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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/620,092	08/12/2014	8805001	8042-2-2	9882

86000 7590 07/23/2014
Gregory A. Nelson
Novak Druce & Quigg LLP
525 Okeechobee Blvd
Suite 1500
West Palm Beach, FL 33401

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment is 528 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

Patrick Pirim, Paris, FRANCE;

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Substitute for form 1449PTO

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**

(Use as many sheets as necessary)

Sheet

1

of

3

Complete if Known

Application Number	
Filing Date	November 17, 2009
First Named Inventor	PIRIM
Art Unit	
Examiner Name	
Attorney Docket Number	8042-2-2

U.S. PATENT DOCUMENTS*

Examiner Initials*	Cite No. ¹	Document Number Number Kind Code ² (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US-4,783,828	11-08-1988	Sadjadi	
		US-5,278,921 A	01-11-1994	Nakamura et al.	
		US-5,774,581 A	06-30-1998	Fassnacht et al.	
		US-6,597,738 B1	07-22-2003	Park et al.	
		US-2003/0067978-A1	04-10-2003	Pirim	
		US-2003-0152267-A1	08-14-2003	Pirim	
		US-6,717,518	04-06-2004	Pirim	
		US-5,565,920	10-15-1996	Lee et al.	
		US-5,592,226	01-07-1997	Lee et al.	
		US-6,256,608 B1	06-03-2004	Malvar	07/2001
		US-2002/0120594 A1	08-29-2002	Pirim	
		US-2002/0156753 A1	10-24-2002	Pirim	
		US-2002/0169732 A1	11-14-2002	Pirim	
		US-5,793,888	08-11-1998	Delanoy	
		US-5,712,729	01-27-1998	Hashimoto	
		US-5,694,495	12-02-1997	Hara et al.	
		US-5,488,430	01-30-1996	Hong	
		US-6,486,909	11-26-2002	Pirim	6,486,909
		US-6,304,187	10-18-2001	Pirim	
		US-5,384,865	01-24-1995	Loveridge	
		US-5,109,425	04-28-1992	Lawton	
		US-5,008,946	04-16-1991	Ando	
		US-5,088,488	02-18-1992	Markowitz et al.	
		US-5,163,095	11-10-1992	Kosaka	
		US-5,359,533	10-25-1994	Ricka et al.	
		US-5,592,237	01-07-1997	Greenway et al.	
		US-5,625,717	04-29-1997	Hashimoto et al.	
		US-2002/0101432 A1	08-01-2002	Ohara et al.	
		US-6,486,909	11-26-2002	Pirim	
		US-7,181,047	02-20-2007	Pirim	
		US-5,912,980	06-15-1999	Hunke	
		US-2007/0140526	06-21-2007	Pirim	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No. ¹	Foreign Patent Document			Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T ³
		Country Code ³	Number ⁴	Kind Code ⁵ (if known)				
		WO	00/11609	A1	03-02-2000	Holding B.E.V. S.A.		<input type="checkbox"/>
		WO	00/11610	A1	03-02-2000	Holding B.E.V. S.A.		<input type="checkbox"/>
		WO	01/63557	A2	08-30-2001	Holding B.E.V. S.A.		<input type="checkbox"/>
		JP	06-205780	A	07-26-1994	Aloka Co. Ltd.		<input type="checkbox"/>
		WO	98/05002		02/05/1998	Carlus Magnus Limited		<input type="checkbox"/>
		EP	0046110	A1	02/17/1982	Urien et al.		<input type="checkbox"/>
		FR	2751772	A1	01/30/1998	Bev Bureau Etude Vision Soc.		<input type="checkbox"/>
		FR	2611063	A1	08/19/1988	Imapply		<input type="checkbox"/>



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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
12/620,092	11/17/2009	2666	462	8042-2-2	4	1

CONFIRMATION NO. 9882

CORRECTED FILING RECEIPT



86000
Gregory A. Nelson
Novak Druce & Quigg LLP
525 Okeechobee Blvd
Suite 1500
West Palm Beach, FL 33401

Date Mailed: 07/15/2014

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Patrick Pirim, Paris, FRANCE;

Applicant(s)

Patrick Pirim, Paris, FRANCE;

Power of Attorney: The patent practitioners associated with Customer Number 86000

Domestic Priority data as claimed by applicant

This application is a CON of 11/676,926 02/20/2007 PAT 7650015
which is a DIV of 09/792,294 02/23/2001 PAT 7181047
which is a CIP of 09/230,502 09/13/1999 PAT 6486909
which is a CIP of PCT/EP98/05383 08/25/1998
and is a 371 of PCT/FR97/01354 07/22/1997

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.)
FRANCE 9609420 07/22/1996

If Required, Foreign Filing License Granted: 04/08/2010

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 12/620,092**

Projected Publication Date: Not Applicable

Non-Publication Request: No

Early Publication Request: No

Title

IMAGE PROCESSING METHOD

Preliminary Class

382

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications:

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

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NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/620,092	11/17/2009	Patrick Pirim	8042-2-2	9882
86000	7590	07/09/2014		
Gregory A. Nelson Novak Druce & Quigg LLP 525 Okeechobee Blvd Suite 1500 West Palm Beach, FL 33401			EXAMINER SETH, MANAV	
			ART UNIT	PAPER NUMBER
			2666	
			NOTIFICATION DATE	DELIVERY MODE
			07/09/2014	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

wpbdocket@novakdruce.com
WPB_Reporting@novakdruce.com

Response to Rule 312 Communication	Application No. 12/620,092	Applicant(s)
	Examiner	Art Unit

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

1. ☒ The amendment filed on 03 July 2014 under 37 CFR 1.312 has been considered, and has been:
- a) ☒ entered.
 - b) ☐ entered as directed to matters of form not affecting the scope of the invention.
 - c) ☐ disapproved because the amendment was filed after the payment of the issue fee.
Any amendment filed after the date the issue fee is paid must be accompanied by a petition under 37 CFR 1.313(c)(1) and the required fee to withdraw the application from issue.
 - d) ☐ disapproved. See explanation below.
 - e) ☐ entered in part. See explanation below.

N.Y. Horne

PUBLISHING DIVISION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Patrick Pirim	Docket No.:	59113-00010
Application No.:	12/620,092	Examiner:	SETH
Filed:	November 17, 2009	Art Unit:	2666
Customer No.:	86000	Conf. No.:	9882

For: IMAGE PROCESSING METHOD

Mail Stop Issue Fee, Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

RESPONSE TO NOTICE TO FILE CORRECTED APPLICATION PAPERS

Sir:

In response to the Notice to File Corrected Application Papers mailed May 7, 2014, please amend the above-identified application as follows:

Amendments to the Specification are reflected on page 2 of this paper.

Remarks/Arguments begin on page 3 of this paper.

AMENDMENTS TO THE SPECIFICATION

Please replace the paragraph entitled "CROSS-REFERENCE TO RELATED APPLICATIONS" with the following paragraph:

The present application is a continuation of U.S. Application No. 11/676,926, filed February 20, 2007.

U.S. Application No. 11/676,926 is now U.S. Patent No. 7,650,015, issued January 19, 2010.

U.S. Application No. 11/676,926 was a divisional of U.S. Application No. 09/792,294, filed February 23, 2001.

U.S. Application No. 09/792,294 is now U.S. Patent No. 7,181,047, issued February 20, 2007.

U.S. Application No. 09/792,294 is a continuation-in-part of U.S. Patent Application No. 09/230,502, filed September 13, 1999.

U.S. Patent Application No. 09/230,502 is now U.S. Patent No. 6,486,909.

U.S. Patent Application No. 09/230,502 was a National Stage Entry of application No. PCT/FR97/01354, filed on July 22, 1997.

U.S. Patent Application No. 09/230,502 was also a continuation-in-part of application No. PCT/EP98/05383, filed on August 25, 1998.

U.S. Patent Application No. 09/230,502 also claims foreign priority to French Patent Application 96 09420, filed July 26, 1996.

REMARKS

This paper is filed in response to the Notice to File Corrected Application Papers mailed May 7, 2014. The specification has been amended to include the relationships to the prior U.S. non-provisional application or international application. No new subject matter has been introduced by way of this amendment.

Fee Authorization

The Director is hereby authorized to charge any deficiency in fees filed, asserted to be filed, or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Deposit Account 14-1437. Please credit any excess fees to such account.

Novak Druce Connolly Bove + Quigg LLP
525 Okeechobee Blvd.,
15th Floor
West Palm Beach, FL 33401

Phone: (561) 847-7800
Fax: (561) 847-7801

Respectfully submitted,

/Michael P. Byrne/
Michael P. Byrne (No. 54,015)

Date: July 3, 2014

Electronic Acknowledgement Receipt

EFS ID:	19490394
Application Number:	12620092
International Application Number:	
Confirmation Number:	9882
Title of Invention:	IMAGE PROCESSING METHOD
First Named Inventor/Applicant Name:	Patrick Pirim
Customer Number:	86000
Filer:	Michael P. Byrne/Krystal Travers
Filer Authorized By:	Michael P. Byrne
Attorney Docket Number:	8042-2-2
Receipt Date:	03-JUL-2014
Filing Date:	17-NOV-2009
Time Stamp:	13:39:42
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
------------------------	----

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		P0232930.PDF	19160 9f3a90076c432c8c67c29946a195a1e08ae7ff4c	yes	3

	Multipart Description/PDF files in .zip description		
	Document Description	Start	End
	Transmittal Letter	1	1
	Specification	2	2
	Applicant Arguments/Remarks Made in an Amendment	3	3
Warnings:			
Information:			
Total Files Size (in bytes):		19160	
<p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p>			



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12/620,092	11/17/2009	Patrick Pirim	8042-2-2	9882
86000	7590	05/07/2014		
Gregory A. Nelson Novak Druce & Quigg LLP 525 Okeechobee Blvd Suite 1500 West Palm Beach, FL 33401			EXAMINER SETH, MANAV	
			ART UNIT 2666	PAPER NUMBER
			NOTIFICATION DATE 05/07/2014	DELIVERY MODE ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

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Application No. : 12620092
Applicant : Pirim
Filing Date : 11/17/2009
Date Mailed : 05/07/2014

NOTICE TO FILE CORRECTED APPLICATION PAPERS

Notice of Allowance Mailed

This application has been accorded an Allowance Date and is being prepared for issuance. The application, however, is incomplete for the reasons below.

Applicant is given two (2) months from the mail date of this Notice within which to respond. This time period for reply is extendable under 37 CFR 1.136(a) for only TWO additional MONTHS.

The application is not in compliance with 37 CFR 1.78, as indicated in the attachment. The consequences of failure to respond within the above-identified time period are set forth in the attachment.

Even if the Office has recognized a benefit claim and has entered it into the Office's database and included it on applicant's filing receipt, the benefit claim is not a proper benefit claim unless the reference in compliance with 37 CFR 1.78 is included, depending upon the application's filing date and as indicated in the attachment, in an application data sheet or in the first sentence(s) of the specification and all other requirements are met.

See attachment.

*A copy of this notice **MUST** be returned with the reply. Please address response to
"Mail Stop Issue Fee, Commissioner for Patents,
P.O. Box 1450, Alexandria, VA 22313-1450".*

/Anita Grimmage/
Publication Branch
Office of Data Management
(571) 272-4200

**APPLICATION FILED PRIOR TO SEPTEMBER 16, 2012,
NOT IN COMPLIANCE WITH 37 CFR 1.78**

- ☒ The 37 CFR 1.78(a)(2) reference on the application data sheet or in the first sentence(s) of the specification does not indicate the relationship (continuation, division, continuation-in-part) to the prior U.S. nonprovisional application or international application designating the U.S. See document coded SPEC dated 11/17/2009, listing application number(s) 09/230,502, PCT/EP98/05383 and PCT/FR97/01354.
- ☐ The 37 CFR 1.78(a)(2) reference on the application data sheet or in the first sentence(s) of the specification following the title does not provide the U.S. nonprovisional application number (series code and serial number) or, with respect to an international PCT application designating the U.S., it provides the international application number or international filing date but not both. See document coded dated , in which the following is missing: .
- ☐ The 37 CFR 1.78(a)(2) reference on the application data sheet or in the first sentence(s) of the specification following the title shows an incorrect, incomplete, or illegible U.S. nonprovisional application number, international PCT application number, or international PCT filing date. See document coded dated , in which the following error was made: .
- ☐ The 37 CFR 1.78(a)(2) reference to the prior U.S. nonprovisional application or international application designating the U.S. is not present on an application data sheet or in the first sentence(s) of the specification following the title, thus removing the validating link under 35 U.S.C. 119(a)-(d) to a prior foreign application or under 35 U.S.C. 119(e) to a prior U.S. provisional application.
- ☐ The 37 CFR 1.78(a)(2) reference to the prior U.S. nonprovisional application or international application designating the U.S. is not present on an application data sheet or in the first sentence(s) of the specification following the title.
- ☐ The 37 CFR 1.78(a)(5) reference to the prior U.S. provisional application is not present on an application data sheet or in first sentence(s) of the specification following the title.
- ☐ The 37 CFR 1.78(a)(5) reference to the prior U.S. provisional application on an application data sheet or in first sentence(s) of the specification following the title does not provide the provisional application number (series code and serial number). See document coded dated , in which the following is missing: .
- ☐ The 37 CFR 1.78(a)(5) reference to the prior U.S. provisional application on an application data sheet or in first sentence(s) of the specification following the title shows an incorrect, incomplete, or illegible U.S. provisional application number. See document coded dated , in which the following error was made: .
- ☐ Other: .

HOW TO RESPOND

A proper response to this notice would include any one of: (1) a supplemental Application Data Sheet (ADS) pursuant to 37 CFR 1.76(c) which provides benefit information that complies with 37 CFR 1.78(a)(2) or 37 CFR 1.78(a)(5); (2) an amendment to the first sentence(s) of the specification which provides benefit information that complies with 37 CFR 1.78(a)(2) or 37 CFR 1.78(a)(5); or (3) a petition filed pursuant to the provisions of 37 CFR 1.78(a)(3) or 37 CFR 1.78(a)(6) if the benefit information from the document identified above by code and date does not accurately reflect the benefits under 35 U.S.C. 119(e), 120, 121 or 365(c) as claimed by applicant (a grantable petition would include either a supplemental ADS or an amendment to the first sentence(s) of the specification as required by 37 CFR 1.78(a)(3)(i) or 37 CFR 1.78(a)(6)(i)). Such amendments to the specification or supplemental ADS submission may be filed after payment of the issue fee if limited to informalities noted herein. See Waiver of 37 CFR 1.312 for Document Required by Office of Patent Publication, 1280 Off. Gaz. Patent Office 918 (March 23, 2004).

WARNING: If Applicant fails to timely submit a proper response, the benefit information will be deleted and the patent will be printed without the benefit information present.



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CONFIRMATION NO. 9882

CORRECTED FILING RECEIPT



86000
Gregory A. Nelson
Novak Druce & Quigg LLP
525 Okeechobee Blvd
Suite 1500
West Palm Beach, FL 33401

Date Mailed: 04/30/2014

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Patrick Pirim, Paris, FRANCE;

Applicant(s)

Patrick Pirim, Paris, FRANCE;

Power of Attorney: The patent practitioners associated with Customer Number 86000

Domestic Priority data as claimed by applicant

This application is a CON of 11/676,926 02/20/2007 PAT 7650015
which is a DIV of 09/792,294 02/23/2001 PAT 7181047
which is a CIP of 09/230,502 09/13/1999 PAT 6486909

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.)

EUROPEAN PATENT OFFICE (EPO) PCT/EP98/05383 08/25/1998
FRANCE PCT/FR97/01354 07/22/1997
FRANCE 9609420 07/22/1996

If Required, Foreign Filing License Granted: 04/08/2010

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 12/620,092**

Projected Publication Date: Not Applicable

Non-Publication Request: No

Early Publication Request: No

Title

IMAGE PROCESSING METHOD

Preliminary Class

382

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications:

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit <http://www.SelectUSA.gov> or call +1-202-482-6800.

PART B - FEE(S) TRANSMITTAL

**Complete and send this form, together with applicable fee(s), to: Mail Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

86000 7590 12/16/2013
Gregory A. Nelson
Novak Druce & Quigg LLP
525 Okeechobee Blvd
Suite 1500
West Palm Beach, FL 33401

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/620,092	11/17/2009	Patrick Pirim	8042-2-2	9882

TITLE OF INVENTION: IMAGE PROCESSING METHOD

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$890	\$300	\$0	\$1190	03/17/2014

EXAMINER	ART UNIT	CLASS-SUBCLASS
SETH, MANAV	2666	382-103000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363). <input type="checkbox"/> Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached. <input type="checkbox"/> "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a Customer Number is required.	2. For printing on the patent front page, list (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.	1 <u>Novak Druce Connolly Bove</u> 2 <u>+ Quigg LLP</u> 3 _____
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3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

IMAGE PROCESSING TECHNOLOGIES LLC

SUFFERN, NEW YORK

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

- ☒ Issue Fee
☐ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)

- ☐ A check is enclosed.
☒ Payment by credit card. Form PTO-2038 is attached.
☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number 14-1437 (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see form PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature /Michael P. Byrne/

Date March 17, 2014

Typed or printed name Michael P. Byrne

Registration No. 54,015

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Electronic Patent Application Fee Transmittal

Application Number:	12620092			
Filing Date:	17-Nov-2009			
Title of Invention:	IMAGE PROCESSING METHOD			
First Named Inventor/Applicant Name:	Patrick Pirim			
Filer:	Michael P. Byrne/Ava Brown			
Attorney Docket Number:	8042-2-2			
Filed as Large Entity				
Utility under 35 USC 111(a) Filing Fees				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Utility Appl Issue Fee	1501	1	960	960
Extension-of-Time:				

SAMSUNG EXHIBIT 1004

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
Total in USD (\$)				960

Electronic Acknowledgement Receipt

EFS ID:	18491321
Application Number:	12620092
International Application Number:	
Confirmation Number:	9882
Title of Invention:	IMAGE PROCESSING METHOD
First Named Inventor/Applicant Name:	Patrick Pirim
Customer Number:	86000
Filer:	Michael P. Byrne/Ava Brown
Filer Authorized By:	Michael P. Byrne
Attorney Docket Number:	8042-2-2
Receipt Date:	17-MAR-2014
Filing Date:	17-NOV-2009
Time Stamp:	13:41:28
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	\$960
RAM confirmation Number	15200
Deposit Account	141437
Authorized User	BYRNE, MICHAEL P.

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)

SAMSUNG EXHIBIT 1004

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	P0221797.PDF	106369	no	2
			0a237552867e025c35eac9bdb45d1702483f832		

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	30492	no	2
			a9d1515075e7399401c5159cfb5c2eb73535f915		

Warnings:

Information:

Total Files Size (in bytes):			136861
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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Patrick Pirim	Docket No.:	59113-00010
Application No.:	12/620,092	Examiner:	SETH
Filed:	November 17, 2009	Art Unit:	2666
Customer No.:	86000	Conf. No.:	9882

For: IMAGE PROCESSING METHOD

Honorable Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

37 C.F.R. 1.27 (g) (2) NOTIFICATION OF
LOSS OF ENTITLEMENT TO SMALL ENTITY STATUS

Pursuant to 37 C.F.R. 1.27 (g) (1) “[A] new determination of entitlement to small entity status is needed when issue and maintenance fees are due. Once status as a small entity has been established in an application or patent, fees as a small entity may thereafter be paid in that application or patent without regard to a change in status until the issue fee is due or any maintenance fee is due.”

A Notice of Allowance was mailed on December 16, 2013 in the above-identified patent application. This paper is a notification of a loss of entitlement to small entity status. This Notification is being filed prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. This notification is signed by a party identified in § 1.33(b).

The Director is hereby authorized to charge any deficiency in fees filed, asserted to be filed, or which should have been filed herewith (or with any paper

hereafter filed in this application by this firm) to our Deposit Account 14-1437.
Please credit any excess fees to such account.

Novak Druce Connolly Bove +
Quigg, LLP
525 Okeechobee Blvd.,
15th Floor
West Palm Beach, FL 33401

Phone: (561) 847-7800
Fax: (561) 847-7801

Date: December 20, 2013

Respectfully submitted,

/Michael P. Byrne/

Michael P. Byrne, Reg. No. 54,015

Electronic Acknowledgement Receipt

EFS ID:	17712925
Application Number:	12620092
International Application Number:	
Confirmation Number:	9882
Title of Invention:	IMAGE PROCESSING METHOD
First Named Inventor/Applicant Name:	Patrick Pirim
Customer Number:	86000
Filer:	Gregory A. Nelson/Ava Brown
Filer Authorized By:	Gregory A. Nelson
Attorney Docket Number:	8042-2-2
Receipt Date:	20-DEC-2013
Filing Date:	17-NOV-2009
Time Stamp:	13:27:20
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	P0208139.PDF	15075 d8d0bf87dc06e28c0e42a982c5017952eac d205f	no	1

Warnings:

Information:

SAMSUNG EXHIBIT 1004

2	Notification of loss of entitlement to small entity status	P0208142.PDF	12154 1ba20fb3be2350e995f6ffc06731c2e6158c51ad	no	2
Warnings:					
Information:					
Total Files Size (in bytes):				27229	
<p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p>					

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Patrick Pirim	Docket No.:	59113-00010
Application No.:	12/620,092	Examiner:	SETH
Filed:	November 17, 2009	Art Unit:	2666
Customer No.:	86000	Conf. No.:	9882

For: IMAGE PROCESSING METHOD

Honorable Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

CERTIFICATE OF TRANSMISSION

I hereby certify that the items listed below are being transmitted today via the Office electronic filing system (EFS-Web) in accordance with 37 CFR §1.8.

1. Notification of Loss of Entitlement to Small Entity Status.

Date: December 20, 2013

Signature: /Ava R. Brown/
Printed Name: Ava R. Brown



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

86000 7590 12/16/2013
Gregory A. Nelson
Novak Druce & Quigg LLP
525 Okeechobee Blvd
Suite 1500
West Palm Beach, FL 33401

EXAMINER

SETH, MANAV

ART UNIT

PAPER NUMBER

2666

DATE MAILED: 12/16/2013

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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12/620,092

11/17/2009

Patrick Pirim

8042-2-2

9882

TITLE OF INVENTION: IMAGE PROCESSING METHOD

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$890	\$300	\$0	\$1190	03/17/2014

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

**Complete and send this form, together with applicable fee(s), to: Mail Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

86000 7590 12/16/2013
Gregory A. Nelson
Novak Druce & Quigg LLP
525 Okeechobee Blvd
Suite 1500
West Palm Beach, FL 33401

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/620,092	11/17/2009	Patrick Pirim	8042-2-2	9882

TITLE OF INVENTION: IMAGE PROCESSING METHOD

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$890	\$300	\$0	\$1190	03/17/2014

EXAMINER	ART UNIT	CLASS-SUBCLASS
SETH, MANAV	2666	382-103000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363). <input type="checkbox"/> Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached. <input type="checkbox"/> "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a Customer Number is required.	2. For printing on the patent front page, list (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. <div> 1 _____ 2 _____ 3 _____ </div>
---	---

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

- ☐ Issue Fee
☐ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)

- ☐ A check is enclosed.
☐ Payment by credit card. Form PTO-2038 is attached.
☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see form PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/620,092	11/17/2009	Patrick Pirim	8042-2-2	9882

86000 7590 12/16/2013
Gregory A. Nelson
Novak Druce & Quigg LLP
525 Okeechobee Blvd
Suite 1500
West Palm Beach, FL 33401

EXAMINER

SETH, MANAV

ART UNIT	PAPER NUMBER
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2666

DATE MAILED: 12/16/2013

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 509 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 509 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

**Notices of Allowance and Fee(s) Due mailed between October 1, 2013 and
December 31, 2013**

(Addendum to PTOL-85)

If the “Notice of Allowance and Fee(s) Due” has a mailing date on or after October 1, 2013 and before January 1, 2014, the following information is applicable to this application.

If the issue fee is being timely paid on or after January 1, 2014, the amount due is the issue fee and publication fee in effect January 1, 2014. On January 1, 2014, the issue fees set forth in 37 CFR 1.18 decrease significantly and the publication fee set forth in 37 CFR 1.18(d)(1) decreases to \$0.

If an issue fee or publication fee has been previously paid in this application, applicant is not entitled to a refund of the difference between the amount paid and the amount in effect on January 1, 2014.

Notice of Allowability	Application No. 12/620,092	Applicant(s) PIRIM, PATRICK	
	Examiner MANAV SETH	Art Unit 2666	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 11/15/2013.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are 57-69 (renumbered as 1-13). As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

- a) ☒ All b) ☐ Some *c) ☐ None of the:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- | | |
|--|--|
| 1. <input type="checkbox"/> Notice of References Cited (PTO-892) | 5. <input type="checkbox"/> Examiner's Amendment/Comment |
| 2. <input type="checkbox"/> Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date _____ | 6. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance |
| 3. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit
of Biological Material | 7. <input type="checkbox"/> Other _____ |
| 4. <input type="checkbox"/> Interview Summary (PTO-413),
Paper No./Mail Date _____ | |

The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

Response to Amendment

1. Applicant's amendment filed on November 15, 2013 has been considered and entered in full.
2. Applicant's amendments to the claims have been considered and are persuasive; therefore all the rejections on the respective claims have been withdrawn.

Allowable Subject Matter

Reasons of Allowance:

3. Claims 57-69 (renumbered as 1-13) are allowed.

The following is an examiner's statement of reasons of allowance:

The reasons of allowance for claims 57 and 64 should be evident from the applicant's arguments as filed in the amendment filed on 11/15/2013, and from the previous office action mailed on 08/15/2013. Therefore claims 57 and 64 are allowed. All other claims depending on claims 57 and 64 are allowable at least by dependency on claims 57 and 64.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."


Art Unit: 2666

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Manav Seth whose telephone number is (571) 272-7456. The examiner can normally be reached on Monday to Friday from 8:30 am to 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Repko, can be reached on (571) 272-8624. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.


Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Manav Seth/
Primary Examiner, Art Unit 2666
November 29, 2013

<i>Index of Claims</i> 	Application/Control No. 12620092	Applicant(s)/Patent Under Reexamination PIRIM, PATRICK
	Examiner MANAV SETH	Art Unit 2624


✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

<input type="checkbox"/> Claims renumbered in the same order as presented by applicant		<input type="checkbox"/> CPA		<input type="checkbox"/> T.D.		<input type="checkbox"/> R.1.47			
CLAIM		DATE							
Final	Original	10/30/2010	06/19/2011	08/11/2013	11/29/2013				
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	2	-	-	-	-				
	3	-	-	-	-				
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	34	-	-	-	-				
	35	-	-	-	-				
	36	-	-	-	-				

<i>Index of Claims</i> 	Application/Control No. 12620092	Applicant(s)/Patent Under Reexamination PIRIM, PATRICK
	Examiner MANAV SETH	Art Unit 2624


✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

<input type="checkbox"/> Claims renumbered in the same order as presented by applicant		<input type="checkbox"/> CPA		<input type="checkbox"/> T.D.		<input type="checkbox"/> R.1.47			
CLAIM		DATE							
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	56		O	-	-				
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2	58		O	O	=				
3	59		O	✓	=				
4	60			✓	=				
5	61			✓	=				
6	62			✓	=				
7	63			O	=				
8	64				=				
9	65				=				
10	66				=				
11	67				=				
12	68				=				
13	69				=				

Issue Classification 	Application/Control No. 12620092	Applicant(s)/Patent Under Reexamination PIRIM, PATRICK
	Examiner MANAV SETH	Art Unit 2666

US ORIGINAL CLASSIFICATION						INTERNATIONAL CLASSIFICATION									
CLASS			SUBCLASS			CLAIMED					NON-CLAIMED				
382			103			G	0	6	K	9 / 00 (2006.01.01)					
CROSS REFERENCE(S)															
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)														
382	128	168													

NONE		Total Claims Allowed:	
		13	
(Assistant Examiner)	(Date)		
/MANAV SETH/ Primary Examiner, Art Unit 2666	11/29/2013	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	22

Issue Classification 	Application/Control No. 12620092	Applicant(s)/Patent Under Reexamination PIRIM, PATRICK
	Examiner MANAV SETH	Art Unit 2666

<input type="checkbox"/> Claims renumbered in the same order as presented by applicant <input type="checkbox"/> CPA <input type="checkbox"/> T.D. <input type="checkbox"/> R.1.47															
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
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	4		20		36		52	12	68						
	5		21		37		53	13	69						
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	10		26		42	2	58								
	11		27		43	3	59								
	12		28		44	4	60								
	13		29		45	5	61								
	14		30		46	6	62								
	15		31		47	7	63								
	16		32		48	8	64								

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 13	
/MANAV SETH/ Primary Examiner, Art Unit 2666 (Primary Examiner) _____ (Date) _____		11/29/2013 (Date)	O.G. Print Claim(s) 1 O.G. Print Figure 22

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	48	patrick near pirim	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2010/10/30 18:26
S2	26	patrick near pirim and pixel\$2	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2010/10/30 18:26
S3	21	patrick near pirim and pixel\$2 and histogram\$2	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2010/10/30 18:26
S4	49	patrick near pirim	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/20 20:26
S5	26	patrick near pirim and pixel\$2	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/20 20:26
S6	21	patrick near pirim and pixel\$2 and histogram\$2	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/20 20:26
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EAST Search History (Prior Art)

S8	9493	(target\$2 or person\$2 or object\$2 or people\$2 or vehicle\$2 or plane\$2 or tank\$2 or player\$2) near4 (track\$2 or surveillan\$4 or recogni\$5 or identify\$4 or identification\$2) and video\$2 and (image\$2 or frame\$2 or photo\$2 or pictur\$2) and histogram\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/07/20 20:47
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S10	4215	S8 and S9	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/07/20 20:47
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S12	1697	(target\$2 or person\$2 or object\$2 or people\$2 or vehicle\$2 or plane\$2 or tank\$2 or player\$2 or pixel\$2) near4 (track\$2 or surveillan\$4 or recogni\$5 or identify\$4 or identification\$2) same histogram\$2 and video\$2 and (image\$2 or frame\$2 or photo\$2 or pictur\$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/07/20 20:53
S13	897	S9 and S12	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/07/20 20:55
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EAST Search History (Prior Art)

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S17	4	("4364089" "4539590" "4849906" "5187585").PN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/07/20 21:58
S18	44	("5473369").URPN.	USPAT	OR	ON	2013/07/20 21:59
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S20	16911	382/100-106.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/08/09 14:24
S21	276	S19 and S20	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/08/09 14:25
S22	1	"12620092"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/08/11 12:35
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EAST Search History (Prior Art)

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S25	428	(pixel\$2 or pel\$2 or (picture near element\$2)) near4 (classificat\$4 or classif\$4) same histogra\$4 same (speed\$3 or velocit\$4 or luminan\$4 or direction\$2 or orient\$5 or colo\$4 or time\$2 or hue\$2 or saturat\$4 or axis or chrom\$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/08/11 12:51
S26	528	(pixel\$2 or pel\$2 or (picture near element\$2)) near4 (classificat\$4 or classif\$4 or track\$4) same histogra\$4 same (speed\$3 or velocit\$4 or luminan\$4 or direction\$2 or orient\$5 or colo\$4 or time\$2 or hue\$2 or saturat\$4 or axis or chrom\$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/08/11 13:26
S27	49	patrick near pirim	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/11/28 16:53
S28	26	patrick near pirim and pixel\$2	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/11/28 16:53
S29	21	patrick near pirim and pixel\$2 and histogram\$2	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/11/28 16:53
S30	49	patrick near pirim	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/11/28 16:54
S31	26	patrick near pirim and pixel\$2	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/11/28 16:54

EAST Search History (Prior Art)

S32	21	patrick near pirim and pixel\$2 and histogram\$2	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/11/28 16:54
S33	2975	(target\$2 or person\$2 or object\$2 or people\$2 or vehicle\$2 or plane\$2 or tank\$2 or player\$2) near4 (track\$2 or surveillan\$4 and video\$2 and (image\$2 or frame\$2 or photo\$2 or pictur\$2) and histogram\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/11/28 16:54
S34	10137	(target\$2 or person\$2 or object\$2 or people\$2 or vehicle\$2 or plane\$2 or tank\$2 or player\$2) near4 (track\$2 or surveillan\$4 or recogni\$5 or identify\$4 or identification\$2) and video\$2 and (image\$2 or frame\$2 or photo\$2 or pictur\$2) and histogram\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/11/28 16:54
S35	141027	"382"/\$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/11/28 16:54
S36	4505	S34 and S35	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/11/28 16:54
S37	1429	(target\$2 or person\$2 or object\$2 or people\$2 or vehicle\$2 or plane\$2 or tank\$2 or player\$2) near4 (track\$2 or surveillan\$4 or recogni\$5 or identify\$4 or identification\$2) same histogram\$2 and video\$2 and (image\$2 or frame\$2 or photo\$2 or pictur\$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/11/28 16:54
S38	1817	(target\$2 or person\$2 or object\$2 or people\$2 or vehicle\$2 or plane\$2 or tank\$2 or player\$2 or pixel\$2) near4 (track\$2 or surveillan\$4 or recogni\$5 or identify\$4 or identification\$2) same histogram\$2 and video\$2 and (image\$2 or frame\$2 or photo\$2 or pictur\$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/11/28 16:54

EAST Search History (Prior Art)

S39	965	S35 and S38	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/11/28 16:54
S40	1473	(target\$2 or person\$2 or object\$2 or people\$2 or vehicle\$2 or plane\$2 or tank\$2 or player\$2 or pixel\$2) near2 (track\$2 or surveillan\$4 or recogni\$5 or identify\$4 or identification\$2) same histogram\$2 and video\$2 and (image\$2 or frame\$2 or photo\$2 or pictur\$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/11/28 16:54
S41	794	S35 and S40	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/11/28 16:54
S42	4	("5280530" "5323470" "5430809" "5473369").PN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/11/28 16:54
S43	4	("4364089" "4539590" "4849906" "5187585").PN.	US-PGPUB; USPAT; USOCR	OR	ON	2013/11/28 16:54
S44	44	("5473369").URPN.	USPAT	OR	ON	2013/11/28 16:54
S45	1473	(target\$2 or person\$2 or object\$2 or people\$2 or vehicle\$2 or plane\$2 or tank\$2 or player\$2 or pixel\$2) near2 (track\$2 or surveillan\$4 or recogni\$5 or identify\$4 or identification\$2) same histogram\$2 and video\$2 and (image\$2 or frame\$2 or photo\$2 or pictur\$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/11/28 16:54
S46	18988	382/100-106.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/11/28 16:54
S47	294	S45 and S46	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/11/28 16:54

EAST Search History (Prior Art)

S48	1	"12620092"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/11/28 16:54
S49	0	(pixel\$2 or pel\$2 or (picture near element\$2)) near4 (classificat\$4 or classif\$4) same hisotgram same (speed\$3 or velocit\$4 or luminan\$4 or direction\$2 or orient\$5 or colo\$4 or time\$2 or hue\$2 or saturat\$4 or axis or chrom\$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/11/28 16:54
S50	0	(pixel\$2 or pel\$2 or (picture near element\$2)) near4 (classificat\$4 or classif\$4) and hisotgram same (speed\$3 or velocit\$4 or luminan\$4 or direction\$2 or orient\$5 or colo\$4 or time\$2 or hue\$2 or saturat\$4 or axis or chrom\$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/11/28 16:54
S51	447	(pixel\$2 or pel\$2 or (picture near element\$2)) near4 (classificat\$4 or classif\$4) same histogra\$4 same (speed\$3 or velocit\$4 or luminan\$4 or direction\$2 or orient\$5 or colo\$4 or time\$2 or hue\$2 or saturat\$4 or axis or chrom\$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/11/28 16:54
S52	551	(pixel\$2 or pel\$2 or (picture near element\$2)) near4 (classificat\$4 or classif\$4 or track\$4) same histogra\$4 same (speed\$3 or velocit\$4 or luminan\$4 or direction\$2 or orient\$5 or colo\$4 or time\$2 or hue\$2 or saturat\$4 or axis or chrom\$2)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/11/28 16:54
S53	226	(pixel\$2 or pel\$2 or (picture near element\$2)) near4 (classificat\$4 or classif\$4 or track\$4) same histogra\$4 same (speed\$3 or velocit\$4 or luminan\$4 or direction\$2 or orient\$5 or colo\$4 or time\$2 or hue\$2 or saturat\$4 or axis or chrom\$2) and center and minim\$4 and maxim\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/11/29 18:34
S54	141027	"382"/\$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/11/29 18:35

EAST Search History (Prior Art)

S55	143	S53 and S54	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/11/29 18:35
S56	618	(target\$2 or person\$2 or object\$2 or people\$2 or vehicle\$2 or plane\$2 or tank\$2 or player\$2 or pixel\$2) near2 (track\$2 or surveillan\$4 or recogni\$5 or identify\$4 or identification\$2) same histogram\$2 and video\$2 and (image\$2 or frame\$2 or photo\$2 or pictur\$2) and center and minim\$4 and maxim\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/11/29 19:02
S57	141027	"382"/\$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/11/29 19:03
S58	322	S56 and S57	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/11/29 19:03
S59	409	(target\$2 or person\$2 or object\$2 or people\$2 or vehicle\$2 or plane\$2 or tank\$2 or player\$2 or pixel\$2) near2 (track\$2 or surveillan\$4 or recogni\$5 or identify\$4 or identification\$2) same histogram\$2 and video\$2 and (image\$2 or frame\$2 or photo\$2 or pictur\$2) and (target\$2 or person\$2 or object\$2 or people\$2 or vehicle\$2 or plane\$2 or tank\$2 or player\$2 or pixel\$2) near3 (center\$4 or middl\$4 or medi\$4) and minim\$4 and maxim\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/11/29 19:04
S60	222	S57 and S59	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/11/29 19:10

EAST Search History (Prior Art)

S61	699	(target\$2 or person\$2 or object\$2 or people\$2 or vehicle\$2 or plane\$2 or tank\$2 or player\$2 or pixel\$2) near2 (track\$2 or surveillan\$4 or recogni\$5 or identify\$4 or identification\$2) same histogram\$2 and video\$2 and (image\$2 or frame\$2 or photo\$2 or pictur\$2) and (target\$2 or person\$2 or object\$2 or people\$2 or vehicle\$2 or plane\$2 or tank\$2 or player\$2 or pixel\$2) near3 (outlin\$4 or boundar\$4 or contour\$3 or edge\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/11/29 19:24
S62	97	(target\$2 or person\$2 or object\$2 or people\$2 or vehicle\$2 or plane\$2 or tank\$2 or player\$2 or pixel\$2) near2 (track\$2 or surveillan\$4 or recogni\$5 or identify\$4 or identification\$2) same histogram\$2 and video\$2 and (image\$2 or frame\$2 or photo\$2 or pictur\$2) and (target\$2 or person\$2 or object\$2 or people\$2 or vehicle\$2 or plane\$2 or tank\$2 or player\$2 or pixel\$2) same (outlin\$4 or boundar\$4 or contour\$3 or edge\$3) near3 (extend\$4 or increas\$4 or spread\$4 or fitt\$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/11/29 19:29

EAST Search History (I nterference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S63	0	(track\$4 and target\$2 and frame\$2 and histogram\$2 and class\$4 and minima and maxima).clm.	US-PGPUB; USPAT; UPAD	OR	OFF	2013/11/29 20:20
S64	2	(track\$4 and target\$2 and frame\$2 and histogram\$2 and class\$4 and boundar\$4).clm.	US-PGPUB; USPAT; UPAD	OR	OFF	2013/11/29 20:20

Search Notes 	Application/Control No. 12620092	Applicant(s)/Patent Under Reexamination PIRIM, PATRICK
	Examiner MANAV SETH	Art Unit 2624

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
382	100,103,107,128-132,168-180,199-206,224,291	10/30/2010	ms
382	All	8/11/2013	ms
Above	Updated	11/29/2013	ms

SEARCH NOTES			
Search Notes		Date	Examiner
East search		10/30/2010	ms
IDS Search		10/30/2010	ms
Inventor Search		10/30/2010	ms
East, Inventor and IEEE Search		8/11/2013	ms
East, Inventor and Interference Search		11/29/2013	ms

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
	PGPUB Text Search	11/29/2013	ms

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Patrick Pirim	Docket No.:	19113.0010.000000
Application No.:	12/620,092	Examiner:	SETH
Filed:	November 17, 2009	Art Unit:	2666
Customer No.:	86000	Conf. No.:	9882

For: IMAGE PROCESSING METHOD

Honorable Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

AMENDMENT

Sir:

This is a reply to the non-final Office Action of August 15, 2013. Please enter and consider the following amendments and remarks.

The Director is hereby authorized to charge any deficiency in fees filed, asserted to be filed, or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Deposit Account 14-1437. Please credit any excess fees to such account.

AMENDMENTS TO THE CLAIMS

Please amend the claims according to the following listing of the claims.

1 - 56. (Canceled)

57. (Currently Amended) A process of tracking a target in an input signal implemented using a system comprising an image processing system, the input signal comprising a succession of frames, each frame comprising a succession of pixels, the target comprising pixels in one or more of a plurality of classes in one or more of a plurality of domains, the process performed by said system comprising, on a frame-by-frame basis:

forming at least one histogram of the pixels in the one or more of a plurality of classes in the one or more of a plurality of domains, said at least one histogram referring to classes defining said target, and identifying the target in said at least one histogram itself,

wherein identifying the target in said at least one histogram further comprises determining a center of the target to be between X and Y minima and maxima of the target.

58. (Previously Presented) The process according to claim 57, wherein identifying the target in said at least one histogram further comprises determining a center of the target to be between X and Y minima and maxima of the target.

59. (Previously Presented) The process according to claim 57, wherein identifying the target in said at least one histogram further comprises determining the center of the target at regular intervals.

60. (Previously Presented) The process according to claim 57 further comprising drawing a tracking box around the target.

61. (Previously Presented) The process according to claim 57, wherein said image processing system comprises at least one components selected

- from a memory, a temporal processing unit, and a spatial processing unit.
62. (Previously Presented) The process according to claim 57, wherein said image processing system comprises at least two components selected from a memory, a temporal processing unit, and a spatial processing unit.
63. (Previously Presented) The process according to claim 57, wherein forming the at least one histogram further comprises successively increasing the size of a selected area until the boundary of the target is found.
64. (New) A process of tracking a target in an input signal implemented using a system comprising an image processing system, the input signal comprising a succession of frames, each frame comprising a succession of pixels, the target comprising pixels in one or more of a plurality of classes in one or more of a plurality of domains, the process performed by said system comprising, on a frame-by-frame basis:
- forming at least one histogram of the pixels in the one or more of a plurality of classes in the one or more of a plurality of domains, said at least one histogram referring to classes defining said target, and identifying the target in said at least one histogram itself,
- wherein forming the at least one histogram further comprises successively increasing the size of a selected area until the boundary of the target is found.
65. (New) The process according to claim 64, wherein identifying the target in said at least one histogram further comprises determining a center of the target to be between X and Y minima and maxima of the target.
66. (New) The process according to claim 64, wherein identifying the target in said at least one histogram further comprises determining the center of the target at regular intervals.
67. (New) The process according to claim 64 further comprising drawing a tracking box around the target.

68. (New) The process according to claim 64, wherein said image processing system comprises at least one components selected from a memory, a temporal processing unit, and a spatial processing unit.
69. (New) The process according to claim 64, wherein said image processing system comprises at least two components selected from a memory, a temporal processing unit, and a spatial processing unit.

REMARKS

Claims 57 – 69 are pending. Claims 1 – 56 are cancelled. The Office Action indicates Claims 58 and 63 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The features of Claim 58 have been incorporated into Claim 57. New Claim 64 is a combination of Claims 57 and 63. New Claims 65 – 69 are based on previous claims 58 – 62. These amendments are made without prejudice and without disclaimer of the cancelled or modified subject matter. Applicant reserves the right to file one or more Continuing Applications. The rejections are moot in view of these claim amendments.

The present application is in condition for allowance, and applicants respectfully request favorable action. In order to facilitate the resolution of any questions, the Examiner is welcome to contact the undersigned by phone.

Novak Druce Connolly Bove + Quigg LLP
525 Okeechobee Blvd.,
15th Floor
West Palm Beach, FL 33401

Phone: (561) 847-7800
Fax: (561) 847-7801

Respectfully submitted,

/Michael P. Byrne/

Michael P. Byrne (No. 54,015)

Date: November 15, 2013

Electronic Acknowledgement Receipt

EFS ID:	17411565
Application Number:	12620092
International Application Number:	
Confirmation Number:	9882
Title of Invention:	IMAGE PROCESSING METHOD
First Named Inventor/Applicant Name:	Patrick Pirim
Customer Number:	86000
Filer:	Gregory A. Nelson/JoAnn Evangelista
Filer Authorized By:	Gregory A. Nelson
Attorney Docket Number:	8042-2-2
Receipt Date:	15-NOV-2013
Filing Date:	17-NOV-2009
Time Stamp:	14:19:40
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		P0204221.PDF	22401 90a07c362c4d787c62b7f2b21f9379023742d224	yes	5

	Multipart Description/PDF files in .zip description		
	Document Description	Start	End
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Claims	2	4
	Applicant Arguments/Remarks Made in an Amendment	5	5
Warnings:			
Information:			
Total Files Size (in bytes):		22401	
<p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p>			

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 12/620,092	Filing Date 11/17/2009	<input type="checkbox"/> To be Mailed
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 ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

(Column 1)

(Column 2)

FOR	NUMBER FILED	NUMBER EXTRA		RATE (\$)	FEE (\$)
<input type="checkbox"/> BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
<input type="checkbox"/> SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
<input type="checkbox"/> EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		X \$ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		X \$ =	
<input type="checkbox"/> APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
<input type="checkbox"/> MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED – PART II

(Column 1)

(Column 2)

(Column 3)

	11/15/2013	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE (\$)	ADDITIONAL FEE (\$)
AMENDMENT	Total (37 CFR 1.16(i))	* 13	Minus	** 20	= 0		X \$40 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0		X \$210 =	0
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))							
	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
	TOTAL ADD'L FEE							0

(Column 1)

(Column 2)

(Column 3)

		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE (\$)	ADDITIONAL FEE (\$)
AMENDMENT	Total (37 CFR 1.16(i))	*	Minus	**	=		X \$ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		X \$ =	
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))							
	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
	TOTAL ADD'L FEE							

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

 LIE
 /DIANIECE JACOBS/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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12/620,092

11/17/2009

Patrick Pirim

8042-2-2

9882

86000

7590

08/15/2013

Gregory A. Nelson
Novak Druce & Quigg LLP
525 Okeechobee Blvd
Suite 1500
West Palm Beach, FL 33401

EXAMINER

SETH, MANAV

ART UNIT

PAPER NUMBER

2666

NOTIFICATION DATE

DELIVERY MODE

08/15/2013

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

wpbdocket@novakdruce.com

Office Action Summary	Application No. 12/620,092	Applicant(s) PIRIM, PATRICK	
	Examiner MANAV SETH	Art Unit 2666	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 August 2011.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on ____; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 5) ☒ Claim(s) 57-63 is/are pending in the application.
5a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 6) ☐ Claim(s) ____ is/are allowed.
- 7) ☒ Claim(s) 57 and 59-62 is/are rejected.
- 8) ☒ Claim(s) 58 and 63 is/are objected to.
- 9) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

- a) ☐ All b) ☐ Some c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 3) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date ____. | 4) <input checked="" type="checkbox"/> Other: <u>Detailed Action</u> . |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on September 23, 2011 has been entered.

Terminal Disclaimer

2. The terminal disclaimer filed on 08/23/2011 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of U.S. Patent No. 7,650,015 has been reviewed and is accepted. The terminal disclaimer has been recorded.

Response to Amendment

3. Applicant's amendment, filed on September 23, 2011 has been considered and entered in full.

4. In view of the terminal disclaimer filed, double patenting rejections on the respective claims have been withdrawn.

5. Applicant's arguments with respect to respective amended claims have been considered but are moot in view of the rejection(s) made below, in view of the further consideration of the amended claims.

Claim Rejections - 35 USC § 103

6. The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 57 and 59-62 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Hunke, U.S. Patent No. 5,912,980, further in view of Grove et al., IEEE Publication, August 1998, "Colour Based Object Tracking" (pages 4).

Regarding claims 57, Hunke discloses a process of tracking a target in an input signal implemented using a system comprising an image processing system (col. 4, lines 14-42; col. 5, lines 1-35 – any system that performs operations on the images is an image processing system), the input signal comprising a succession of frames, (Abstract, last few lines – "the method allows tracking of target objects in subsequent frames of the video image stream based upon the colors in the target objects; col. 5, lines 1-13), Hunke further discloses "each frame comprising a succession of pixels (col. 8, lines 1-3 – images obtained from the video camera are represented as a **pixel matrix** RGB values where pixel matrix represents succession of pixels), Hunke further discloses "the target comprising pixels in one or more of a plurality of classes in one or more of a plurality of domains" (col. 8, lines 17-20 – the domain being the color domain as the image frame pixels are classified into the target color pixels and non-target color pixels, and target pixels further comprise a target class having a specific color, where target classes, for example, being human faces with different skin

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colors (col. 9, lines 50-65); the other domain being the time domain since the tracking is being done at different times (col. 10, lines 42-60)), the process comprising, on-a frame-by-frame basis: forming at least one histogram of the pixels in the one or more of a plurality of classes in the one or more of a plurality of domains, said at least one histogram referring to classes defining said target, and identifying the target from said at least one histogram (col. 10, lines 45-51 – the normalized color distribution of the image of the tracked target is computed in each image frame during tracking the target, where the histogram refers to the classes defining (as discussed before) said target (col. 10, lines 25-55), thus identifying the target in each frame using histogram). Hunke as disclosed identifies the target in the normalized colored distribution of the image computed from the histogram rather than in the histogram itself. However, examiner here cites Grove to teach color based object identification within the histogram itself (See Grove, page 3, right column). Therefore, it would have been obvious to one of ordinary skill in the art at the time invention was made to use Grove's teachings in the invention of Hunke. One of ordinary skill in the art at the time invention was made would have been motivated to use Grove's teachings in the invention of Hunke because both Hunke and Grove are directed to the same field of endeavor of tracking a target in an video signal using color histograms and using Grove's teachings of object identification in the Hunke's invention would add robustness and would provide results at a faster rate (See Grove, Topic 5 – Conclusions and future work).

Regarding claim 59, the combined invention of Hunke and Grove discloses the process according to claim 57, wherein identifying the target in said at least one histogram further comprises determining the center of the target at regular intervals (See Grove, page 3, right column, first few lines).

Regarding claim 60, Hunke discloses drawing a tracking box around the target (col. 5, lines 25-35 – rectangular box around the target).

Regarding claims 61 and 62, claims 61 and 62 recites “wherein said image processing system comprises components selected from a memory, a temporal processing unit, and a spatial processing unit”. As discussed in the rejection of claim 57, Hunke discloses a digital system which tracks the object in multiple digital frames of a video, and memory, a temporal processing unit and a spatial processing unit are inherent components of a digital system that performs operations on the video, where video has a time component in it. (see Hunke – col. 5, lines 1-35; col. 10, lines 42-67).

8. Claims 57 and 60-62 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Hunke, U.S. Patent No. 5,912,980, further in view of Swain et al., IEEE Publication, 1990, “Indexing via color histograms” (pp. 390-393).

Regarding claims 57, Hunke discloses a process of tracking a target in an input signal implemented using a system comprising an image processing system (col. 4, lines 14-42; col. 5, lines 1-35 – any system that performs operations on the images is an image processing system), the input signal comprising a succession of frames, (Abstract, last few lines – “the method allows tracking of target objects in subsequent frames of the video image stream based upon the colors in the target objects; col. 5, lines 1-13), Hunke further discloses “each frame comprising a succession of pixels (col. 8, lines 1-3 – images obtained from the video camera are represented as a **pixel matrix** RGB values where pixel matrix represents succession of pixels), Hunke further discloses “the target

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comprising pixels in one or more of a plurality of classes in one or more of a plurality of domains” (col. 8, lines 17-20 – the domain being the color domain as the image frame pixels are classified into the target color pixels and non-target color pixels, and target pixels further comprise a target class having a specific color, where target classes, for example, being human faces with different skin colors (col. 9, lines 50-65); the other domain being the time domain since the tracking is being done at different times (col. 10, lines 42-60)), the process comprising, on-a frame-by-frame basis: forming at least one histogram of the pixels in the one or more of a plurality of classes in the one or more of a plurality of domains, said at least one histogram referring to classes defining said target, and identifying the target from said at least one histogram (col. 10, lines 45-51 – the normalized color distribution of the image of the tracked target is computed in each image frame during tracking the target, where the histogram refers to the classes defining (as discussed before) said target (col. 10, lines 25-55), thus identifying the target in each frame using histogram). Hunke as disclosed identifies the target in the normalized colored distribution of the image computed from the histogram rather than in the histogram itself. However, examiner here cites Swain to teach color based object identification in the histogram itself (See Swain, page 391, topic 2 – Object Identification via Histogram). Therefore, it would have been obvious to one of ordinary skill in the art at the time invention was made to use Swain's teachings in the invention of Hunke. One of ordinary skill in the art at the time invention was made would have been motivated to use Swain's teachings in the invention of Hunke because both Hunke and Swain are directed to the same field of endeavor of target identification using color histograms and using Swain's teachings of object identification in the Hunke's invention would provide robust results at a faster rate, further not requiring to compute normalized colored distribution of the image from the histogram.

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Regarding claim 60, Hunke discloses drawing a tracking box around the target (col. 5, lines 25-35 – rectangular box around the target).

Regarding claims 61 and 62, claims 61 and 62 recites “wherein said image processing system comprises components selected from a memory, a temporal processing unit, and a spatial processing unit”. As discussed in the rejection of claim 57, Hunke discloses a digital system which tracks the object in multiple digital frames of a video, and memory, a temporal processing unit and a spatial processing unit are inherent components of a digital system that performs operations on the video, where video has a time component in it. (see Hunke – col. 5, lines 1-35; col. 10, lines 42-67).

9. Claims 58 and 63 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Examiner note: Examiner has cited particular columns and line numbers in the references as applied to the claims above for the convenience of the applicant. Although the specified citations are representative of the teachings for the art and are applied to the specific limitations within the individual claim, other passages and figures may be applied as well. It is respectfully requested from the applicant in preparing responses, to fully consider the references entirely as potential teachings all or part of the claimed invention, as well as the context of the passage as taught by the prior art or disclosed by the examiner.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Manav Seth whose telephone number is (571) 272-7456. The examiner can normally be reached on Monday to Friday from 8:30 am to 5:00 pm.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Repko, can be reached on (571) 272-8624. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Manav Seth/
Primary Examiner, Art Unit 2666
August 11, 2013

Notice of References Cited	Application/Control No. 12/620,092		Applicant(s)/Patent Under Reexamination PRIM, PATRICK	
	Examiner MANAV SETH		Art Unit 2666	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-5,123,055 A	06-1992	Kasdan, Harvey L.	382/134
*	B	US-5,263,098 A	11-1993	Horikami, Kinji	382/128
*	C	US-5,278,921 A	01-1994	Nakamura et al.	382/167
*	D	US-5,430,809 A	07-1995	Tomitaka, Tadafusa	382/173
*	E	US-5,473,369 A	12-1995	Abe, Keiko	348/169
*	F	US-5,521,843 A	05-1996	Hashima et al.	700/253
*	G	US-5,546,475 A	08-1996	Bolle et al.	382/190
*	H	US-5,608,820 A	03-1997	Vaidyanathan, Akhileswar G.	382/169
*	I	US-5,610,653 A	03-1997	Abecassis, Max	348/170
*	J	US-5,912,980 A	06-1999	Hunke, H. Martin	382/103
*	K	US-5,982,944 A	11-1999	Vaidyanathan et al.	382/271
*	L	US-6,226,388 B1	05-2001	Qian et al.	382/103
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N	EP 574831 A1	12-1993	European Patent	VANNELLI et al.	G01N 21/88
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	Swain et al., IEEE Publication, 1990, "Indexing via color histograms" (pp. 390-393).
	V	Grove et al., IEEE Publication, August 1998, "Colour Based Object Tracking" (pages 4).
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

(18)



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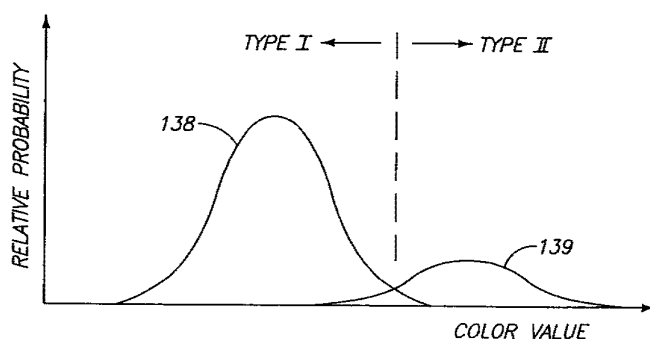
(11) Publication number:

0 574 831 A1

(12)

EUROPEAN PATENT APPLICATION(21) Application number: **93109328.0**(51) Int. Cl.⁵: **G01N 21/88, B07C 5/342,
G06F 15/68**(22) Date of filing: **09.06.93**(30) Priority: **16.06.92 US 899450**(43) Date of publication of application:
22.12.93 Bulletin 93/51(84) Designated Contracting States:
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Dipl.-Ing. E. Graalfs,
Dipl.-Ing. W. Wehnert,
Dr.-Ing. W. Döring
Mozartstrasse 23, D-80336 München (DE)(54) **Product inspection method and apparatus.**

(57) Described herein is an automated quality inspection station for evaluating color component characteristics of a product. The inspection station includes a color video camera, for capturing video frames of product images, and a control system for analyzing those video frames. The control system is programmed to perform a reference calibration and then a sample calibration. During the reference calibration an operator identifies component type areas from a displayed reference frame of a typical product assortment. The control system calculates color value density curves from the identified areas. The density curves are then calibrated to each other by scaling each of the density curves by a scaling factor. The scaling factors can either be provided directly by the operator or default values can be calculated by the control system. Default scaling factor values are calculated by summing the product of the corresponding density curve and an overall histogram of a sample video frame over a range of color values. Individual pixels are classified as one of a plurality of component types according to the highest calibrated density curve at the pixels' color value.



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Technical Field

This invention relates to methods and apparatus for inspecting food products and other products or items whose quality can be visually ascertained; for classifying component areas of such products or items; and for setting process parameters of in-line processing equipment based on such classifications.

Background Art

Pixel classification is sometimes referred to as segmentation, in which various segments of an image are identified as belonging to individual product component types. Pixel classification is commonly used in quality control or product inspection applications, particularly in the food products industry, in order to distinguish between acceptable and defective product.

Food products are often graded by their appearance. Green beans, for instance, are expected to be a uniform shade of green. Defects within a single green bean might be formed by white, brown, black, or other discolored areas. It is desirable to detect green beans having such defective areas, and to separate them from green beans without such defects. It may also be desirable to quantify the defective areas, and to reject as defective only those green beans having more than a specified area of any certain type of defect.

Before automated product inspection can take place, an image of the product must be captured in a form which is meaningful to a computer or data processor; a form in which the image is represented by a series or array of numbers. Electronic video systems do this by dividing an image into a number of discrete picture elements or "pixels." Each pixel has an associated color value, representing the hue and intensity of that portion of the image which corresponds to the pixel.

In a monochrome or black-and-white video system, the color value is specified by a single variable which ranges from 0 to n. The color value in such a case represents the absolute light intensity of the image area corresponding to the pixel. A color value of 0 corresponds to black, and a color value of n corresponds to white. Intermediate color or intensity values correspond to progressing levels of grey.

In a color video system it is necessary to record intensities for at least two different ranges of colors. Three different color ranges, designated red, green, and blue are typically used. Thus, a single color value in a color video system might be specified by three or more discrete variables or intensity values, r, g, and b, corresponding to intensities of red, green, and blue.

In segmenting a video image, it is necessary to classify each possible color value as one of a plurality of component types. A component type is defined as an area of the product representing a single quality classification such as "acceptable" product, "white defect" product, "brown defect" product, or another classification, depending on the nature of the product. In practice, it is desirable to define a number of such quality classifications corresponding not only to visually identifiable product areas, but also to areas representing foreign objects such as rocks or wood. Segmenting the video image is often the first and most critical step in a detailed image analysis which includes many subsequent analytical steps.

In a monochrome system, in which each pixel is represented by a color value having only one intensity value, it is common to set one or more thresholds for purposes of color value or pixel classification. The relationship of each pixel's color value to the thresholds determines that pixel's classification. Because the color value is single-dimensioned, e.g., a function of a single variable, the operator is able to easily conceptualize the thresholds and vary them to obtain the desired segmentation results. Varying the single-dimensioned thresholds is a simple matter of increasing or decreasing their values.

Pixel classification becomes somewhat more difficult when the color value has two or three variables or dimensions, such as in a color video system having r, g, and b intensity values. Simple thresholds, if used, would need to be set for each of the three dimensions. Not only would such thresholds be difficult for an operator to conceptualize, but the number of variables would make meaningful and proper adjustment nearly impossible. In addition, simple thresholds allow specification of only a rectangularly shaped space in the three-dimensional space defined by the possible color values, while actual component areas usually contain color values forming irregular shapes within the three-dimensional color value space. Therefore, color analysis systems generally require more sophisticated methods of pixel or color value classification than are used with black-and-white systems.

One approach to color image classification, used in a diamond inspection apparatus, is described in U.S. Patent No. 4,951,825 to Hawkins et al., entitled "Apparatus for Classifying Particulate Material." The Hawkins patent describes a "learning" process in which one class at a time of pre-sorted diamonds are introduced into the machine. The machine stores the color values obtained during the learning process and subsequently compares color values in sample diamonds with the stored values to determine the closest

match.

The method described by Hawkins et al. might be suitable when it is not necessary to detect specific features occurring within a single image. The method is not sufficient, however, when component types contained within the same image must be differentiated from each other, or when it is required to detect the presence of small component types within larger articles.

A more suitable approach for classifying a number of component types, all contained within the same image, is described in U.S. Patent No. 4,807,163 to Gibbons, entitled "Method and Apparatus for Digital Analysis of Multiple Component Visible Fields." Gibbons describes segmenting an image of a human scalp to quantify hair loss.

In the Gibbons method, subareas of a visual image, each containing only a single component type (bald or not bald), are initially identified or selected by an operator from a sample image. A histogram is then compiled for each identified sub-area, and mean intensity values are determined for each component type based on the histogram. The intensity value for each pixel is then compared to the mean intensity values. If the pixel intensity value falls within a predetermined range of any component mean intensity value, it is classified as that component type. The pixels are then counted to determine the number of pixels classified as bald.

In an alternative embodiment, Gibbons compares the mean intensity value for two component types to determine an average intensity value. This average intensity value is then used as a threshold, with higher values being classified as one component type and lower values being classified as the other component type.

Gibbons does not address the problem of setting thresholds in the three-dimensional space of a color analysis system. In fact, the prior art has to this date failed to adequately address the problem of accurately setting classification parameters in a color system. Most prior art systems are directed to single color systems or are limited to distinguishing between two component types. Many of these systems also require operator intervention prior to analyzing each image.

The prior art classification methods are not easily adaptable to color systems in which pixels are represented by more than one variable or intensity value. For instance, it is not clear in the Gibbons disclosure how intensity value comparisons could be made in each dimension of a three-color system. Even if the Gibbons methods were adaptable to color systems, the simple thresholds described would make it impossible to set accurate boundaries for component types occupying irregular three-dimensional spaces.

In addition, the prior art, including the Gibbons patent, does not adequately account for cases in which the component types have overlapping histograms--when a specific color value occurs in more than one component type. In such cases, it is necessary to determine the proper component type classification for each color value. The Gibbons analysis arbitrarily selects a threshold based on mean histogram values. This threshold has no correlation to the desired classification priority.

The invention described below provides means and methods for classifying pixels and their color values as one of many component types, taking into account relative classification priorities and other factors, and resulting in more reliable classification. In addition, the methods described below adapt themselves automatically to changing product loads and conditions.

Brief Description of the Drawings

Preferred embodiments of the invention are described below with reference to the accompanying drawings, in which:

Fig. 1 is an end view of a preferred embodiment of a color product analyzer in accordance with the invention;

Fig. 2 is a side view of the product analyzer shown in Fig. 1;

Fig. 3 is a schematic block diagram of a control system which is part of the color product analyzer shown in Fig. 1;

Fig. 4 is a simplified flow chart showing preferred methodical steps in accordance with the invention;

Fig. 5 is simplified flow chart showing the methodical steps of a reference calibration in accordance with the methods of this invention;

Fig. 6 is a simplified illustration of a reference video frame;

Fig. 7 is a simplified, single-dimensional, histogram of color values occurring within the type I area of Fig. 6;

Fig. 8 is a simplified, one-dimensional histogram of color values occurring within the type II area of Fig. 6;

Fig. 9 is a simplified flow chart of a first embodiment sample calibration in accordance with the methods of this invention;

Fig. 10 shows color value density curves corresponding to the type I and type II areas of Fig. 6;
 Fig. 11 shows relative probability curves corresponding to the type I and type II areas of Fig. 6;
 Fig. 12 illustrates a segmented sample video frame;
 Fig. 13 is a simplified flow chart of a second embodiment sample calibration in accordance with the
 5 methods of this invention;
 Fig. 14 is an overall histogram of color values occurring within the entire video frame of Fig. 6; and
 Fig. 15 is an alternative embodiment reference calibration in accordance with the methods of this
 invention.

10 **Disclosure of Invention and Best Modes for Carrying Out the Invention**

Described below is an automated quality inspection device or color product analyzer for identifying and
 evaluating visual or optical component characteristics of food products or other products whose quality can
 be visually ascertained. The product analyzer provides a method of classifying pixels and pixel color values
 15 according to their component types. Such classification is then be used in subsequent analytical steps as
 desired. In the preferred embodiments described below, the classifications are used in calculating statistical
 quality control data regarding visual characteristics of multiple product samples. In general, such calcula-
 tions include segmenting visual images into their constituent component types. Another possible use for
 such classification is in setting classification parameters for in-line optical sorting machines, in which
 20 segmentation is sometimes not involved.

Fig. 1 shows a preferred embodiment of an automated quality inspection device or station in
 accordance with the invention, generally designated by the reference numeral 20. Inspection station 20
 includes a frame 22 supported by casters 24. A product conveyor belt 26 runs longitudinally through frame
 22. A conveyor motor 28 is mounted to frame 22 to power conveyor belt 26. Conveyor belt 26 forms a
 25 product sample surface for supporting product which is to be inspected.

A camera 30 is positioned relative to the optical inspection surface formed by conveyor belt 26 to
 produce video frames or images of the supported sample product. Each video frame contains an array of
 pixels or color values. Each pixel represents a corresponding area of a sample product image.

Camera 30 produces a video signal with color values representing each pixel. Each color value is
 30 specified by at least one variable to indicate the color, shade, or intensity of the corresponding pixel. In the
 preferred embodiment, each color value is defined by three variable image intensity values: red (r), green
 (g), and blue (b). The methods of the invention are particularly appropriate in such a system, where the
 color values are specified by at least two variables.

Inspection station 20 uses a 3-color line scan camera which produces repeated linear scans across the
 35 surface of a belt, each scan being representative of optical characteristics of the product. A succession of
 linear scans can be accumulated to form a two-dimensional array of pixels representing a two-dimensional
 visual image.

Camera 30 utilizes an optical transducer or sensing device (not shown) which contains three rows of
 light sensitive sensors. Each row is sensitive to a different range of optical wavelengths, so that each row
 40 corresponds to one of the three intensity variables. Since the rows are spaced from each other in the
 direction of product flow, they are each responsive to a different transverse line across conveyor belt 26.
 The rows are logically shifted, subsequent to image capture, to align them relative to each other.

Inspection station 20 also includes a pair of fluorescent light tubes 32 for illuminating product on
 conveyor belt 26. A pair of product guides 34 are adjustable to guide product within the line of sight of
 45 camera 30 (indicated by dashed lines). Electronic control circuits are housed within frame 22 behind doors
 36.

Fig. 3 shows a control system 40 which forms a part of inspection station 20. Control system 40 is
 connected to control and receive the images or video frames from camera 30. It comprises a processing
 means or data processor 42, an associated keyboard 44, a data video display monitor 46 for displaying
 50 data, a graphics video display monitor 48 for displaying segmented and unsegmented video frames, and an
 input device 50 such as a light pen or mouse for allowing an operator to select sub-areas from graphics
 video display 48 and to otherwise provide instructions to data processor 42.

A frame grabber 52 is connected to camera 30 and receives the video signal produced by camera 30. It
 contains means for capturing and storing multiple scans of camera 30, the multiple scans comprising a two-
 55 dimensional video image of product flowing beneath camera 30. A variety of suitable frame grabber boards,
 adaptable to a variety of video cameras, are widely available from various manufacturers.

Data processor 42 is operably connected to control and receive video frames from camera 30 and
 frame grabber 52. It is also connected to display monitors 46 and 48 and to mouse 50. Data processor 42 is

a general purpose computer such as an IBM-compatible computer having an Intel 80486 microprocessor or CPU, as well as appropriate volatile and non-volatile memory. The selection of data processor 42 is dictated primarily by its processing capacity and the time constraints imposed by the particular application.

Data processor 42 is programmed by conventional means to perform the operations and control functions described below. It communicates and receives instructions from an operator through keyboard 44, mouse 50 and video display monitors 46 and 48.

Alternative embodiments of both the electronic and mechanical hardware are of course possible without departing from the principles of this invention. In general, some means for obtaining a video frame of a product sample is required. Many different methods of obtaining such a video frame are commonly available and used. For instance, a two-dimensional video camera, rather than a line scan camera, could advantageously be provided for simultaneously capturing an entire video frame. Such a two-dimensional camera would in most applications be equally preferable to the line scan camera described above. If using such a camera it would be possible, although not required, to provide a stationary inspection surface rather than a conveyor belt. The primary advantage of a conveyor belt support surface is that it allows placement of the inspection station in-line with a continuous product flow so that inspection may be made without interrupting the product flow.

In operation, a continuous flow of product passes beneath camera 30 on conveyor belt 26. Control system 40 is programmed to periodically capture a video frame representing a two-dimensional video image of the product passing below camera 30. The control system analyzes each image and produces a quality control report based on the results of this analysis.

In analyzing video images, inspection station 20 segments images on the basis of color value differentiation--each pixel is classified into a component type according to its color value. Each color value is therefore classified as "belonging" to one, and only one, component type classification. Pixels are classified in accordance with the classification of their color values.

The various possible component types are defined prior to classification in response to operator instructions. For instance, a particular product might have classifications corresponding to "white defect," "brown defect," "light acceptable product," "dark acceptable product," "rocks," and "other." Component types may also exist for "background," and "unidentified" areas.

Fig. 4 is a flow chart showing operation of the apparatus and the overall methodical steps in accordance with the preferred embodiment of the invention. Control system 40 is programmed to initially perform a reference calibration 100, followed by a sample calibration 102. Image classification and analysis 104 follows the calibration steps.

Reference calibration 100 allows the operator to identify the component types, from a reference video image of actual product, into which pixels are to be classified. Sample calibration 102 is an analytical step, based on a sample video image of actual product, in which color value classification criteria are determined. Image analysis 104 includes classifying image pixels according to their color value classifications. It also typically includes segmenting video frames based upon the component type classifications of their pixels and further steps such as shape analysis which are not within the scope of this invention. The image analysis step 104 is reiterated for subsequent video images. Reference calibration 100 and sample calibration 102 are repeated as desired or as instructed by an operator.

Reference frame calibration 100 generally requires operator intervention and is therefore performed only infrequently, for example when setting up for a new or different type of product. Sample frame calibrations, on the other hand, are not dependent on operator input and may therefore be performed along with every sample frame. However, practical constraints such as available processing time and speed will often dictate that sample frame calibrations be performed only periodically at an operator's instruction.

During reference frame calibration 100 the control system captures a reference video frame. A reference frame is a video frame representing an image of a typical product assortment. The operator then specifies portions of individual component types within the reference video frame. Reference calibrations can be repeated periodically if needed, although it is contemplated that the need for repeating the reference calibration will arise only rarely, usually when introducing a new product or product batch to the analyzer.

During subsequent sample frame calibration 102, the control system captures a sample frame. The control system is programmed to derive relative component type probability curves from the identified portions of the individual component types, preferably by comparing the color values of the identified portions to the color values of the overall sample video frame. The control system then classifies individual color values as single component types according to the highest relative component type probability for each individual color value.

The sample frame can be the same frame as the reference frame, or it may be captured subsequently to the reference frame. It may be a frame which is to be analyzed or a frame which is to be used solely for

calibration purposes, with analysis being performed on subsequent frames.

During the image analysis step 104, pixels are classified based on the classifications of their color values (as established in sample calibration 102). The image is segmented accordingly and further analyzed as required by the particular application. Subsequent images are analyzed without any further requirement for calibration steps. If desired, however, the sample calibration step can be performed prior to analyzing each image.

FIG. 5 shows steps for performing a reference frame calibration 100 in accordance with the methods of this invention. Reference frame calibration 100 includes the following steps, performed by control system 40: (a) capturing a reference video frame of a representative product sample (step 120); (b) displaying the reference video frame on graphics video display 48 (step 121); (c) allowing an operator to identify portions of individual component types within the reference video frame (step 122); (d) compiling reference or component histograms of color values occurring within the identified portions of individual component types (step 123); and (e) calculating reference color value density curves from the component histograms (step 124).

Fig. 6 shows a simplified reference video frame 130 which has been captured and displayed on graphics video display monitor 48. A green bean 135 is shown in Fig. 6 as an example of an article which is to be analyzed or segmented. To simplify the explanation, assume that green bean 135 contains only two component types: type I and type II. Type I represents acceptable or desirable areas of the green bean while type II represent areas of the article having undesirable or unacceptable visual characteristics. While Fig. 6 shows green bean 135 as two discrete areas, the actual representation would show only slight or gradual color variations from one component type to another.

For further simplification, the following discussion is presented in terms of a single-color or monochrome system, in which each color value is represented by a single variable. The methods presented, however, are particularly applicable to color systems in which color values are represented by a plurality of variables and in situations where it is desired to identify more than two component type areas. The methods presented are directly applicable to such situations.

The operator is instructed to identify areas on the display corresponding to each component type which is to be identified. Mouse 50, keyboard 44, and graphic video display monitor 48 form component selection means which are operably connected to processor 42 for allowing the operator to identify portions of individual component types within reference video frame 130. The operator can select individual pixels or an area of pixels. The rectangular, dashed boxes indicate areas which the operator has identified as being portions of the two component areas.

The operator identifies component areas by selecting individual reference pixels or by tracing an area of reference pixels. The control system is programmed to highlight or otherwise indicate selected reference frame pixels or areas. The operator in this step need not identify all component areas of each type, nor is it necessary to accurately trace the exact perimeters of the component areas selected. All that is necessary is to highlight at least nine or ten reference pixels representative of each component type. Ultimate accuracy is of course enhanced if relatively large areas or numerous instances of each component type are selected. Nevertheless, the methods of this invention will achieve a high degree of accuracy even when only small component areas are identified.

After operator selection, the identified component areas define a number of reference pixels for each component type. Processor 42 is programmed to compile reference histograms from these pixels corresponding to the component types. Reference histograms indicate the number of occurrences of each possible color value within the identified portions of the component types.

FIGS. 7 and 8 show reference histograms corresponding to the identified portions of component types I and II of Fig. 6. Such histograms are typically incomplete to the extent that not all color values were included in the identified portions of the component types. In many cases, not all possible color values for a component type are even present in the reference frame--subsequent video frames may contain additional color values which should be classified as the component type. Further, identified samples may contain localized anomalies not generally representative of the corresponding component type.

To account for these deficiencies, processor 42 is programmed to calculate color value density curves, also referred to as reference curves, from the reference histograms for each component type. Each reference curve is a continuous function which is fit to the corresponding reference histogram using a least square analysis. The calculated density or reference curves represent, for each component type, an approximation of the statistical distribution of color values within the component type.

It is believed that the color value distribution in most reference histograms will approximate a gaussian distribution; therefore, the least square analysis utilizes a set of functions known as Hermite polynomials, weighted by a gaussian weighting function. Utilizing the Hermite polynomials simplifies the least square

analysis as described below.

The gaussian weighting function $E(x)$ for a given reference histogram is given by the following equation:

$$E(x) = \frac{1}{\sqrt{\sigma}\sqrt{\pi}} \exp\left(-\frac{x^2}{2}\right)$$

where σ is the standard deviation of the reference histogram. The first four orders of Hermite polynomials (P_0 through P_3) are used in the least square analysis:

$$P_0(t) = 1 \quad P_1(t) = 2t \quad P_2(t) = 4t^2 - 2 \quad P_3(t) = 8t^3 - 12t$$

The Hermite polynomials P_0 through P_3 are weighted and normalized as follows prior to being fit to the reference histogram:

$$N_0(x) = E\left(\frac{x-u}{\sigma}\right)$$

$$N_1(x) = \frac{-1}{\sqrt{2}} P_1\left(\frac{x-u}{\sigma}\right) E\left(\frac{x-u}{\sigma}\right)$$

$$N_2(x) = \frac{1}{\sqrt{8}} P_2\left(\frac{x-u}{\sigma}\right) E\left(\frac{x-u}{\sigma}\right)$$

$$N_3(x) = \frac{-1}{\sqrt{86}} P_3\left(\frac{x-u}{\sigma}\right) E\left(\frac{x-u}{\sigma}\right)$$

where u is the mean color value of the reference histogram. The normalizing factors preceding the polynomial functions ensure that the functions are normalized to each other--that their integrals are equal to one.

Weighted and normalized polynomials N_0 through N_3 are calculated for each of the three color value dimensions or variables, r , g , and b , yielding 12 polynomial functions.

The orthogonal nature of the weighted polynomials simplifies subsequent calculations, reducing the least squares analysis to a convolution. Sixty four polynomial coefficients are therefore calculated as follows:

$$C_{i,j,k} = \sum_{r=0}^l \sum_{g=0}^m \sum_{b=0}^n \sqrt{H_m(r,g,b)} N_i(r) N_j(g) N_k(b)$$

where i , j , and k vary from 0 to 3, representing the four orders of Hermite polynomials. $H(r,g,b)$ is the reference histogram for which a density curve is being calculated.

The reference function or curve $D(r,g,b)$ is then calculated directly, using coefficients $C_{i,j,k}$, as follows:

$$D(r,g,b) = \left(\sum_{i=0}^3 \sum_{j=0}^3 \sum_{k=0}^3 C_{i,j,k} N_i(r) N_j(g) N_k(b) \right)^2 F$$

where F is a normalization factor which is calculated to ensure that the integral of the square of each density curve is equal to one, or that

$$\sum_{r=0}^l \sum_{g=0}^m \sum_{b=0}^n (D(r,g,b))^2 = 1$$

The function fitting steps described above, when performed only in a single dimension, result in reference density curves 136 and 137, shown by dashed lines in Figs. 7 and 8, corresponding to the type I and type II reference histograms, respectively. The particular steps described have the advantage of automatically adapting to reference histograms having varying widths or standard deviations; the width of the weighted Hermite polynomials varies with the reference histograms' standard deviation. This produces density curves which quite accurately fit their corresponding reference histograms. In many cases, such as when a histogram contains a minimal number of samples, only two or three orders of the weighted Hermite polynomials need be used in the least square analysis.

FIG. 10 shows density curves 136 and 137 superimposed over each other. The curves indicate that color values in the range of C1 to C3 have a finite statistical probability of occurring in type I components. Color values in the range of C2 to C4 have a finite statistical probability of occurring in type II components. An overlap occurs between C2 and C3, with the color values in that range being likely to occur in both type I and type II component types.

Because of overlaps such as illustrated in Fig. 10, pixel classification based solely on color value discrimination will of mathematical necessity involve uncertainties and a certain number of erroneous classifications. For instance, a color value of X, within an overlap of component type color values, might occur in either of the type I and type II component types. In more complex situation, a given color value might legitimately occur in several component types. In assigning such a color value to a component type, previous methods have set arbitrary "thresholds," or have ignored the possibility of a color value occurring in an overlap area. The methods of this invention, however, provide a logical and meaningful determination of the desired classification based on relative component type probabilities as calculated or set by an operator.

A general feature of this invention includes determining the probability of any single color value occurring in any single component type, as opposed to that same color value occurring in any other component type. The reference curves do not indicate this probability, since they show only the relative distribution of color values within a single component type. The density curve magnitudes are dependent upon the size of the identified portions of the component types and upon the normalization factors used in calculating the density curves. Therefore while the shape of the reference curves are meaningful, their overall magnitudes are arbitrarily set. The density curves do not predict the relative probability of a single color value occurring in one or another of the component types.

For instance, component type I occurs much more frequently in green bean 135 than does component type II. Therefore, color values corresponding to component type I are also more likely to appear in any video frame of green beans than are color values corresponding to component type II. The density curve magnitudes do not represent this fact.

Further methods of this invention include allowing an operator to specify how the uncertainties created by color value overlaps are resolved. The methods thus provide a logical and consistent basis upon which to base classification decisions regarding color values within component type overlaps. Such methods include scaling or calibrating the reference density curves relative to each other to make them more meaningful in relation to each other. This scaling is performed in a sample calibration step by appropriately multiplying the reference curves.

In a first embodiment of a sample calibration the operator is allowed to specify and adjust probability scaling factors which are then used to scale the reference curves. The scaling results in probability curves, wherein each probability curve represents the probability of any single color value occurring in any single

component type relative to any other component type. Each pixel is classified as the component type having the highest relative probability at the pixel's color value, according to the probability curves. The operator can view on the video display monitor the resulting image segmentation while adjusting the probability scaling factors, and can therefore set the scaling factors to achieve the desired discrimination between various component types. The operator also sets a minimum probability threshold. Color values having probabilities only beneath this threshold are classified as "other" or "unidentified," rather than as any of the component types specifically identified by the operator.

For instance, in a particular application it might be desired to identify all pixels which are at all likely to be of a first component type--even if it results in erroneously including pixels of a second component type in the first component type. In other words, the operator can specify that overlap uncertainties be resolved in favor of a first component type classification. To do this, the operator increases the probability scaling factor for the first component type to place a relatively higher importance or cost on the first component type, even at the expense of erroneously identifying some second component type pixels as the first component type.

In a second, more preferable embodiment of a sample calibration, default values for the density scaling factors are calculated automatically, and the operator specifies probability multipliers corresponding to each component type. The data processor is programmed to adjust each default density scaling factor by the corresponding probability multiplier before scaling the density curves.

The probability curves are calculated in sample calibration step 102 which follows reference calibration step 100. The sample calibration is performed on a sample frame, which can be the same frame as the reference frame or subsequent frames to the reference frame. While it may be desirable to perform a sample calibration on every frame, it will usually be impractical due to the processing time required by the sample calibration.

FIG. 9 is a flow chart showing a first embodiment of a sample calibration 102. The sample calibration includes the following steps performed by control system 40: (a) capturing a sample video frame of a product which is to be inspected or segmented (step 140); (b) obtaining scaling factors from an operator (step 141); (c) scaling the density curves (obtained during reference calibration) by the density scaling factors to obtain relative probability curves (step 142); (d) comparing the probability curves at each color value to determine the component type having the highest probability at each color value (step 143); (e) classifying each color value as the component type having the highest relative probability at that color value (step 144); and (f) displaying a segmented representation of the sample video frame (step 145).

The density scaling factors are obtained from the operator. Further, the operator can repetitively adjust the density scaling factors and view the resulting sample frame segmentation. To accomplish this, the sample frame is displayed on graphics display terminal 48 with an indication of segmented areas. Simultaneously, either on the graphics display terminal 48 or on data display terminal 46, operator controls are displayed which allow the operator to set and adjust density scaling factors. As the operator varies the scaling factors, the operator may monitor the effect of the scaling factors on the sample image segmentation. The operator adjusts the scaling factors until the desired or optimal discrimination between component type areas is attained, or until the operator is satisfied with the resulting pixel classifications.

Once the probability curves have been calculated, the pixels of subsequent sample frames are classified or segmented merely by comparing the relative probabilities at the pixels' color values. Alternatively, processing means 42 contains a look-up table for storing the proper color value classifications. The table is loaded during the sample calibration for later reference while analyzing subsequent sample frames. As another alternative, the probability curves are compared only as needed, when a pixel having a particular color value is being classified, with the results of each comparison being stored in a memory look-up table as the comparison is completed. Using this latter variation, each color value is classified only once, and only when needed. If subsequent pixels have the same color value, reference is made to the look-up table for the proper classification.

FIG. 10 shows reference curves 136 and 137 acquired during the reference calibration. FIG. 11 shows the corresponding probability curves 138 and 139 obtained by scaling reference curves 136 and 137. The classification of pixels, based on their color values, is performed by reference to the probability curves. At an individual pixel's color value, the probability type for each component value are compared to determine which has the highest value. The pixel is classified as the component type having the highest probability at the pixel's color value. In the simplified, single-dimensional situation illustrated, all color values to the left of the intersection of the two probability curves will be classified as type I component elements. All color values to the right of the intersection of the two probability curves will be classified as type II component elements. Increasing the scaling factor for component type II will result in the intersection moving to the left, thereby increasing the number of color values which are classified as type II.

In actual practice, the color values occupy a three-dimensional space. While varying one component type's scaling factor increases the number of color values which will be classified as that component type, it does not have the effect of varying a simple threshold. Rather, the color values of each component type are represented by an irregular three-dimensional shape which expands and contracts as the corresponding scaling factor is adjusted. While this shape cannot be conveniently viewed on a display monitor, the resulting segmentation can, as illustrated by Fig. 12.

FIG. 12 illustrates a segmented sample video frame 149. Each image is segmented according to the component type classifications of its pixels' color values, with a representation of the segmented image being displayed on graphics display monitor 48. The displayed segmented representations are updated in response to the operator providing new scaling factors. Therefore, the operator need only adjust the various component type scaling factors to provide the desired results, based on the segmented image displayed on the video display monitor.

FIG. 13 illustrates a second preferred form of sample calibration step 102. The sample calibration includes the following steps performed by control system 40: (a) capturing a sample video frame of a product which is to be inspected or segmented (step 150); (b) compiling an overall histogram of color values within the entire sample video frame, or at least a major portion thereof (step 151); (c) comparing the density curves (obtained during reference calibration) to the overall histogram to obtain scaling factors corresponding to each density curve (step 152); (d) obtaining probability multipliers from an operator (step 153); (e) adjusting the density scaling factors by the probability multipliers (step 154); (f) scaling the density curves by the adjusted scaling factor to obtain probability reference curves corresponding to the component types (step 155); (g) comparing the probability curves at each color value to determine the component type having the highest probability at each color value (step 156); (h) classifying each color value as the component type having the highest relative probability at that color value (step 157); and (i) displaying a segmented representation of the sample video frame (step 158).

FIG. 14 shows an overall histogram corresponding to a sample video frame. The overall histogram indicates the number of occurrences of each possible color value within the sample frame. In general, an overall histogram will include peaks which correspond to the peaks of the individual reference curves.

Default density scaling factors are computed by comparing the density curves to the overall histogram. This comparison can take various forms, with the object being to find scaling factors which transform the reference curves into relative probability curves, wherein the curves are meaningful in comparison to each other. One comparison includes determining a continuous overall distribution function for the overall histogram and then scaling each reference curve so that its peak has a magnitude equal to the corresponding magnitude of the overall distribution function.

A less computation intensive method computes each scaling factor by summing the product of the corresponding density curve and the overall histogram over a range of color values. Thus, the scaling factor K for component type T is determined by the following equation:

$$K_T = \sum_{r=0}^l \sum_{g=0}^m \sum_{b=0}^n D_T(r,g,b) H_O(r,g,b)$$

where $H_O(r,g,b)$ is the overall histogram, representing the number of occurrences of color values defined by red (r), green (g), and blue (b) intensities; and $D_T(r,g,b)$ represents the reference curve for component type T . " l ," " m ," and " n " are the highest allowable intensities allowed for red, green, and blue, respectively. This method of scaling has been found to provide reliable scaling factors, and can be performed without operator intervention.

Default scaling factors can be adjusted if desired. Processor 42 obtains probability multipliers corresponding to each component type from the operator. The default density scaling factors are adjusted by the probability multipliers prior to the scaling step.

The sample image is then segmented according to the component type classifications of its color values, with a representation of the segmented image being displayed on graphics display monitor 48. The displayed segmented representations are updated in response to the operator providing new probability multipliers. Therefore, the operator need only adjust the various component type probability multipliers to provide the desired results, based on the segmented sample frame displayed on the graphics display monitor.

The calibration step described above can be performed for every sample frame, processing speed permitting. No operator intervention is required since the operator adjustments are applied proportionally to each succeeding sample frame according to the percentages specified. Normally, however, time and processing speed constraints will preclude sample calibrations except at rather lengthy intervals.

Classification of pixels is performed as already described with reference to Fig. 11. In practice, control system 40 compares the probability at each color value prior to classifying pixels, with the resulting color value classification being stored in a three-dimensional look-up table. As individual pixels are processed, the processor refers to the look-up table for the proper classification.

FIG. 15 shows an alternative method of reference frame calibration 100. The alternative reference frame calibration method initially follows the steps discussed with reference to Fig. 5. However, the alternative method is reiterative. After performing steps 120-124, a sample calibration 102 is performed, with the reference frame as the sample frame, in accordance with the procedures already discussed. The sample calibration 102 is used as an alternative form of component selection, with the resulting segmented areas being used as component type areas while repeating steps 123 and 124.

Using this alternative reference frame calibration method, the operator need initially only define a very small area for each component type. The pixels in this small area are then analyzed to create a first approximation of the desired classification. The operator adjusts scaling factors or probability multipliers to define larger component areas in the reference frame, with these larger areas being subsequently used in obtaining revised reference histograms and density curves, and more accurate classifications.

The methods described above can be integrated in an online sorting machine such as described in U.S. Patent No. 4,581,632, entitled "Optical Inspection Apparatus for Moving Articles." Such a sorting machine has a line scan camera which views articles as they pass beneath on a conveyor belt. The machine includes processing means for classifying individual pixels and for then identifying and rejecting defective products based on the pixel classification. High classification speeds are attained by loading color value classification data in a look-up table. Improved control over classification parameters can be achieved by utilizing the methods described above in loading the table.

The classifications and quality control parameters obtained through the above methods can also be used to set and adjust process parameters of other in-line processing equipment such as blanchers, steam peelers, etc.

Claims

1. An apparatus of classifying video pixels in a product inspection device as one of a plurality of component types, wherein each pixel has an associated color value, each color value being specified by at least one variable, the apparatus comprising:
 - means for capturing a reference video frame of a product image, the reference video frame comprising an array of video pixels;
 - means for identifying portions of individual component types within the reference video frame;
 - means for deriving relative component type probability curves from the identified portions of the individual component types; and
 - for classifying individual pixels as single component types according to the highest relative component type probability for each individual pixel's color value.
2. The apparatus of claim 1, wherein the means for deriving the relative component type probability curves comprises processing means for comparing color values of the identified portions of component types to the color values of an overall sample video frame.
3. The apparatus of claim 1 or 2, wherein each color value is specified by at least two variables.
4. The apparatus of one of claims 1 to 3, further comprising additional means for classifying individual color values as individual component types according to their highest relative probability; and a look-up table for storing the component type classifications of individual color values.
5. The apparatus of one of claims 1 to 4, further comprising means for segmenting a video frame based on the classifications of its pixels; and displaying the segmented video frame.
6. The apparatus of one of claims 1 to 5, wherein said processing means include means for compiling reference histograms of color values occurring within the identified portions of the reference video

frame;

means for calculating color value density curves from the reference histograms; and

means for scaling the density curves by scaling factors to obtain the relative component type probability curves.

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7. The apparatus of claim 6, comprising means for updating the segmented video frame display in response to the operator providing new scaling factors.

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8. The apparatus of claim 6 or 7, wherein the processing means calculate the color value density curves from the reference histograms by fitting a set of gaussian-weighted Hermite polynomials to each reference histogram.

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9. The apparatus of one of claims 6 to 8, wherein the processing means is programmed to compile reference histograms of color values occurring within the identified portions of the reference video frame;

to calculate color value density curves from the reference histograms:

to compile an overall histogram of color values within the sample video frame;

to compare the density curves to the overall histogram to obtain a scaling factor corresponding to each density curve; and

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to scale the density curves by scaling factors to obtain the relative component type probability curves.

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10. The apparatus of one of claims 6 to 9, further comprising means for obtaining probability multipliers corresponding to the relative probability curves from an operator; and the processing means further adjusting each density scaling factor by the corresponding probability multiplier before scaling the density curves.

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11. The apparatus according to one of claims 6 to 10, wherein comparing the density curves to the overall histogram comprises summing the product of the corresponding density curve and the overall histogram over a range of color values.

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12. A product inspection device for identifying component types in a sample product having a plurality of component types, the inspection device comprising:

a sample surface for supporting product which is to be inspected;

a camera positioned relative to the optical inspection surface to produce video frames of the supported sample product, each video frame containing an array of pixels, wherein each pixel has an associated color value which is specified by at least two variables;

a video display monitor which displays video frames to an operator;

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component selection means for allowing an operator to identify portions of individual component types within a reference video frame;

a data processor operably connected to the camera, the video display monitor, and the component selection means, the data processor being programmed to derive relative component type probability curves from the identified portions of the individual component types, and to classify individual color values as single component types according the highest relative component type probability for each color value.

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13. The device of claim 12, comprising a frame grabber which receives the video signal and captures video frames representing images of the product, each video frame containing an array of pixels, each pixel having an associated color value which is specified by at least two variables.

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14. A method of classifying video pixels in a product inspection device as one of a plurality of component types, wherein each pixel has an associated color value, each color value being specified by at least one variable, the apparatus comprising the following steps:

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capturing a reference video frame of a product image, the reference video frame comprising an array of video pixels;

identifying portions of individual component types within the reference video frame;

deriving relative component type probability curves from the identified portions of the individual component types; and

classifying individual pixels as single component types according to the highest relative component type probability for each individual pixel's color value.

15. The method of claim 14, further comprising the following additional steps:

5 compiling reference histograms of color values occurring within the identified portions of the reference video frame;

 calculating color value density curves from the reference histograms; and

 scaling the density curves by scaling factors to obtain the relative component type probability curves.

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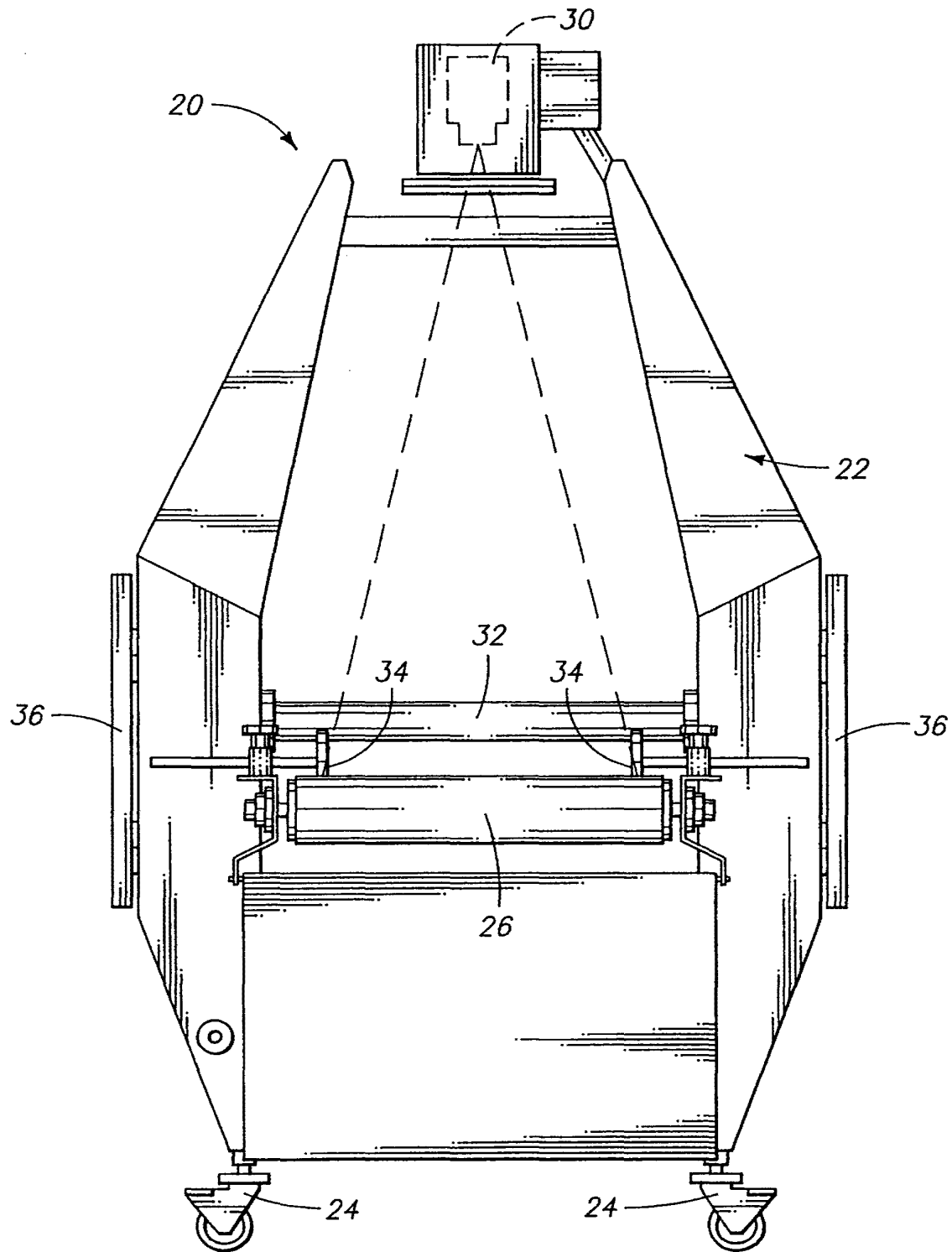
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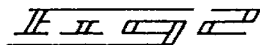
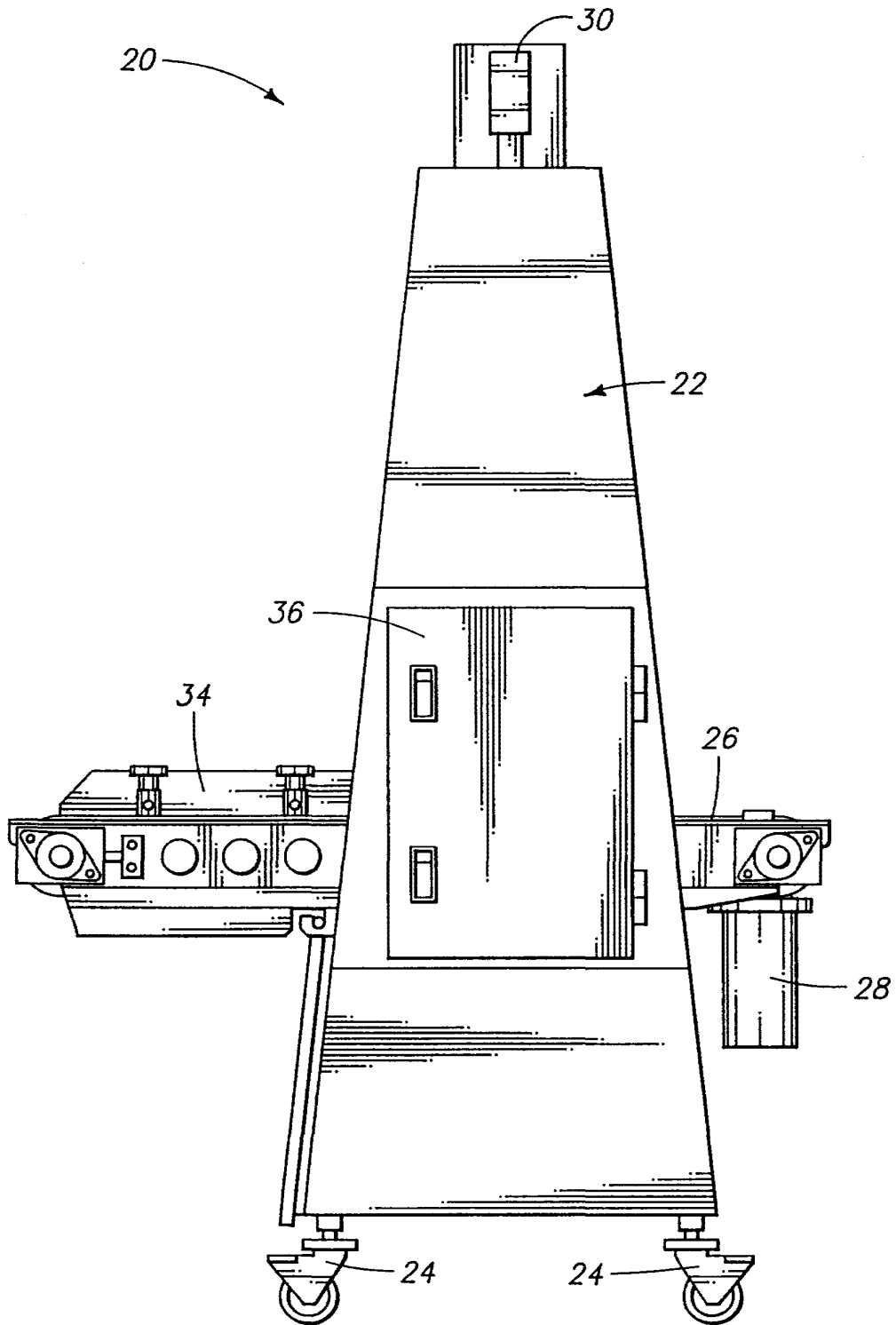
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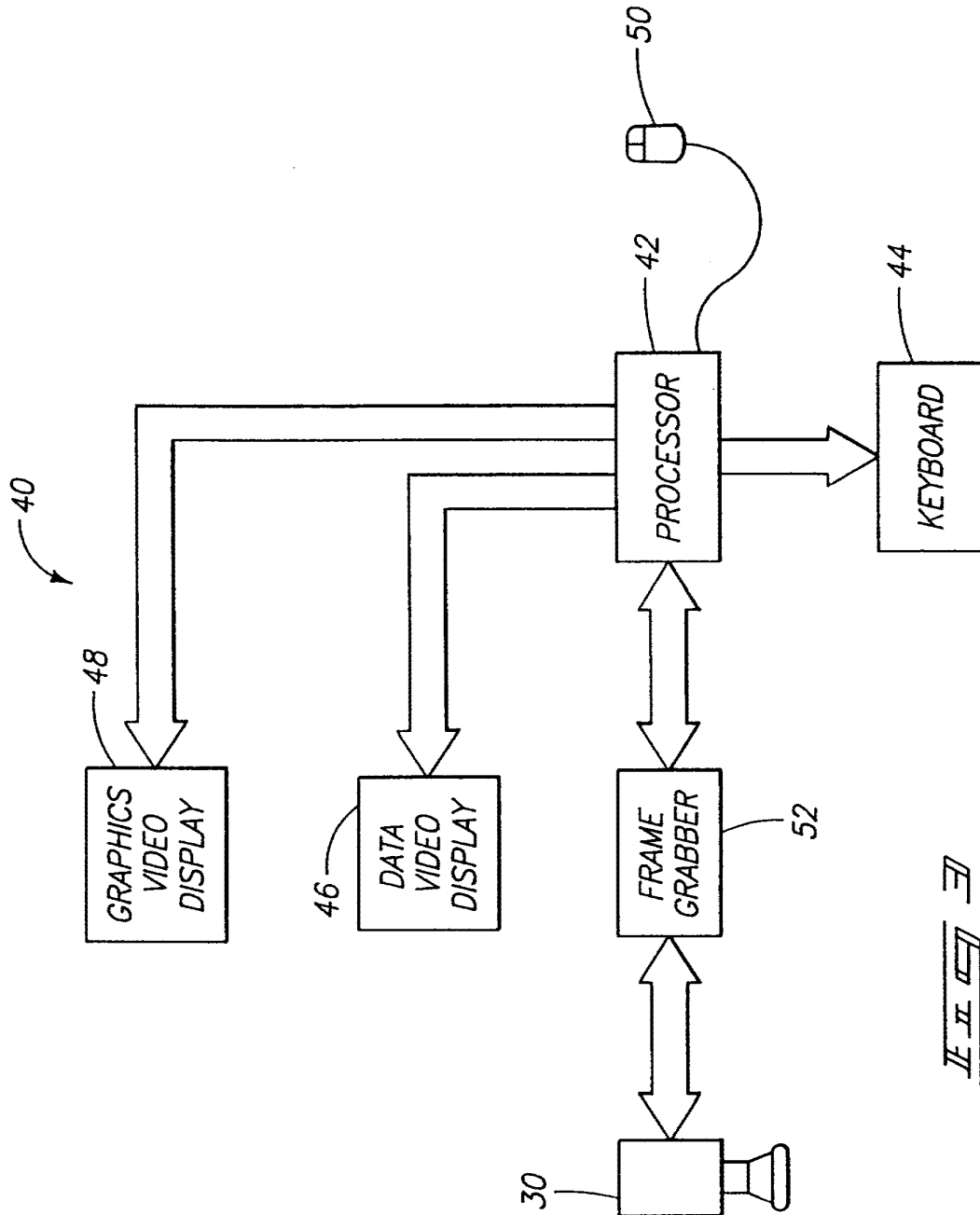
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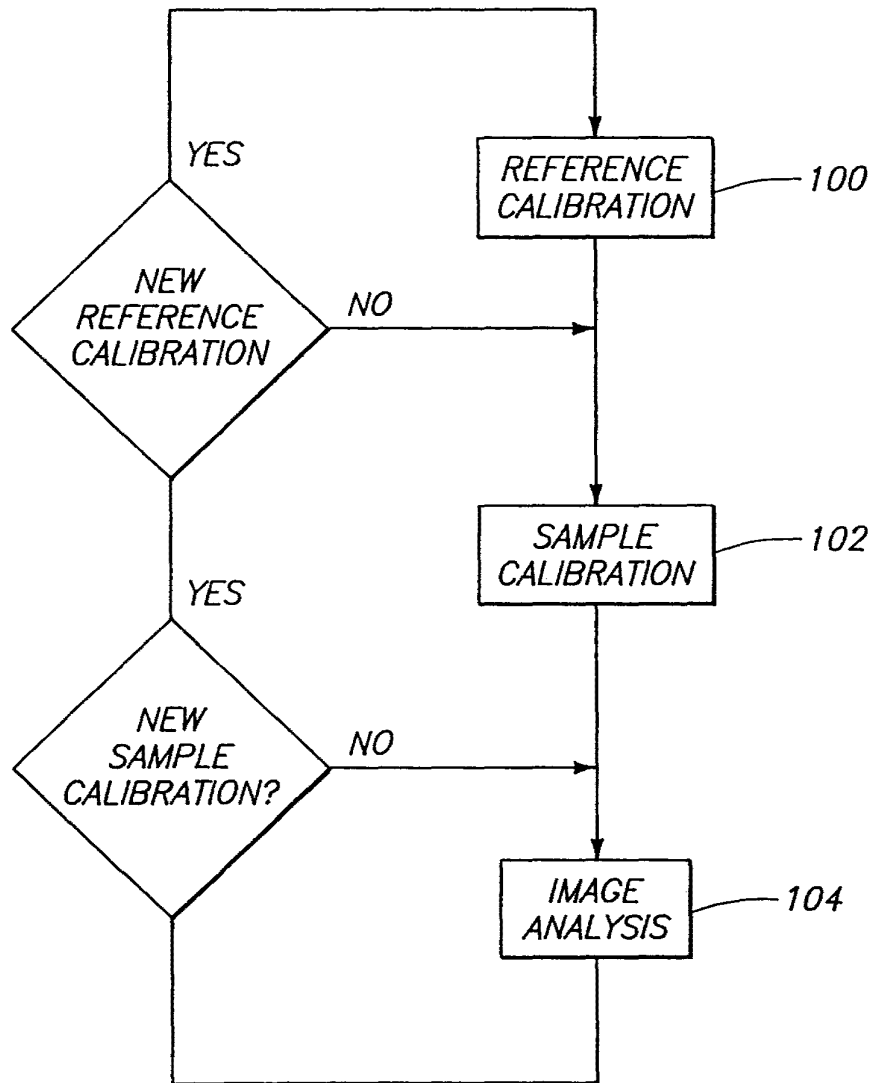


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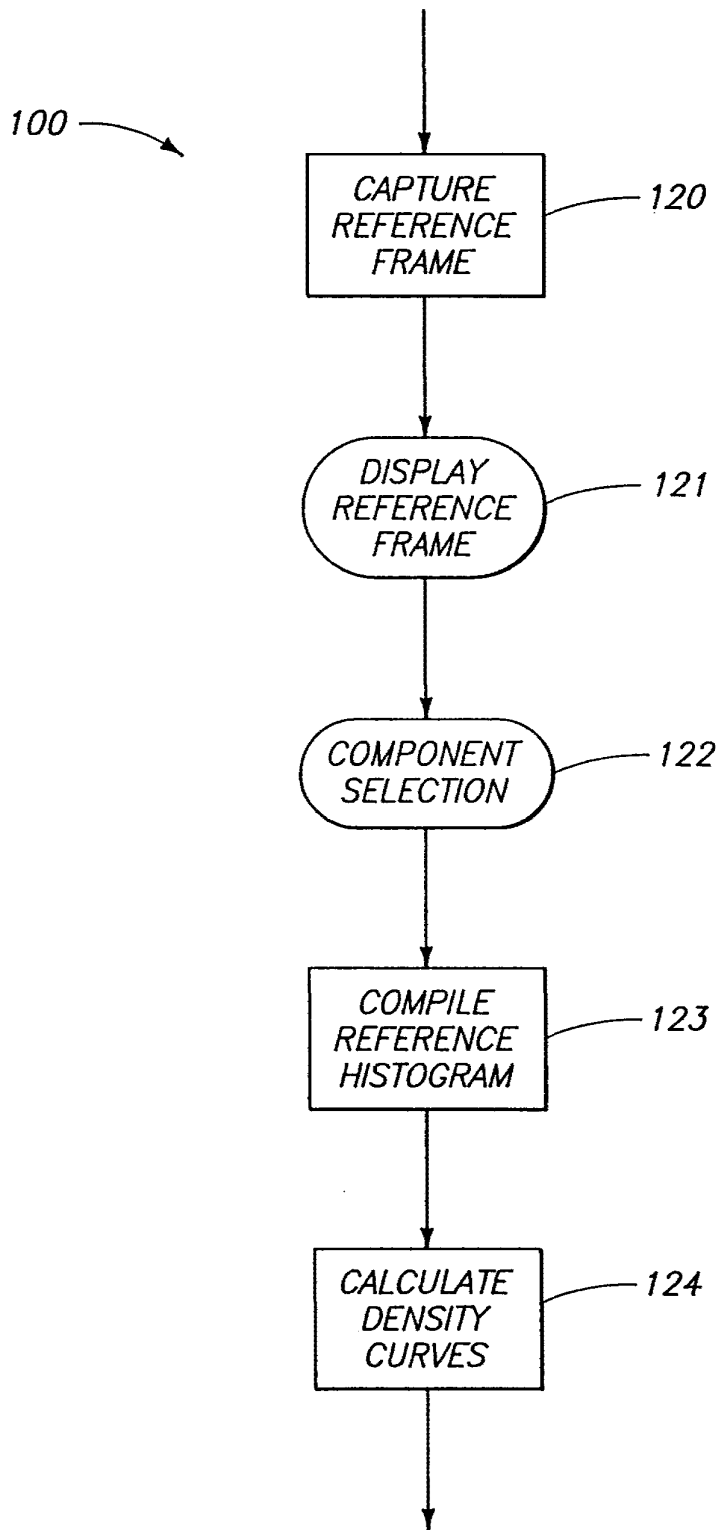




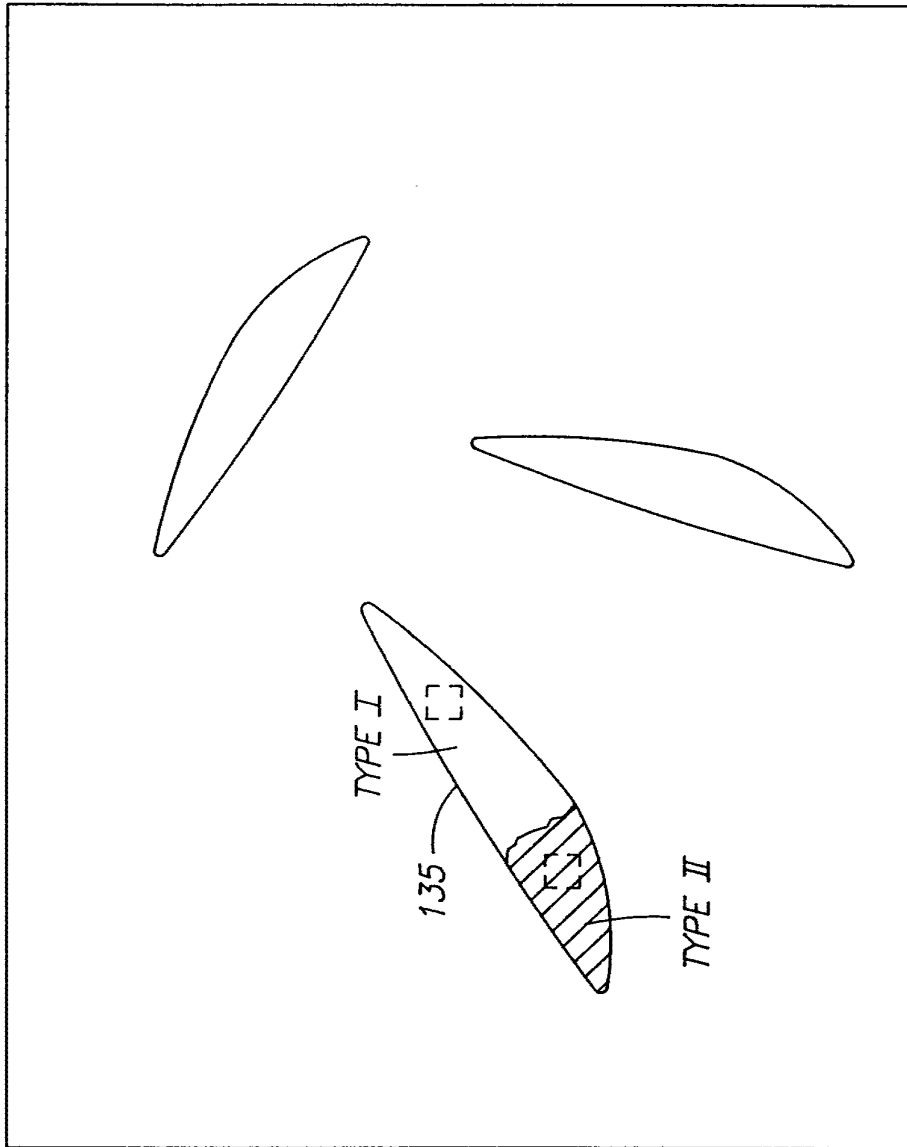
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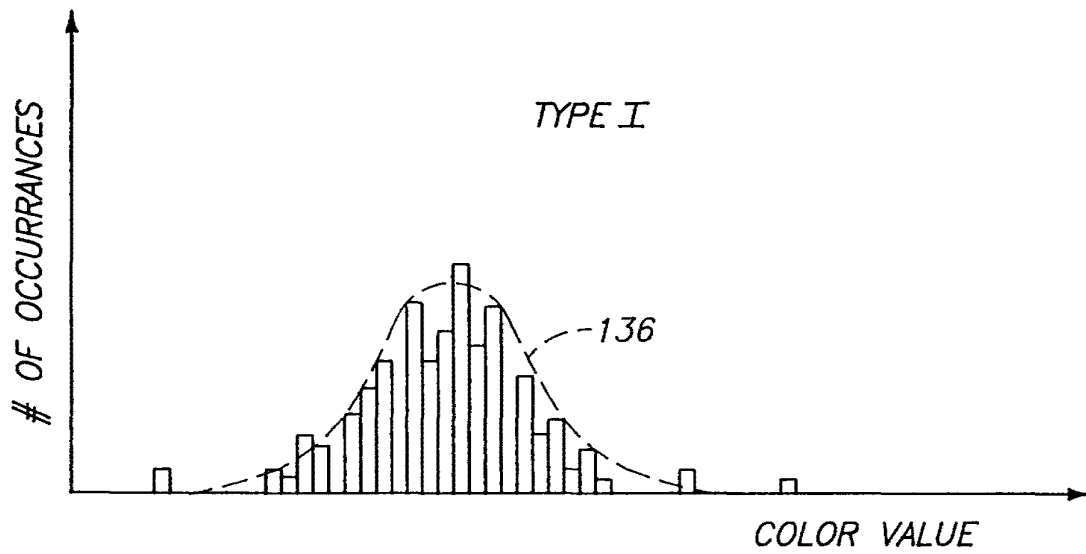
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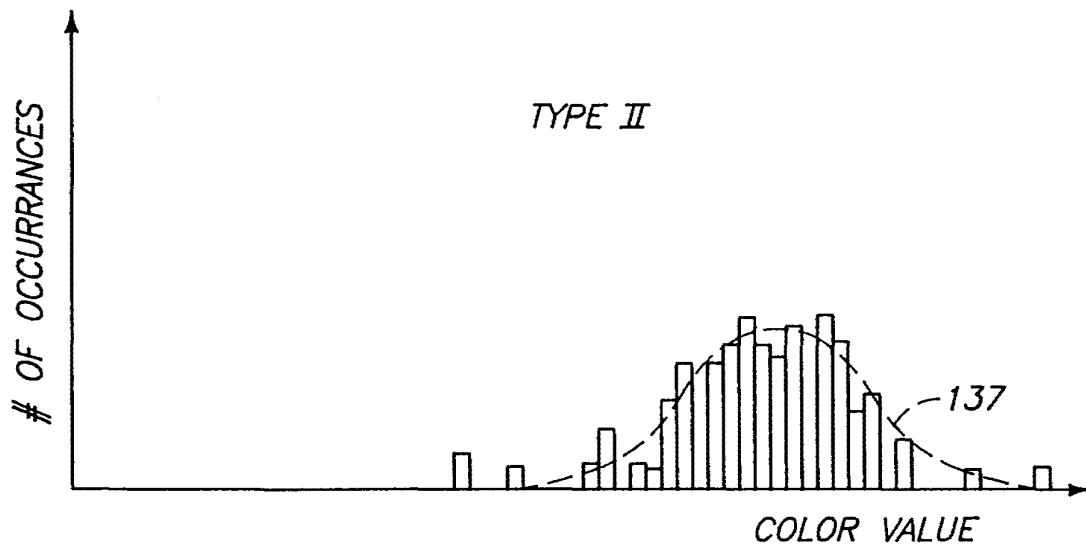
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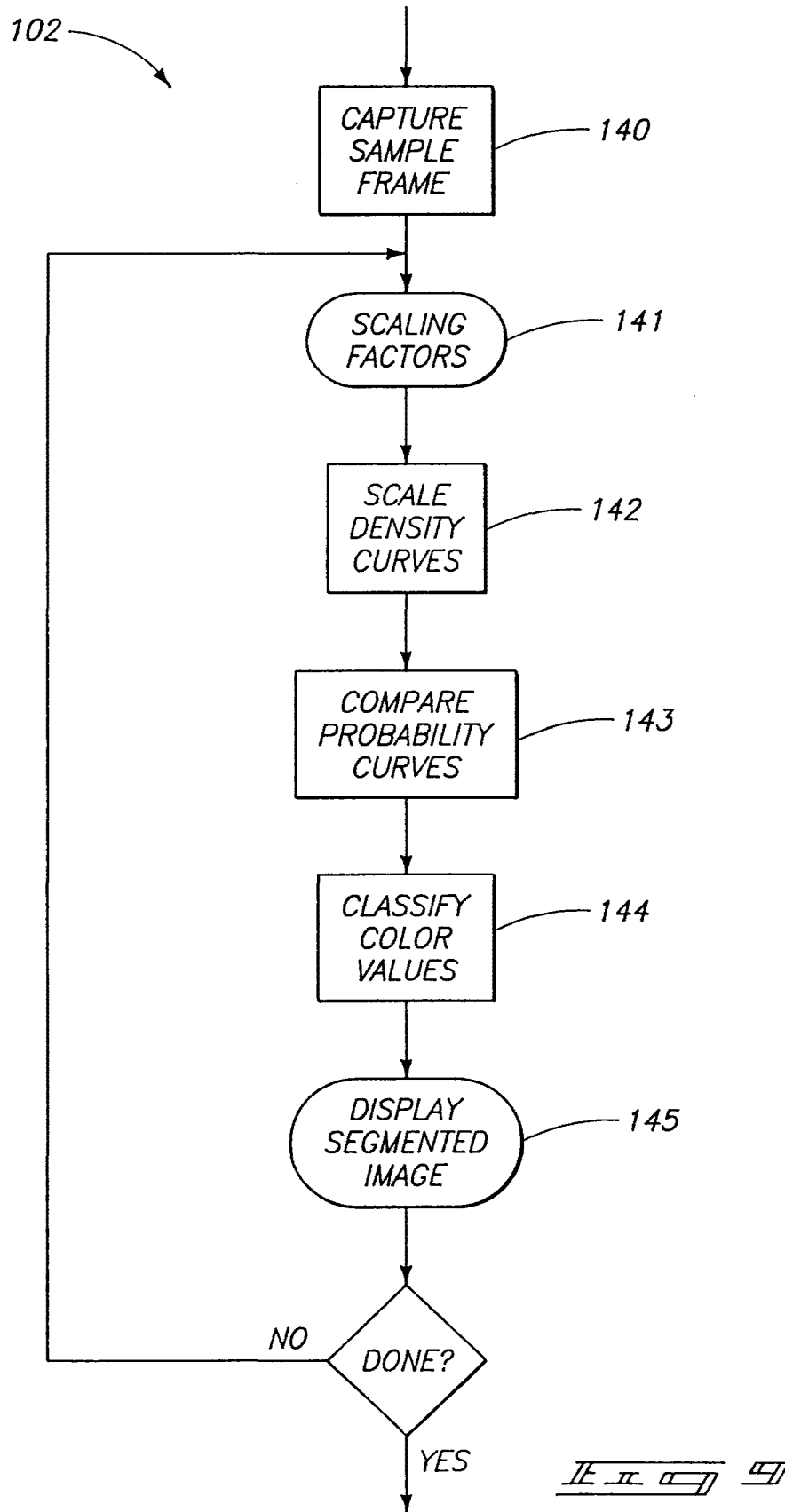
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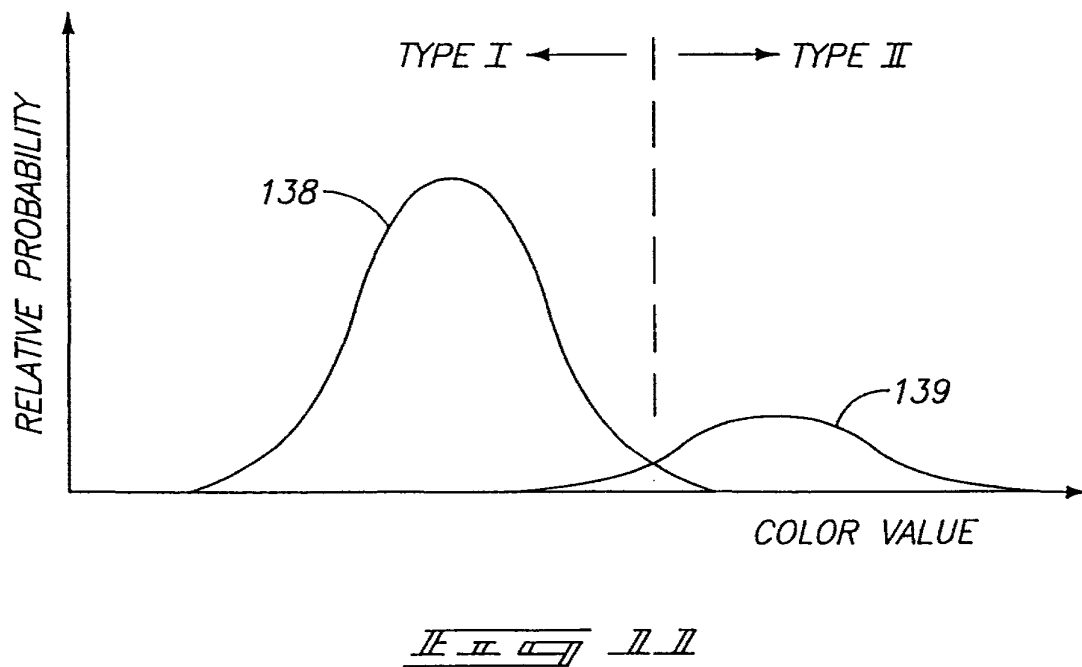
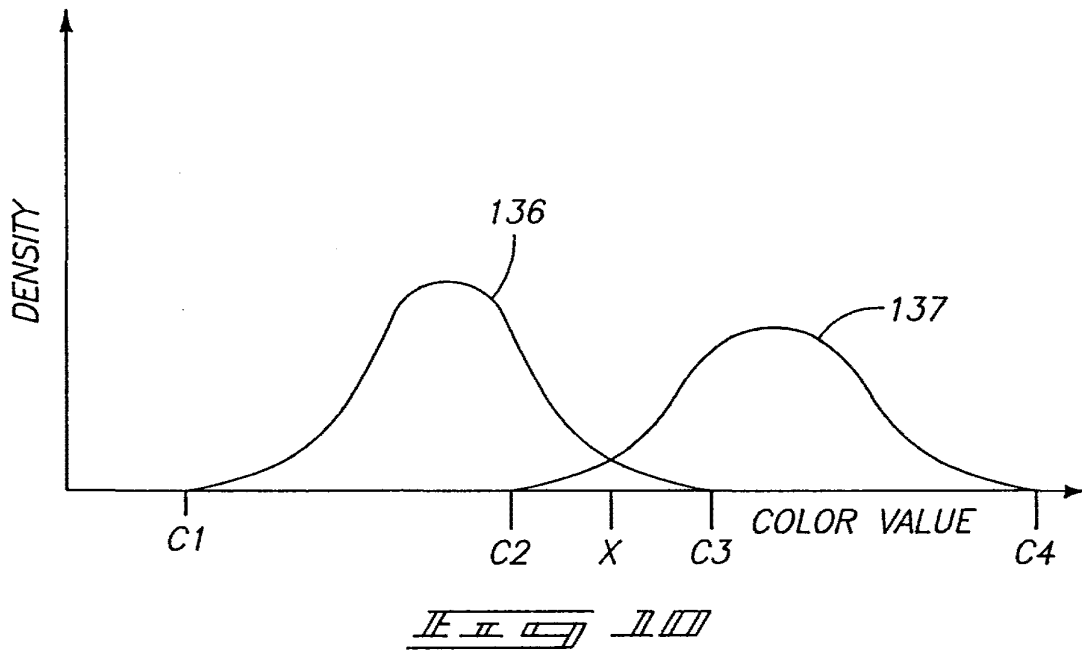


IE II II



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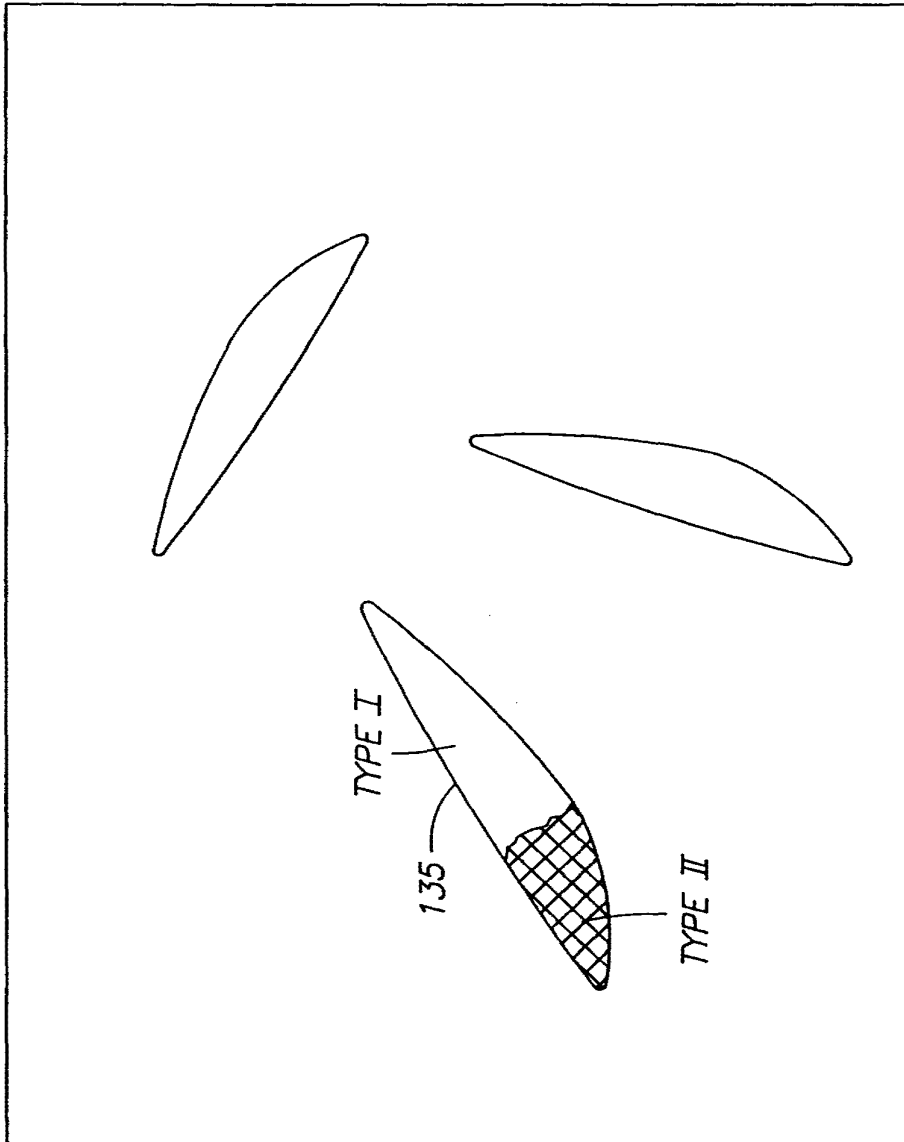
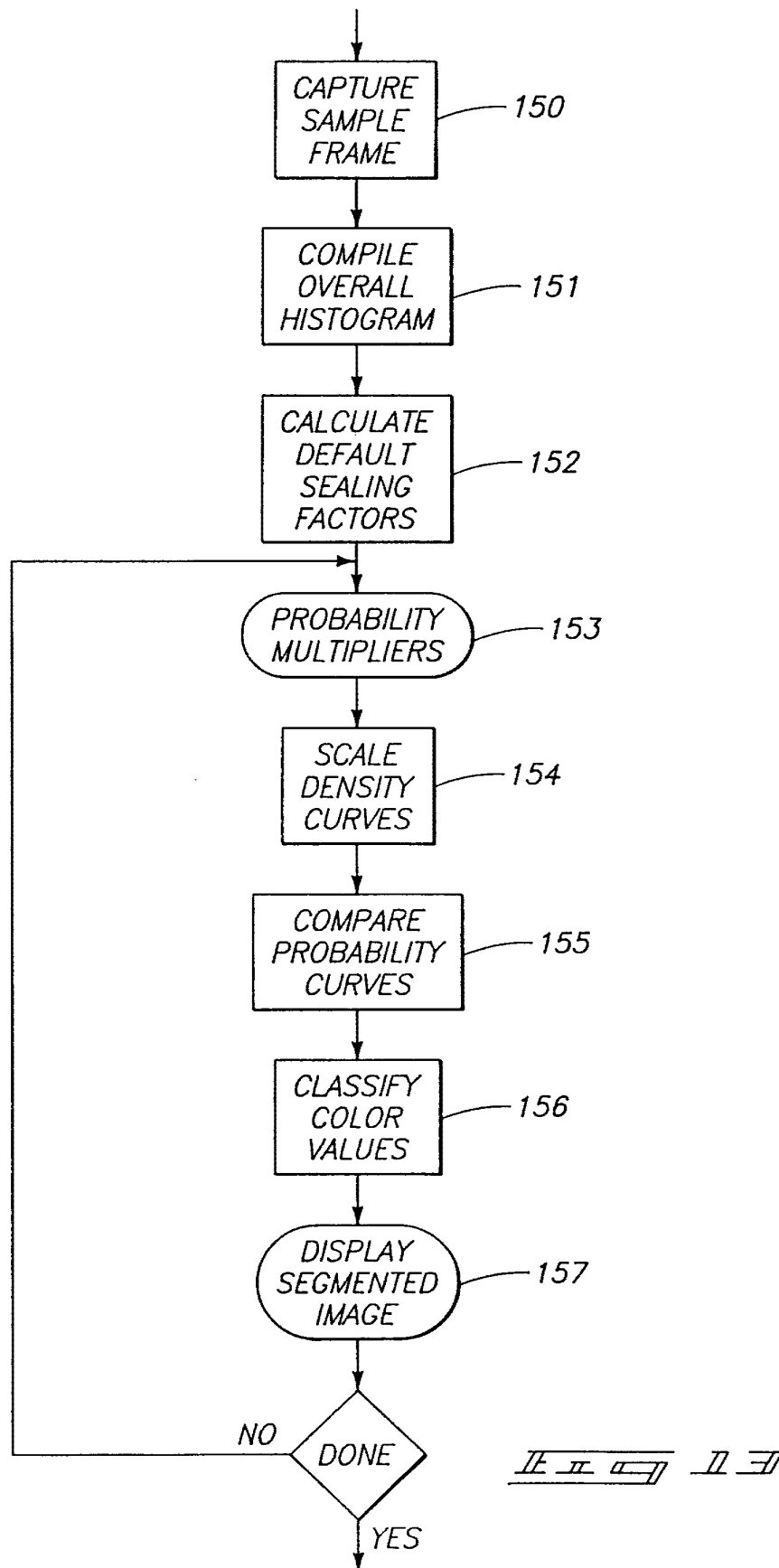
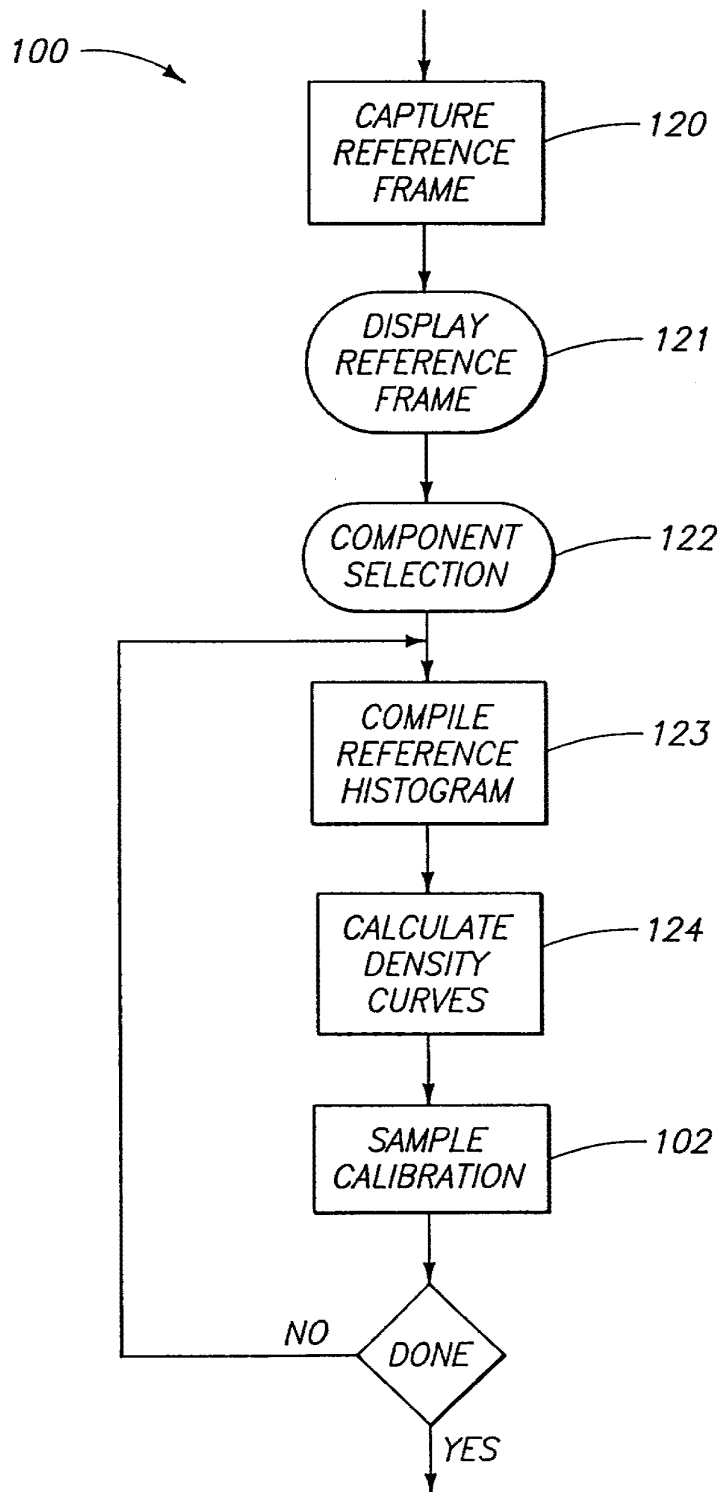


FIG. 12

149 →





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European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 93 10 9328
Page 1

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	US-A-5 085 325 (JONES) * abstract * * column 1, line 23 - line 31 * * column 3, line 1 - line 15 * * column 3, line 60 - line 68 * * column 4, line 11 - line 58 * * column 4, line 66 - line 68 * * column 5, line 9 - line 34 * * column 5, line 56 - line 68 * * column 6, line 45 - line 50 * * column 6, line 65 - column 7, line 33 * * column 7, line 45 - line 50 * * column 8, line 18 - line 31 * * column 10, line 7 - line 28 * * column 11, line 11 - line 16 * * column 12, line 39 - line 68 * * figures 1-4, 11-14 * ---	1-5, 12-14	G01N21/88 B07C5/342 G06F15/68
A	US-A-4 811 090 (KHURANA) * column 6, line 44 - column 7, line 13 * * column 7, line 40 - line 42 * * figures 5, 6 * ---	6, 9, 15	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	PATTERN RECOGNITION LETTERS vol. 7, no. 4, April 1988, AMSTERDAM NL pages 201 - 206 Q-Z. YE ET AL 'On minimum error thresholding and its implementations' * abstract * * page 1 * * page 2, paragraph 1 * --- -/--	1, 6, 9, 14, 15 1, 6, 14	G01N B07C G06F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 29 SEPTEMBER 1993	Examiner THOMAS R.M.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document			

EPO FORM 1503.03.92 (P0401)



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 93 10 9328

Page 2

DOCUMENTS CONSIDERED TO BE RELEVANT


Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	US-A-4 992 949 (ARDEN) * column 1, line 9 - line 14 * * column 4, line 51 - line 59 * * column 5, line 22 - line 50 * * column 6, line 5 - line 12 * * column 6, line 23 - line 28 * * column 6, line 47 - line 65 * * figures 4-6 * ---	1,12,14	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	WO-A-9 116 619 (LEICESTER POLYTECHNIC) * abstract * * page 7, line 20 - page 8, line 10; figure 4 * ---	1,2,6, 12,14	
A	EP-A-0 122 543 (GEC) * abstract * * page 17, line 33 - page 19, line 2 * * page 27, line 22 - page 28, line 1 * * page 28, line 18 - page 30, line 15; figures 1,3 * ---	1,2,6	
A	WO-A-8 606 305 (PENNWALT CORP.) * abstract * * page 9, line 6 - line 9 * * page 20, line 7 - line 33; figure 7 * -----	1,7,12	
The present search report has been drawn up for all claims			
Place of search THE HAGUE	Date of completion of the search 29 SEPTEMBER 1993	Examiner THOMAS R.M.	
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03/82 (P0401)

<i>Index of Claims</i> 	Application/Control No. 12620092	Applicant(s)/Patent Under Reexamination PIRIM, PATRICK
	Examiner MANAV SETH	Art Unit 2624


✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

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CLAIM		DATE							
Final	Original	10/30/2010	06/19/2011	08/11/2013					
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<i>Index of Claims</i> 	Application/Control No. 12620092	Applicant(s)/Patent Under Reexamination PIRIM, PATRICK
	Examiner MANAV SETH	Art Unit 2624

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

<input type="checkbox"/> Claims renumbered in the same order as presented by applicant		<input type="checkbox"/> CPA		<input type="checkbox"/> T.D.		<input type="checkbox"/> R.1.47			
CLAIM		DATE							
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	62			✓					
	63			○					

Search Notes 	Application/Control No. 12620092	Applicant(s)/Patent Under Reexamination PIRIM, PATRICK
	Examiner MANAV SETH	Art Unit 2624

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
382	100,103,107,128-132,168-180,199-206,224,291	10/30/2010	ms
382	All	8/11/2013	ms

SEARCH NOTES			
Search Notes		Date	Examiner
East search		10/30/2010	ms
IDS Search		10/30/2010	ms
Inventor Search		10/30/2010	ms
East, Inventor and IEEE Search		8/11/2013	ms

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

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EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	48	patrick near pirim	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2010/10/30 18:26
S2	26	patrick near pirim and pixel\$2	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2010/10/30 18:26
S3	21	patrick near pirim and pixel\$2 and histogram\$2	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2010/10/30 18:26
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S5	26	patrick near pirim and pixel\$2	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2013/07/20 20:26
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EAST Search History (Prior Art)

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EAST Search History (Prior Art)


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EAST Search History (Prior Art)

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EAST Search History (I nterference)

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Application Number 	Application/Control No. 12620092	Applicant(s)/Patent Under Reexamination PIRIM, PATRICK
Document Code - DISQ		Internal Document – DO NOT MAIL

TERMINAL DISCLAIMER	<input checked="" type="checkbox"/> APPROVED	<input type="checkbox"/> DISAPPROVED
Date Filed: 08/23/2011	This patent is subject to a Terminal Disclaimer	

Approved/Disapproved by:	
J. Olszewski	

U.S. Patent and Trademark Office

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL (Submitted Only via EFS-Web)

Application Number	12/620,092	Filing Date	2009-11-17	Docket Number (if applicable)	8042-2-2	Art Unit	2624
First Named Inventor	Patrick Pirim			Examiner Name	Seth, Manav		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.

Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☒ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____

☐ Other _____

☐ Enclosed

☐ Amendment/Reply

☐ Information Disclosure Statement (IDS)

☐ Affidavit(s)/ Declaration(s)

☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____
(Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.

☒ The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to
Deposit Account No 141437

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

☐ Applicant Signature

Signature of Registered U.S. Patent Practitioner			
Signature	/Kevin Greenleaf/	Date (YYYY-MM-DD)	2011-09-23
Name	Kevin Greenleaf	Registration Number	64062

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal				
Application Number:		12620092		
Filing Date:		17-Nov-2009		
Title of Invention:		IMAGE PROCESSING METHOD		
First Named Inventor/Applicant Name:		Patrick Pirim		
Filer:		Gregory A. Nelson/Lorraine Quiles		
Attorney Docket Number:		8042-2-2		
Filed as Small Entity				
Utility under 35 USC 111(a) Filing Fees				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
Request for continued examination	2801	1	405	405
Total in USD (\$)				405

Electronic Acknowledgement Receipt

EFS ID:	11033559
Application Number:	12620092
International Application Number:	
Confirmation Number:	9882
Title of Invention:	IMAGE PROCESSING METHOD
First Named Inventor/Applicant Name:	Patrick Pirim
Customer Number:	86000
Filer:	Gregory A. Nelson/Lorraine Quiles
Filer Authorized By:	Gregory A. Nelson
Attorney Docket Number:	8042-2-2
Receipt Date:	23-SEP-2011
Filing Date:	17-NOV-2009
Time Stamp:	15:55:54
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	\$405
RAM confirmation Number	5194
Deposit Account	141437
Authorized User	NOVAK DRUCE AND QUIGG LLP

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	P0111485.PDF	697843 2b4a28fcaa81b49fa443e82883f4003a7f8312ef	no	3
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30237 5de53e005c789aaf7bc5225618ce1232167d4523	no	2
Warnings:					
Information:					
Total Files Size (in bytes):			728080		
<p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p>					

Applicant-Initiated Interview Summary

Application No.	Applicant(s)
12/620,092	PIRM, PATRICK
Examiner	Art Unit
MANAV SETHI	2624

All participants (applicant, applicant's representative, PTO personnel):

- (1) MANAV SETHI (3) _____
 (2) Kevin Greenleaf (Reg. No. 64 062) (4) _____

Date of Interview: 16 August 2011

Type: ☐ Telephonic ☐ Video Conference
☒ Personal (copy given to: ☒ applicant ☐ applicant's representative)

Exhibit shown or demonstration conducted: ☐ Yes ☐ No
 If Yes, brief description: _____

Issues Discussed: ☐ 101 ☐ 112 ☒ 102 ☐ 103 ☐ Others
 (For each of the checked boxes) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: 61

Identification of prior art discussed: Hunke U.S. Patent No. 5,912,980

Substance of Interview

(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some types may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc.)


Claim 51 was discussed with respect to reference Hunke. Both Examiner and Mr. Greenleaf agreed on the differences between the reference Hunke and the invention. Based on the differences, some suggestions on the claim amendments were discussed. Applicant would submit a response with respect to these discussions.

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☐ Attachment

Manav Sethi
 Primary Examiner, Art Unit 2624



U.S. Patent and Trademark Office
 PTO/L-413 (Rev. 5/11/2010)

Interview Summary

Paper No. 20110516



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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12/620,092

11/17/2009

Patrick Pirim

8042-2-2

9882

86000

7590

09/08/2011

Gregory A. Nelson

Novak Druce & Quigg LLP

525 Okeechobee Blvd

Suite 1500

West Palm Beach, FL 33401

EXAMINER

SETH, MANAV

ART UNIT

PAPER NUMBER

2624

MAIL DATE

DELIVERY MODE

09/08/2011

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

<p align="center">Advisory Action Before the Filing of an Appeal Brief</p>	Application No. 12/620,092	Applicant(s) PIRIM, PATRICK
	Examiner MANAV SETH	Art Unit 2624

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 23 August 2011 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

1. ☒ The reply was filed after a final rejection, but prior to or on the same day as filing a Notice of Appeal. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114. The reply must be filed within one of the following time periods:

- a) ☐ The period for reply expires _____ months from the mailing date of the final rejection.
b) ☒ The period for reply expires on: (1) the mailing date of this Advisory Action, or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.

Examiner Note: If box 1 is checked, check either box (a) or (b). ONLY CHECK BOX (b) WHEN THE FIRST REPLY WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37 CFR 41.37(a).

AMENDMENTS

3. ☒ The proposed amendment(s) filed after a final rejection, but prior to the date of filing a brief, will not be entered because
(a) ☒ They raise new issues that would require further consideration and/or search (see NOTE below);
(b) ☒ They raise the issue of new matter (see NOTE below);
(c) ☐ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
(d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.

NOTE: _____. (See 37 CFR 1.116 and 41.33(a)).

4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).
5. ☐ Applicant's reply has overcome the following rejection(s): _____.
6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).
7. ☒ For purposes of appeal, the proposed amendment(s): a) ☒ will not be entered, or b) ☐ will be entered and an explanation of how the new or amended claims would be rejected is provided below or appended.
The status of the claim(s) is (or will be) as follows:
Claim(s) allowed: _____.
Claim(s) objected to: 58-63.
Claim(s) rejected: 57.
Claim(s) withdrawn from consideration: _____.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ The affidavit or other evidence filed after a final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).
9. ☐ The affidavit or other evidence filed after the date of filing a Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing a good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).
10. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

11. ☐ The request for reconsideration has been considered but does NOT place the application in condition for allowance because: _____.
12. ☐ Note the attached Information *Disclosure Statement(s)*. (PTO/SB/08) Paper No(s). _____.
13. ☐ Other: _____.

/Manav Seth/
Primary Examiner, Art Unit 2624

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Pirim	Docket No.:	8042-2-2
Application No.:	12/620,092	Examiner:	SETH
Filed:	11-17-2009	Art Unit:	2624
Customer No.:	86000	Confirmation No.:	9882

For: IMAGE PROCESSING METHOD

Honorable Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

AMENDMENT

Sir:

This is a reply to the final Office action of June 23, 2010. Please enter and consider the following amendments and remarks.

Amendments to the Claims

Please amend the claims according to the following listing of the claims.

1 - 56. (Canceled)

57. (Currently Amended) A process of tracking a target in an input signal implemented using a system comprising an image processing system, the input signal comprising a succession of frames, each frame comprising a succession of pixels, the target comprising pixels in one or more of a plurality of classes in one or more of a plurality of domains, the process performed by said system comprising, on a frame-by-frame basis:
- forming at least one histogram of the pixels in the one or more of a plurality of classes in the one or more of a plurality of domains, said at least one histogram referring to classes defining said target, and identifying the target in said at least one histogram itself.
58. (Previously Presented) The process according to claim 57, wherein identifying the target in said at least one histogram further comprises determining a center of the target to be between X and Y minima and maxima of the target.
59. (Previously Presented) The process according to claim 57, wherein identifying the target in said at least one histogram further comprises determining the center of the target at regular intervals.
60. (New) The process according to claim 57 further comprising drawing a tracking box around the target.
61. (New) The process according to claim 57, wherein said image processing system comprises at least one components selected from a memory, a temporal processing unit, and a spatial processing unit.
62. (New) The process according to claim 57, wherein said image processing system comprises at least two components selected from a memory, a

temporal processing unit, and a spatial processing unit.

63. (New) The process according to claim 57, wherein forming the at least one histogram further comprises successively increasing the size of a selected area until the boundary of the target is found.

REMARKS

Status of the Claims

Claims 51–59 are pending.

Claims 1–50 have been canceled.

Claim Amendment

Claims 51–56 have been canceled.

Support for new claims 60–64 can be found throughout the specification, including FIGS. 16, 17, and 21–23; and ¶¶ [0196]–[0199] and [0202]–[0208] of the published application no. 20100215214. New claims 60–63 also find support in canceled claims 52–55 as previously presented. No new matter has been added.

Accordingly, claims 57–63 are currently pending in this application.

Summary of Interview

Applicant thanks Examiner Seth for the interview of August 12, 2011, with Applicant's representative, Kevin Greenleaf. At the interview, Applicant explained that Hunke did not disclose "identifying the target in said at least one histogram." Examiner Seth explained that he interpreted "identifying the target in" to have a broad meaning that covered the prior art. The parties identified differences between the application and the prior art and an amendment to overcome the prior art. Examiner Seth stated that further searching and consideration may be warranted. This response captures the substance of the interview and proposed amendments.

Claim Rejections

- I. The Office Action rejects claims 51–54 and 57, citing 35 U.S.C §102(e), US 5,912,980 to Hunke (hereinafter, “Hunke”).

Anticipation requires a single prior art reference to describe every aspect of the claimed subject matter.¹ Claimed subject matter is “anticipated” only when it was previously known. Anticipation requires a single prior art reference to describe every aspect of the claimed subject matter² and to enable a person of ordinary skill in the field of the invention to practice the invention without undue experimentation.³ It is not enough for the reference to disclose all the claimed elements in isolation. Instead, every element of the claimed subject matter and every limitation of the claimed subject matter must be described in the reference as arranged in the claimed invention.⁴ Indeed, “[the] reference must clearly and unequivocally disclose the claimed [invention] or direct those skilled in the art to the [invention] without any need for picking, choosing, and combining various disclosures not directly related to each other by the teachings of the cited reference.”⁵

Hunke does not disclose “identifying the target in said at least one histogram itself”, as recited by claim 57 of the present application. To the contrary, Hunke discloses identifying the target in a normalized, binary image, which is not a histogram.

Claim 1 of Hunke is illustrative. Specifically, claim 1 of Hunke recites “determining typical colors found in objects of said predetermined target class.”

¹ See Schering Corp. v. Geneva Pharms., Inc., 339 F.3d 1373, 1379 (Fed. Cir. 2003); Continental Can Co. USA v. Monsanto Co., 948 F.2d 1264, 1267-69 (Fed. Cir. 1991).

² Id.

³ See Amgen Inc. v. Hoechst Marion Roussel, Inc., 457 F.3d 1293, 1306-07 (Fed. Cir. 2006); Elan Pharms., Inc. v. Mayo Found. for Med. Educ. & Research, 346 F.3d 1051, 1054 (Fed. Cir. 2003).

⁴ Connell v. Sears, Roebuck & Co., 722 F.2d 1542, 1548 (Fed. Cir. 1983)

⁵ In re Arkley, 455 F.2d 586, 587 (CCPA 1972) (emphasis in original).

This step can include generating a histogram of the colors of the target and normalizing them to $[0 \dots 1]$ (*i.e.*, whether a color is associated with a target).

The next step in creating a target color classifier is to use a normalized color distribution of a sample image to determine percentages of reflections of a target with a specific source of light. The color distribution $N_{r,g}$ is a histogram of the frequency of occurrence of each possible color (r, g) in the sample image. The color distribution is then normalized by transforming the values $N_{r,g}$ into values from $[0 \dots 1]$. Given a color space of $[0 \dots 1]$, $[0 \dots 1]$, the normalized color distribution $N'_{r,g}$ is computed as

$$\overline{N}_{r,g} = \frac{N_{r,g}}{\max_{i+j \leq l} N_{i,j}}$$

The normalized color distribution $N'_{r,g}$ will accurately reflect the distribution of colors in the sample image, if the number of pixels in the sample image is large compared to the number of possible colors

$$\frac{l^2}{2}.$$

When updating the ITCC 46, a normalized color distribution is obtained using the small image of the tracked target. If the number of pixels in the sample image is small compared to the number of possible colors, the determined histogram does not reflect the color distribution of the object in the sample image. To obtain a valid color distribution, the determined histogram is smoothed by lowpass filtering. Other methods for computing a color distribution include adding a gaussian distribution of a given variance for each pixel of the sample image with the specific color in its mean value.

The normalized color distribution can be used as a target color classifier by classifying a color as a target color if the value $N'_{r,g}$ exceeds a given threshold. A threshold of 0.2 would classify all colors as target colors which occur at least 0.2 times as often as the most frequently occurring color in the sample image.

Hunke at 8:58–9:30 (emphasis added).

Next, claim 1 of Hunke recites “detecting a moving area in said video image stream”, *i.e.*, the target is located via movement.

While movement is necessary to locate targets in the target acquisition module, the target tracking module does not require movement to track the position of a target. If the target tracking module does not detect motion, the position of the target is the same as in the previous image. [...]

A target acquisition motion analysis 24 detects motion and erases all regions not containing movement from the target acquisition blackboard, so that these regions are not considered for locating new targets.

Hunke at 6:29–34 and 51–54.

In the step of “determining whether the moving area contains colors similar to the predetermined target class typical colors”; in other words, colors that are not associated with a target, *i.e.*, colors normalized to ‘0’, are removed.



Fig. 6

Hunke at FIG. 6

FIG. 5 and 6 demonstrate the effect of individual target color classification with a human face as example. FIG. 5 shows a lowpass filtered color distribution 72 of an individual face. The right part of the figure shows a magnification 74 of the essential region of this color distribution 72. A rectangular box 76 indicates the colors considered as individual target colors. FIG. 6 demonstrates the effect of using this color distribution as an ITCe. The face in FIG. 6 was used to compute the color distribution 72 in FIG. 5. In FIG. 6 each pixel not having individual target color is replaced with white, so that only regions with skin-color are shown. The regions

containing the lips and eyes are not considered having individual target color, because the colors of the lips and eyes occur very infrequently in a face compared to skin color and therefore have low values $N_{r,g}$ in the color distribution.

Hunke at 10:26–41.

Accordingly, objects are tracked via the normalized, binary image and whether a threshold number of pixels have a color that is normalized to '1'.

Detecting an object is defined to mean detecting a coherent set of pixels belonging to one object. The following definition is one example for defining coherent sets of pixels. Other applications might favor a different distance measurement and definition:

Def. 1: Two pixels p_1 and p_2 with coordinates (x_{p1}, y_{p1}) and (x_{p2}, y_{p2}) are neighbored, if $\|x_{p1} - x_{p2}\| \leq 1 \wedge \|y_{p1} - y_{p2}\| \leq 1$ is valid.

Def. 2: A set S is coherent, if

1. $S = \{p\}$ or
2. $S = \bigcup p$, so that T is a coherent set and $\exists q \in T$: p is neighbored to q .

Hunke at 13:28–40.

Therefore, Hunke does not disclose “identifying the target from said at least one histogram itself”, as recited by claim 51 of the present application, but instead discloses identifying the target in a normalized, binary image, which is not a histogram.

Applicant has clarified the above-described arguments by amending the claims to recite “identifying the target from said at least one histogram itself” in accordance with the interview of August 12, 2011, thus placing the application in condition for allowance. Applicant respectfully requests that the present rejection be withdrawn and a notice of allowance be issued.

- II. The Office Action rejects claims 51–54, citing the ground of nonstatutory obviousness-type double patenting and claims 1–7 of US 7,650,015 to Pirim (hereinafter, “the ‘015 patent”).

A terminal disclaimer was submitted with a response on April 4, 2011, in accordance with 37 C.F.R. § 1.321(c). Authorization for the fee was given as it is in the ¶ below. However, to avoid confusion and delay, a fee and new terminal disclaimer are included with this response. Thus, the rejection should be withdrawn.

Fee Authorization

The Director is hereby authorized to charge any deficiency in fees filed, asserted to be filed, or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Deposit Account 14-1437. Please credit any excess fees to such account.

Respectfully submitted,
NOVAK DRUCE + QUIGG, LLP

/Kevin Greenleaf/

Date: August 23, 2011

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Electronic Patent Application Fee Transmittal

Application Number:	12620092			
Filing Date:	17-Nov-2009			
Title of Invention:	IMAGE PROCESSING METHOD			
First Named Inventor/Applicant Name:	Patrick Pirim			
Filer:	Michael P. Byrne/Slawomir J. Mosiolek			
Attorney Docket Number:	8042-2-2			
Filed as Small Entity				
Utility under 35 USC 111(a) Filing Fees				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Statutory or terminal disclaimer	2814	1	70	70
Extension-of-Time:				

SAMSUNG EXHIBIT 1004

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
Total in USD (\$)				70

Electronic Acknowledgement Receipt

EFS ID:	10798397
Application Number:	12620092
International Application Number:	
Confirmation Number:	9882
Title of Invention:	IMAGE PROCESSING METHOD
First Named Inventor/Applicant Name:	Patrick Pirim
Customer Number:	86000
Filer:	Michael P. Byrne/Slawomir J. Mosiolek
Filer Authorized By:	Michael P. Byrne
Attorney Docket Number:	8042-2-2
Receipt Date:	23-AUG-2011
Filing Date:	17-NOV-2009
Time Stamp:	19:00:20
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	\$70
RAM confirmation Number	15364
Deposit Account	141437
Authorized User	NELSON,GREGORY

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)

SAMSUNG EXHIBIT 1004

Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Terminal Disclaimer Filed	12620092-TD.pdf	135238	no	2
			5e638e942f746159ef9b90124df36019d0b57d4		

Warnings:

Information:

2		8042-2-2-Reply-to-23June2011-FOA.pdf	171715	yes	9
			9b2e750f18e770f93f6ea56851745fda09907420		

Multipart Description/PDF files in .zip description

	Document Description	Start	End
	Amendment After Final	1	1
	Claims	2	3
	Applicant Arguments/Remarks Made in an Amendment	4	9

Warnings:

Information:

3	Fee Worksheet (SB06)	fee-info.pdf	29966	no	2
			a556960f47697a4b768420558b313d3e62af0cbf		

Warnings:

Information:

Total Files Size (in bytes):			336919
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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

**TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING
REJECTION OVER A "PRIOR" PATENT**Docket Number (Optional)
8042-2-2

In re Application of: Pirim

Application No.: 12/620,092

Filed: November 17, 2009

For: Image Processing Method

The owner*, Image Processing Technologies, LLC, of 100 percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term **prior patent** No. 7,650,015 as the term of said prior patent is defined in 35 U.S.C. 154 and 173, and as the term of said **prior patent** is presently shortened by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the **prior patent** are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the owner does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term as defined in 35 U.S.C. 154 and 173 of the **prior patent**, "as the term of said **prior patent** is presently shortened by any terminal disclaimer," in the event that said **prior patent** later:

- expires for failure to pay a maintenance fee;
- is held unenforceable;
- is found invalid by a court of competent jurisdiction;
- is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
- has all claims canceled by a reexamination certificate;
- is reissued; or
- is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

Check either box 1 or 2 below, if appropriate.

1. ☐ For submissions on behalf of a business/organization (e.g., corporation, partnership, university, government agency, etc.), the undersigned is empowered to act on behalf of the business/organization.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

2. ☒ The undersigned is an attorney or agent of record. Reg. No. 54,015

/Michael P. Byrne/

Signature

04-04-2011

Date

Michael P. Byrne

Typed or printed name

202.659.0100

Telephone Number

- ☒ Terminal disclaimer fee under 37 CFR 1.20(d) included.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

*Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner).
Form PTO/SB/96 may be used for making this certification. See MPEP § 324.

This collection of information is required by 37 CFR 1.321. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875					Application or Docket Number 12/620,092		Filing Date 11/17/2009		<input type="checkbox"/> To be Mailed	
APPLICATION AS FILED – PART I										
(Column 1)			(Column 2)			SMALL ENTITY <input checked="" type="checkbox"/> OR		OTHER THAN SMALL ENTITY		
FOR	NUMBER FILED	NUMBER EXTRA	RATE (\$)	FEE (\$)	OR	RATE (\$)	FEE (\$)			
<input type="checkbox"/> BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A				
<input type="checkbox"/> SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A			N/A				
<input type="checkbox"/> EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A				
TOTAL CLAIMS (37 CFR 1.16(j))	minus 20 =	*	X \$	=	OR	X \$	=			
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X \$	=		X \$	=			
<input type="checkbox"/> APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$250 (\$125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).									
<input type="checkbox"/> MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))										
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL				
APPLICATION AS AMENDED – PART II										
(Column 1)			(Column 2)			SMALL ENTITY OR		OTHER THAN SMALL ENTITY		
AMENDMENT	08/23/2011	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)	OR	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	* 7	Minus	** 20	= 0	X \$26 =	0	OR	X \$	=
	Independent (37 CFR 1.16(h))	* 1	Minus	*** 3	= 0	X \$110 =	0	OR	X \$	=
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))									
	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE	0	OR	TOTAL ADD'L FEE	
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)	OR	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X \$	=	OR	X \$	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X \$	=	OR	X \$	=
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))									
	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
<p>* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.</p> <p>** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".</p> <p>*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".</p> <p>The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.</p>										

Legal Instrument Examiner:
/KAREN VESTAL/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Applicant Initiated Interview Request Form

Application No.: 12/620,092 First Named Applicant: Patrik Pirim
 Examiner: Seth Manav Art Unit: 2624 Status of Application: Final Rejection Mailed

Tentative Participants:(1) Kevin Greenleaf (2) _____

(3) _____ (4) _____

Proposed Date of Interview: 8/16/2011 Proposed Time: 3 PM (AM/PM)

Type of Interview Requested:(1) ☐ Telephonic (2) ☒ Personal (3) ☐ Video ConferenceExhibit To Be Shown or Demonstrated: ☐ YES ☒ NO

If yes, provide brief description: _____

Issues To Be Discussed

Issues (Rej., Obj., etc)	Claims/ Fig. #s	Prior Art	Discussed	Agreed	Not Agreed
(1) <u>Rej.</u>	<u>51-54 and 57</u>	<u>Hunke</u>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(2) _____	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(3) _____	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(4) _____	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

☐ Continuation Sheet Attached ☐ Proposed Amendment or Arguments Attached

Brief Description of Arguments to be Presented: Hunke does not anticipate the claims because
the prior art does not disclose "identifying the target in said at least one histogram" as the claims recite.

An interview was conducted on the above-identified application on _____

NOTE: This form should be completed and filed by applicant in advance of the interview (see MPEP § 713.01). If this form is signed by a registered practitioner not of record, the Office will accept this as an indication that he or she is authorized to conduct an interview on behalf of the principal (37 CFR 1.32(a)(3)) pursuant to 37 CFR 1.34. This is not a power of attorney to any above named practitioner. See the Instruction Sheet for this form, which is incorporated by reference. By signing this form, applicant or practitioner is certifying that he or she has read the Instruction Sheet. After the interview is conducted, applicant is advised to file a statement of the substance of this interview (37 CFR 1.133(b)) as soon as possible. This application will not be delayed from issue because of applicant's failure to submit a written record of this interview.

/Kevin Greenleaf/

Applicant/Applicant's Representative Signature

Examiner/SPE Signature

Kevin Greenleaf

Typed/Printed Name of Applicant or Representative

64,062

Registration Number, if applicable

This collection of information is required by 37 CFR 1.133. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 24 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Instruction Sheet for:
APPLICANT INITIATED INTERVIEW REQUEST FORM
(Not to be Submitted to the USPTO)

1. If this form is signed by a registered practitioner not of record, the authority to submit the Applicant Initiated Interview Request Form is pursuant to limited authority to act in a representative capacity under 37 CFR 1.34 and further proof of authority to act in a representative capacity may be required.
See 37 CFR 1.34.

The Office will accept the signed form as an indication that the registered practitioner not of record is authorized to conduct an interview on behalf of the principal in pursuant to 37 CFR 1.34.

For more information, see the "Conducting an Interview with a Registered Practitioner Acting in a Representative Capacity" notice which is available on the USPTO Web site at: <http://www.uspto.gov/patents/law/notices/2010.jsp>.

2. This is not a power of attorney to any named practitioner. Accordingly, any registered practitioner not of record named on the form does not have authority to sign a request to change the correspondence address, a request for express abandonment, a disclaimer, a power of attorney, or other document requiring the signature of the applicant, assignee of the entire interest or an attorney of record. If appropriate, a separate power of attorney to the named practitioner should be executed and filed in the US Patent and Trademark Office.
3. Any interview concerning an unpublished application under 35 U.S.C. § 122(b) with a registered practitioner not of record, pursuant to 37 CFR 1.34, will be conducted based on the information and files supplied by the practitioner in view of the confidentiality requirements of 35 U.S.C. § 122(a).

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	10719938
Application Number:	12620092
International Application Number:	
Confirmation Number:	9882
Title of Invention:	IMAGE PROCESSING METHOD
First Named Inventor/Applicant Name:	Patrick Pirim
Customer Number:	86000
Filer:	Michael P. Byrne/Slawomir J. Mosiolek
Filer Authorized By:	Michael P. Byrne
Attorney Docket Number:	8042-2-2
Receipt Date:	11-AUG-2011
Filing Date:	17-NOV-2009
Time Stamp:	17:48:58
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Letter Requesting Interview with Examiner	PTOL413A.pdf	542055 cdaa74789eec74a0d08e19cc496cfc9fc07745ed	no	3

Warnings:

Information:

SAMSUNG EXHIBIT 1004

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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12/620,092

11/17/2009

Patrick Pirim

8042-2-2

9882

86000

7590

06/23/2011

Gregory A. Nelson

Novak Druce & Quigg LLP

525 Okeechobee Blvd

Suite 1500

West Palm Beach, FL 33401

EXAMINER

SETH, MANAV

ART UNIT

PAPER NUMBER

2624

MAIL DATE

DELIVERY MODE

06/23/2011

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	12/620,092	PIRIM, PATRICK	
	Examiner	Art Unit	
	MANAV SETH	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 April 2011.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 51-59 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 51-54 and 57 is/are rejected.
- 7) ☒ Claim(s) 55,56,58 and 59 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. The amendment received on April 04, 2011 has been entered in full.
2. Terminal Disclaimer filed on 04/04/2011 has been disapproved because the disclaimer fee under 37 CFR 1.20(d) in the amount of \$140.00 has not been submitted, nor is there any pre-authorization in the application to charge to a deposit account. Therefore, the double patenting rejections are still maintained by the office.
3. Applicant's arguments with respect to rejected claims as presented in the amendment filed have been fully considered but are not persuasive

Response to Arguments

4. Applicant's arguments regarding the prior art rejections under Hunke on pages 4-8 of the amendment filed on April 04, 2011 have been fully considered but are not persuasive.
5. Applicant argues in substance:

a. Hunke does not disclose "identifying the target from said at least one histogram" as recited in claim 51.

The Examiner respectfully disagrees. Examiner in the last office action requested applicant to consider the complete Hunke reference when replying to the office action and applicant has failed to do so. Examiner has given the broadest interpretation to the claims as per the claim merits. Hunke in col. 8, lines 58-67 discloses "The next step is creating a target color classifier is to use a normalized color distribution of a sample image to determine percentages of reflections of a target

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with a specific source of light. **The color distribution $N_{r,g}$ is a histogram** of the frequency of occurrence of each possible color (r,g) in the sample image. The color distribution is then normalized.....). Hunke further discloses “The normalized color distribution can be used as a target color classifier by classifying a color as target color if theDifferent target color classifiers are used for locating new unknown objects and tracking a specific known target” (col. 9, lines 25-35). Clearly, the targets are identified from the color distribution of the image and (color distribution is nothing but a histogram as highlighted in bold above). If applicant wants examiner to consider some specific meaning of the word “from” in the limitation “identifying the target from said at least one histogram”, it should be clearly defined in the claim itself. Hence, the rejections with respect to the reference Hunke are still maintained by the office.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is

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determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

7. Claims 51-54 and 57 are rejected under 35 U.S.C. 102(e) as being anticipated by Hunke, U.S. Patent No. 5,912,980.

Regarding claims 51 and 57, Hunke discloses a process of tracking a target in an input signal implemented using a system comprising an image processing system (col. 4, lines 14-42; col. 5, lines 1-35 – any system that performs operations on the images is an image processing system), the input signal comprising a succession of frames, (Abstract, last few lines – “the method allows tracking of target objects in subsequent frames of the video image stream based upon the colors in the target objects; col. 5, lines 1-13), Hunke further discloses “each frame comprising a succession of pixels (col. 8, lines 1-3 – images obtained from the video camera are represented as a **pixel matrix** RGB values where pixel matrix represents succession of pixels), Hunke further discloses “the target comprising pixels in one or more of a plurality of classes in one or more of a plurality of domains” (col. 8, lines 17-20 – the domain being the color domain as the image frame pixels are classified into the target color pixels and non-target color pixels, and target pixels further comprise a target class having a specific color, where target classes, for example, being human faces with different skin colors (col. 9, lines 50-65); the other domain being the time domain since the tracking is being done at different times (col. 10, lines 42-60)), the process comprising, on-a frame-by-frame basis: forming at least one histogram of the pixels in the one or more of a plurality of classes in the one or more of a plurality of domains, said at least one histogram referring to classes defining said target, and identifying the target from said at least one histogram (col. 10, lines 45-51 – the normalized color distribution (histogram) of the image of the tracked target is computed in each image frame during

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tracking the target, where the histogram refers to the classes defining (as discussed before) said target (col. 10, lines 25-55), thus identifying the target in each frame using histogram).

Regarding claim 52, Hunke discloses drawing a tracking box around the target (col. 5, lines 25-35 – rectangular box around the target).

Regarding claims 53 and 54, claims 53 and 54 recites “wherein said image processing system comprises components selected from a memory, a temporal processing unit, and a spatial processing unit”. As discussed in the rejection of claim 54, Hunke discloses a digital system which tracks the object in multiple digital frames of a video, and memory, a temporal processing unit and a spatial processing unit are inherent components of a digital system that performs operations on the video, where video has a time component in it. (see Hunke – col. 5, lines 1-35; col. 10, lines 42-67).

Double Patenting

8. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686

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F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

9. Claims 51-54 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-7 of U.S. Patent No. 7,650,015 (Herein referred as Pirim).

Claim 1 has been analyzed and rejected as per claims 1 and 6 of Pirim.

Claim 2 has been analyzed and rejected as per claim 1 of Pirim.

Claim 3 has been analyzed and rejected as per claim 4 of Pirim.

Claim 4 has been analyzed and rejected as per claim 5 of Pirim.

10. Claim 57 is objected to under 37 CFR 1.75 as being a substantial duplicate of claim 51. When two claims in an application are duplicates or else are so close in content that they both cover

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the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

11. Claims 55-56 and 58-59 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Examiner note: Examiner has cited particular columns and line numbers in the references as applied to the claims above for the convenience of the applicant. Although the specified citations are representative of the teachings for the art and are applied to the specific limitations within the individual claim, other passages and figures may be applied as well. It is respectfully requested from the applicant in preparing responses, to fully consider the references entirely as potential teachings all or part of the claimed invention, as well as the context of the passage as taught by the prior art or disclosed by the examiner.

Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Art Unit: 2624

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Manav Seth whose telephone number is (571) 272-7456. The examiner can normally be reached on Monday to Friday from 8:30 am to 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vikkram Bali, can be reached on (571) 272-7415. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Manav Seth/
Primary Examiner, Art Unit 2624
June 19, 2011

<p align="center">Index of Claims</p> 	Application/Control No. 12620092	Applicant(s)/Patent Under Reexamination PIRIM, PATRICK
	Examiner MANAV SETH	Art Unit 2624


✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

<input type="checkbox"/> Claims renumbered in the same order as presented by applicant				<input type="checkbox"/> CPA		<input type="checkbox"/> T.D.		<input type="checkbox"/> R.1.47	
CLAIM		DATE							
Final	Original	10/30/2010	06/19/2011						
	1	-	-						
	2	-	-						
	3	-	-						
	4	-	-						
	5	-	-						
	6	-	-						
	7	-	-						
	8	-	-						
	9	-	-						
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	33	-	-						
	34	-	-						
	35	-	-						
	36	-	-						

<i>Index of Claims</i> 	Application/Control No. 12620092	Applicant(s)/Patent Under Reexamination PIRIM, PATRICK
	Examiner MANAV SETH	Art Unit 2624

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

<input type="checkbox"/> Claims renumbered in the same order as presented by applicant				<input type="checkbox"/> CPA		<input type="checkbox"/> T.D.		<input type="checkbox"/> R.1.47	
CLAIM		DATE							
Final	Original	10/30/2010	06/19/2011						
	37	-	-						
	38	-	-						
	39	-	-						
	40	-	-						
	41	-	-						
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	50	-	-						
	51	✓	✓						
	52	✓	✓						
	53	✓	✓						
	54	✓	✓						
	55		○						
	56		○						
	57		✓						
	58		○						
	59		○						

Application Number 	Application/Control No. 12/620,092	Applicant(s)/Patent under Reexamination PIRIM, PATRICK	
Document Code - DISQ		Internal Document – DO NOT MAIL	

TERMINAL DISCLAIMER	<input type="checkbox"/> APPROVED	<input checked="" type="checkbox"/> DISAPPROVED
Date Filed : April 4, 2011	This patent is subject to a Terminal Disclaimer	

Approved/Disapproved by:
Henry D. Jefferson [x] The disclaimer fee under 37 CFR 1.20(d) in the amount of \$_140.00__ has not been submitted, nor is there any pre authorization in the application to charge to a deposit account. (See FP 14.24 and 14.26.07.)

U.S. Patent and Trademark Office



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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/620,092	11/17/2009	Patrick Pirim	8042-2-2

CONFIRMATION NO. 9882

POA ACCEPTANCE LETTER



86000
Gregory A. Nelson
Novak Druce & Quigg LLP
525 Okeechobee Blvd
Suite 1500
West Palm Beach, FL 33401

Date Mailed: 04/08/2011

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 04/04/2011.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/snguyen/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Pirim	Docket No.:	8042-2-2
Application No.:	12/620,092	Examiner:	SETH
Filed:	11-17-2009	Art Unit:	2624
Customer No.:	86000	Confirmation No.:	9882

For: IMAGE PROCESSING METHOD

Honorable Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being transmitted today via the Office electronic filing system (EFS-Web) in accordance with 37 CFR _§1.8.

Date: 04/04/2011

Signature: /diane taylor/
Printed Name: Diane Taylor

AMENDMENT

Sir:

This is a reply to the non-final Office Action of November 2, 2010. Please enter and consider the following amendments and remarks.

Amendments to the Claims

Please amend the claims according to the following listing of the claims.

1 - 50. (canceled)

51. (Previously Presented) A process of tracking a target in an input signal implemented using a system comprising an image processing system, the input signal comprising a succession of frames, each frame comprising a succession of pixels, the target comprising pixels in one or more of a plurality of classes in one or more of a plurality of domains, the process performed by said system comprising, on a frame-by-frame basis:
- forming at least one histogram of the pixels in the one or more of a plurality of classes in the one or more of a plurality of domains, said at least one histogram referring to classes defining said target, and identifying the target from said at least one histogram.
52. (Previously presented) The process according to claim 51 further comprising drawing a tracking box around the target.
53. (Previously presented) The process according to claim 51, wherein said image processing system comprises at least one components selected from a memory, a temporal processing unit, and a spatial processing unit.
54. (Previously Presented) The process according to claim 51, wherein said image processing system comprises at least two components selected from a memory, a temporal processing unit, and a spatial processing unit.
55. (New) The process according to claim 51, wherein forming the at least one histogram further comprises successively increasing the size of a selected area until the boundary of the target is found.
56. (New) The process according to claim 52, wherein forming the at least one histogram further comprises determining X minima and maxima and Y minima and maxima of boundaries of the target.

57. (New) A process of tracking a target in an input signal implemented using a system comprising an image processing system, the input signal comprising a succession of frames, each frame comprising a succession of pixels, the target comprising pixels in one or more of a plurality of classes in one or more of a plurality of domains, the process performed by said system comprising, on a frame-by-frame basis:
- forming at least one histogram of the pixels in the one or more of a plurality of classes in the one or more of a plurality of domains, said at least one histogram referring to classes defining said target, and identifying the target in said at least one histogram.
58. (New) The process according to claim 57, wherein identifying the target in said at least one histogram further comprises determining a center of the target to be between X and Y minima and maxima of the target.
59. (New) The process according to claim 57, wherein identifying the target in said at least one histogram further comprises determining the center of the target at regular intervals.

REMARKS

Status of the Claims

Claims 51–59 are pending.

Claims 1–50 have been canceled.

Claim Amendment

Support for new claims 55–59 can be found throughout the specification, including FIGS. 16, 17 and 21–23; and ¶¶ [0196]–[0199] [0202]–[0207] of the published application no. 20100215214. New claim 59 also finds support in claim 51 as previously presented.

Claim Rejections

- I. The Office Action rejects claims 51–54, citing 35 U.S.C §102(e), US 5,912,980 to Hunke (hereinafter, “Hunke”).

Anticipation requires a single prior art reference to describe every aspect of the claimed subject matter.¹ Claimed subject matter is “anticipated” only when it was previously known. Anticipation requires a single prior art reference to describe every aspect of the claimed subject matter² and to enable a person of ordinary skill in the field of the invention to practice the invention without undue experimentation.³ It is not enough for the reference to disclose all the claimed elements in isolation. Instead, every element of the claimed subject matter and every limitation of the claimed subject matter must be described in the reference

¹ See Schering Corp. v. Geneva Pharms., Inc., 339 F.3d 1373, 1379 (Fed. Cir. 2003); Continental Can Co. USA v. Monsanto Co., 948 F.2d 1264, 1267-69 (Fed. Cir. 1991).

² Id.

³ See Amgen Inc. v. Hoechst Marion Roussel, Inc., 457 F.3d 1293, 1306-07 (Fed. Cir. 2006); Elan Pharms., Inc. v. Mayo Found. for Med. Educ. & Research, 346 F.3d 1051, 1054 (Fed. Cir. 2003).

as arranged in the claimed invention.⁴ Indeed, “[the] reference must clearly and unequivocally disclose the claimed [invention] or direct those skilled in the art to the [invention] without any need for picking, choosing, and combining various disclosures not directly related to each other by the teachings of the cited reference.”⁵

Hunke does not disclose “identifying the target from said at least one histogram”, as recited by claim 51 of the present application. To the contrary, Hunke discloses identifying the target in a normalized, binary image, which is not a histogram.

Claim 1 of Hunke is illustrative. Specifically, claim 1 of Hunke recites “determining typical colors found in objects of said predetermined target class”. This step can include generating a histogram of the colors of the target and normalizing them to [0 . . . 1] (i.e., whether a color is associated with a target).

The next step in creating a target color classifier is to use a normalized color distribution of a sample image to determine percentages of reflections of a target with a specific source of light. The color distribution $N_{r,g}$ is a histogram of the frequency of occurrence of each possible color (r, g) in the sample image. The color distribution is then normalized by transforming the values $N_{r,g}$ into values from [0 ... 1]. Given a color space of [0 ... 1], [0 ... 1], the normalized color distribution $N'_{r,g}$ is computed as

$$N'_{r,g} = \frac{N_{r,g}}{\max_{i+j \leq t} N_{i,j}}$$

The normalized color distribution $N'_{r,g}$ will accurately reflect the distribution of colors in the sample image, if the number of pixels in the sample image is large compared to the number of possible colors

$$\frac{P}{2}.$$

⁴ Connell v. Sears, Roebuck & Co., 722 F.2d 1542, 1548 (Fed. Cir. 1983)

⁵ In re Arkley, 455 F.2d 586, 587 (CCPA 1972) (emphasis in original).

When updating the ITCC 46, a normalized color distribution is obtained using the small image of the tracked target. If the number of pixels in the sample image is small compared to the number of possible colors, the determined histogram does not reflect the color distribution of the object in the sample image. To obtain a valid color distribution, the determined histogram is smoothed by lowpass filtering. Other methods for computing a color distribution include adding a gaussian distribution of a given variance for each pixel of the sample image with the specific color in its mean value.

The normalized color distribution can be used as a target color classifier by classifying a color as a target color if the value $N'_{r,g}$ exceeds a given threshold. A threshold of 0.2 would classify all colors as target colors which occur at least 0.2 times as often as the most frequently occurring color in the sample image.

Hunke at 8:58–9:30.

Next, claim 1 of Hunke recites “detecting a moving area in said video image stream”, i.e., the target is located via movement.

While movement is necessary to locate targets in the target acquisition module, the target tracking module does not require movement to track the position of a target. If the target tracking module does not detect motion, the position of the target is the same as in the previous image. [...]

A target acquisition motion analysis 24 detects motion and erases all regions not containing movement from the target acquisition blackboard, so that these regions are not considered for locating new targets.

Hunke at 6:29–34 and 51–54.

In the step of “determining whether the moving area contains colors similar to the predetermined target class typical colors”; in other words, colors that are not associated with a target, i.e., colors normalized to ‘0’, are removed.



Fig. 6

Hunke at FIG. 6

FIG. 5 and 6 demonstrate the effect of individual target color classification with a human face as example. FIG. 5 shows a lowpass filtered color distribution 72 of an individual face. The right part of the figure shows a magnification 74 of the essential region of this color distribution 72. A rectangular box 76 indicates the colors considered as individual target colors. FIG. 6 demonstrates the effect of using this color distribution as an ITCe. The face in FIG. 6 was used to compute the color distribution 72 in FIG. 5. In FIG. 6 each pixel not having individual target color is replaced with white, so that only regions with skin-color are shown. The regions containing the lips and eyes are not considered having individual target color, because the colors of the lips and eyes occur very infrequently in a face compared to skin color and therefore have low values $N_{r,g}$ in the color distribution.

Hunke at 10:26–41.

Accordingly, objects are tracked via the normalized, binary image and whether a threshold number of pixels have a color that is normalized to '1'.

Detecting an object is defined to mean detecting a coherent set of pixels belonging to one object. The following definition is one example for defining coherent sets of pixels. Other applications might favor a different distance measurement and definition:

Def. 1: Two pixels p_1 and p_2 with coordinates (x_{p1}, y_{p1}) and (x_{p2}, y_{p2}) are neighbored, if $\|x_{p1} - x_{p2}\| \leq 1 \wedge \|y_{p1} - y_{p2}\| \leq 1$ is valid.

Def. 2: A set S is coherent, if

1. $S = \{p\}$ or
2. $S = T \cup p$, so that T is a coherent set and $\exists q \in T$: p is neighbored to q .

Hunke at 13:28–40.

Therefore, Hunke does not disclose “identifying the target from said at least one histogram”, as recited by claim 51 of the present application, but instead discloses identifying the target in a normalized, binary image, which is not a histogram.

New claim 57 further distinguishes over Hunke by reciting, identifying the target in said at least one histogram. New claim 58 specifies that identifying the target in said at least one histogram further comprises determining a center of the target to be between X and Y minima and maxima of the target. New claim 59 specifies that identifying the target in said at least one histogram further comprises determining the center of the target at regular intervals. Hunke does not disclose any of these features.

The present rejection should be withdrawn.

- II. The Office Action rejects claims 51–54, citing the ground of nonstatutory obviousness-type double patenting and claims 1–7 of US 7,650,015 to Pirim (hereinafter, “the ‘015 patent”).

A terminal disclaimer is submitted herewith in accordance with 37 C.F.R. § 1.321(c). The rejection should be withdrawn.

Petition for Extension of Time

Applicants respectfully request that a two-month extension of time be granted in this case. The respective fee is paid by credit card.

Fee Authorization

The Director is hereby authorized to charge any deficiency in fees filed, asserted to be filed, or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Deposit Account 14-1437. Please credit any excess fees to such account.

Respectfully submitted,
NOVAK DRUCE + QUIGG, LLP

/Michael P. Byrne/

Date: April 4, 2011

Gregory A. Nelson, Reg. No. 30,577

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Washington, D.C. 20001

Phone: (202) 659-0100

Fax: (202) 659-0105

Electronic Patent Application Fee Transmittal

Application Number:	12620092			
Filing Date:	17-Nov-2009			
Title of Invention:	IMAGE PROCESSING METHOD			
First Named Inventor/Applicant Name:	Patrick Pirim			
Filer:	Michael P. Byrne/Diane Taylor			
Attorney Docket Number:	8042-2-2			
Filed as Small Entity				
Utility under 35 USC 111(a) Filing Fees				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Extension - 2 months with \$0 paid	2252	1	245	245

SAMSUNG EXHIBIT 1004

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
Total in USD (\$)				245

Electronic Acknowledgement Receipt

EFS ID:	9802958
Application Number:	12620092
International Application Number:	
Confirmation Number:	9882
Title of Invention:	IMAGE PROCESSING METHOD
First Named Inventor/Applicant Name:	Patrick Pirim
Customer Number:	86002
Filer:	Michael P. Byrne/Diane Taylor
Filer Authorized By:	Michael P. Byrne
Attorney Docket Number:	8042-2-2
Receipt Date:	04-APR-2011
Filing Date:	17-NOV-2009
Time Stamp:	15:36:47
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	\$245
RAM confirmation Number	2162
Deposit Account	141437
Authorized User	BYRNE,MICHAEL P.

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)

SAMSUNG EXHIBIT 1004

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Terminal Disclaimer Filed	8042-2-2_TerminalDisclaimerForm.pdf	211289 8d792ec9a6bf1fb3cf756c1aec018c9073794a18	no	2

Warnings:

Information:

2	Power of Attorney	Power_of_Attorney.pdf	75183 9616773820bca2e4972f60f06a8fb61017469cf1	no	1
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Warnings:

Information:

3	Assignee showing of ownership per 37 CFR 3.73(b).	ASSIGNEE_STMT.pdf	82314 4025994ae86ae5d2e12fed20ad798218d2beabc	no	1
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Warnings:

Information:

4	Assignee showing of ownership per 37 CFR 3.73(b).	Assignment7181047-Marshall_to_Harbaugh.pdf	92660 4e1c800e33e64ab357f95b772bebceacf98e6937	no	2
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Warnings:

Information:

5	Assignee showing of ownership per 37 CFR 3.73(b).	Assignment7181047-Pirim_to_US_Marshall.pdf	86798 f0ba9f6703d7491048b4f5b94d7e9d7d23a6bba3	no	2
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Warnings:

Information:

6		8042-2-2_Resp_to_2Nov2010_NFOA.pdf	113621 a0314b56559c9bd2096cae2e5802f60e261f1fe1	yes	9
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Multipart Description/PDF files in .zip description

Document Description	Start	End
Amendment/Req. Reconsideration-After Non-Final Reject	1	1
Claims	2	3
Applicant Arguments/Remarks Made in an Amendment	4	9

Warnings:

Information:					
7	Fee Worksheet (PTO-875)	fee-info.pdf	30242	no	2
			4d4e2337c3db4c9ec6d0252936c911d71463112e		
Warnings:					
Information:					
Total Files Size (in bytes):				692107	
<p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p>					

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

**TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING
REJECTION OVER A "PRIOR" PATENT**Docket Number (Optional)
8042-2-2

In re Application of: Pirim

Application No.: 12/620,092

Filed: November 17, 2009

For: Image Processing Method

The owner*, Image Processing Technologies, LLC, of 100 percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term **prior patent** No. 7,650,015 as the term of said prior patent is defined in 35 U.S.C. 154 and 173, and as the term of said **prior patent** is presently shortened by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the **prior patent** are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the owner does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term as defined in 35 U.S.C. 154 and 173 of the **prior patent**, "as the term of said **prior patent** is presently shortened by any terminal disclaimer," in the event that said **prior patent** later:

- expires for failure to pay a maintenance fee;
- is held unenforceable;
- is found invalid by a court of competent jurisdiction;
- is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
- has all claims canceled by a reexamination certificate;
- is reissued; or
- is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

Check either box 1 or 2 below, if appropriate.

1. ☐ For submissions on behalf of a business/organization (e.g., corporation, partnership, university, government agency, etc.), the undersigned is empowered to act on behalf of the business/organization.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

2. ☒ The undersigned is an attorney or agent of record. Reg. No. 54,015

/Michael P. Byrne/

Signature

04-04-2011

Date

Michael P. Byrne

Typed or printed name

202.659.0100

Telephone Number

- ☒ Terminal disclaimer fee under 37 CFR 1.20(d) included.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

*Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner).
Form PTO/SB/96 may be used for making this certification. See MPEP § 324.

This collection of information is required by 37 CFR 1.321. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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POWER OF ATTORNEY OR REVOCATION OF POWER OF ATTORNEY WITH A NEW POWER OF ATTORNEY AND CHANGE OF CORRESPONDENCE ADDRESS	Application Number	12/620,092
	Filing Date	2009-11-17
	First Named Inventor	Pirim
	Title	Image Processing Method
	Art Unit	2624
	Examiner Name	Manav Seth
	Attorney Docket Number	8042-2-2

I hereby revoke all previous powers of attorney given in the above-identified application.

☐ A Power of Attorney is submitted herewith.

OR

☒ I hereby appoint Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the United States Patent and Trademark Office connected therewith:

86000

OR

☐ I hereby appoint Practitioner(s) named below as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the United States Patent and Trademark Office connected therewith:

Practitioner(s) Name	Registration Number

Please recognize or change the correspondence address for the above-identified application to:

☐ The address associated with the above-mentioned Customer Number.

OR

☒ The address associated with Customer Number:

86000

OR

☐ Firm or Individual Name

Address

City

State

Zip

Country

Telephone

Email

I am the:

☐ Applicant/Inventor.

OR

☒ Assignee of record of the entire interest. See 37 CFR 3.71.

Statement under 37 CFR 3.73(b) (Form PTO/SB/96) submitted herewith or filed on _____.

SIGNATURE of Applicant or Assignee of Record

Signature	<i>Paul J. Lerner</i>	Date	April 9, 2011
Name	Paul J. Lerner	Telephone	(845) 368-9000 x104
Title and Company	Image Processing Technologies, LLC		

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below*.☐ *Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

STATEMENT UNDER 37 CFR 3.73(b)Applicant/Patent Owner: PirimApplication No./Patent No.: 12/620,092Filed/Issue Date: 11-17-2009Titled: Image Processing Method

Image Processing Technologies, LLC

, a Corporation

(Name of Assignee)

(Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that it is:

1. ☒ the assignee of the entire right, title, and interest in;
2. ☐ an assignee of less than the entire right, title, and interest in
(The extent (by percentage) of its ownership interest is _____ %); or
3. ☐ the assignee of an undivided interest in the entirety of (a complete assignment from one of the joint inventors was made)

the patent application/patent identified above, by virtue of either:

- A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy therefore is attached.

OR

- B. ☒ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: Patrick Pirim To: US Marshall

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

2. From: US Marshall To: Brown as trustee for Joseph Harbaugh

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

3. From: Brown as trustee for Joseph Harbaugh To: Image Processing Technologies, LLC

The document was recorded in the United States Patent and Trademark Office at
Reel 023409, Frame 0987, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

- ☒ As required by 37 CFR 3.73(b)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

Paul J. Lerner
Signature

April 7, 2011
Date

Paul J. Lerner
Printed or Typed Name

V.P. of Manager
Title

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1460, Alexandria, VA 22313-1460.

IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF FLORIDA

CASE NO. 03-61674-Civ-Cohn
Magistrate Judge Snow

JOSEPH D. HARBAUGH,)
)
Plaintiff/Judgment Creditor,)
)
-vs-)
)
CHRISTIAN RENE GRESLIN, PATRICK)
PIRIM, IGOR MARIE DE L'ISLE a/k/a)
IGOR MARIE L'ISLE a/k/a JEAN)
PIERRE MARIE L'ISLE, HOLDING)
B.E.V. S.A., CARLUS MAGNUS LIMITED,)
and BEV DEVELOPMENT, S.A.)
)
Defendants/Judgment Debtors. /
JOSEPH D. HARBAUGH,)
)
Plaintiff/Judgment Creditor,)
)
-vs-)
)
PYRROS N. VARDINOYANNIS,)
)
Impleaded Third Party. /

2006 JAN 12 AM 11:44
CLERK U.S. DIST. CT.
S.D. OF FLA.-FT. L.

U.S. MARSHAL'S ASSIGNMENT
United States Patent Application 20020071595
(Image processing apparatus and method)

WHEREAS, on December 21, 2005, in the above-styled and numbered cause, the Court entered its Order Confirming Sale (DE 701), to which reference is made for all purposes, ordering me to execute this Assignment;

NOW, THEREFORE, I have assigned and by these presents do assign and convey unto William J. Brown, as Trustee for Joseph

719
90

CASE NO. 03-61674-Civ-Cohn
Magistrate Judge Snow

D. Harbaugh all right, title, interest, and claim of Holding

B.E.V. S.A. and Patrick Pirim, in and to the property.

TO HAVE AND TO HOLD the property described as:

United States Patent Application 20020071595

Image processing apparatus and method

Inventor: **Pirim, Patrick;** (Paris, FR)

Serial No.: **792294**

Series Code: **09**

Filed: **February 23, 2001**

U.S. Current Class: **382/107; 382/170**

U.S. Class at Publication: **382/107; 382/170**

Intern'l Class: **G06K 009/00**

unto the said William J. Brown as Trustee for Joseph D. Harbaugh
and his assigns, forever as fully and as absolutely as I,
Christina Pharo, United States Marshal, as aforesaid, can convey
by virtue of said Judgment, Order of Sale, and Order Confirming
Sale.

IN TESTIMONY WHEREOF, I have hereunto set my hand this 11
day of January, 2006.


Certified to be a true and correct copy of the original.	
United States Marshal Southern District of Fla	
By: <u>DC</u>	DUSM - Admin. Clerk
Date: <u>2/11/06</u>	

CHRISTINA PHARO
UNITED STATES MARSHAL
SOUTHERN DISTRICT OF FLORIDA

By

Christina Pharo

Connie E. Maki
Notary Public

NOTARY PUBLIC STATE OF FLORIDA
 **Connie E. Maki**
Commission # DD448495
Expires: AUG. 23, 2009
Bonded Thru Atlantic Bonding Co., Inc.

IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF FLORIDA

CASE NO. 03-61674-Civ-Cohn
Magistrate Judge Snow

JOSEPH D. HARBAUGH,)
)
Plaintiff,)
-vs-)
)
CHRISTIAN RENE GRESLIN,)
PATRICK PIRIM, IGOR MARIE)
DE L'ISLE a/k/a IGOR MARIE)
L'ISLE a/k/a JEAN PIERRE MARIE)
L'ISLE, HOLDING B.E.V. S.A.,)
CARLUS MAGNUS LIMITED, and)
BEV DEVELOPMENT, S.A.)
)
Defendants.)

**ASSIGNMENT OF UNITED STATES PATENT APPLICATION 20020071595
(Image Processing Apparatus and Method)**

I, Patrick Pirim, as the inventor, am authorized to assign
the Patent Application described as:

United States Patent Application 20020071595

Image processing apparatus and method

Inventor: **Pirim, Patrick;** (Paris, FR)

Serial No.: **792294**

Series Code: **09**

Filed: **February 23, 2001**

U.S. Current Class: 382/107; 382/170

U.S. Class at Publication: 382/107; 382/170

Intern'l Class: G06K 009/00

And, as ordered by the Honorable Judge James I. Cohn of the
United States District Court for the Southern District of Florida
in the above styled action, I hereby assign and transfer unto

CASE NO. 03-61674-Civ-Cohn
Magistrate Judge Snow

Christina Pharo, United States Marshal for the Southern District of Florida, the full and exclusive right to the said invention in the United States and the entire rights, title and interest in and to any and all Patents which may be granted therefore in the United States. I hereby authorized and request the Director of the U.S. Patent and Trademark Office to issue said United States Patent to the said assignee of the entire right, title, and interest in and to the same, for her sole use and behoof; and for the use and behoof of her legal representatives and assigns, to the full end of the term for which said Patent may be granted.

I DECLARE under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

EXECUTED this ____ day of JULY, 2005.

CLARENCE MADDOX,
Clerk of the U.S. District Court,
Duly Appointed Legal Representative
of Patrick Pirim, Inventor


by _____

Deputy Clerk

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875					Application or Docket Number 12/620,092		Filing Date 11/17/2009		<input type="checkbox"/> To be Mailed	
APPLICATION AS FILED – PART I										
(Column 1)			(Column 2)			SMALL ENTITY <input checked="" type="checkbox"/> OR		OTHER THAN SMALL ENTITY		
FOR	NUMBER FILED	NUMBER EXTRA	RATE (\$)	FEE (\$)	OR	RATE (\$)	FEE (\$)			
<input type="checkbox"/> BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A				
<input type="checkbox"/> SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A			N/A				
<input type="checkbox"/> EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A				
TOTAL CLAIMS (37 CFR 1.16(j))	minus 20 =	*	X \$	=	OR	X \$	=			
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X \$	=		X \$	=			
<input type="checkbox"/> APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$250 (\$125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).									
<input type="checkbox"/> MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))										
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL				
APPLICATION AS AMENDED – PART II										
(Column 1)			(Column 2)			SMALL ENTITY OR		OTHER THAN SMALL ENTITY		
AMENDMENT	04/04/2011	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)	OR	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	* 9	Minus	** 20	= 0	X \$26 =	0	OR	X \$	=
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0	X \$110 =	0	OR	X \$	=
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))									
	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE	0	OR	TOTAL ADD'L FEE	
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)	OR	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X \$	=	OR	X \$	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X \$	=	OR	X \$	=
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))									
	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
<p>* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.</p> <p>** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".</p> <p>*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".</p> <p>The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.</p>										

Legal Instrument Examiner:
/MONICA HARRIS/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/620,092	11/17/2009	Patrick Pirim	8042-2-2	9882
86002	7590	11/02/2010		
J. Rodman Steele Novak Druce & Quigg LLP 525 Okeechobee Blvd Suite 1500 West Palm Beach, FL 33401			EXAMINER SETH, MANAV	
			ART UNIT 2624	PAPER NUMBER
			MAIL DATE 11/02/2010	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 12/620,092	Applicant(s) PIRIM, PATRICK	
	Examiner MANAV SETH	Art Unit 2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 November 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 51-54 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 51-54 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 November 2009 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>11/17/09</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

2. Claims 51-54 are rejected under 35 U.S.C. 102(e) as being anticipated by Hunke, U.S. Patent No. 5,912,980.

Regarding claim 51, Hunke discloses a process of tracking a target in an input signal implemented using a system comprising an image processing system (col. 4, lines 14-42; col. 5, lines 1-35 – any system that performs operations on the images is an image processing system), the input signal comprising a succession of frames, (Abstract, last few lines – “the method allows tracking of target objects in subsequent frames of the video image stream based upon the colors in the target objects; col. 5, lines 1-13), Hunke further discloses “each frame comprising a succession of pixels

Art Unit: 2624

(col. 8, lines 1-3 – images obtained from the video camera are represented as a **pixel matrix** RGB values where pixel matrix represents succession of pixels), Hunke further discloses “the target comprising pixels in one or more of a plurality of classes in one or more of a plurality of domains” (col. 8, lines 17-20 – the domain being the color domain as the image frame pixels are classified into the target color pixels and non-target color pixels, and target pixels further comprise a target class having a specific color, where target classes, for example, being human faces with different skin colors (col. 9, lines 50-65); the other domain being the time domain since the tracking is being done at different times (col. 10, lines 42-60)), the process comprising, on-a frame-by-frame basis: forming at least one histogram of the pixels in the one or more of a plurality of classes in the one or more of a plurality of domains, said at least one histogram referring to classes defining said target, and identifying the target from said at least one histogram (col. 10, lines 45-51 – the normalized color distribution (histogram) of the image of the tracked target is computed in each image frame during tracking the target, where the histogram refers to the classes defining (as discussed before) said target (col. 10, lines 25-55), thus identifying the target in each frame using histogram).

Regarding claim 52, Hunke discloses drawing a tracking box around the target (col. 5, lines 25-35 – rectangular box around the target).

Regarding claims 53 and 54, claims 53 and 54 recites “wherein said image processing system comprises components selected from a memory, a temporal processing unit, and a spatial processing unit”. As discussed in the rejection of claim 54, Hunke discloses a digital system which tracks the object in multiple digital frames of a video, and memory, a temporal processing unit and a spatial processing unit are inherent components of a digital system that performs operations on the video, where video has a time component in it. (see Hunke – col. 5, lines 1-35; col. 10, lines 42-67).

Double Patenting

3. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

4. Claims 51-54 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-7 of U.S. Patent No. 7,650,015 (Herein referred as Pirim).

Claim 1 has been analyzed and rejected as per claims 1 and 6 of Pirim.

Art Unit: 2624

Claim 2 has been analyzed and rejected as per claim 1 of Pirim.

Claim 3 has been analyzed and rejected as per claim 4 of Pirim.

Claim 4 has been analyzed and rejected as per claim 5 of Pirim.

Examiner note: Examiner has cited particular columns and line numbers in the references as applied to the claims above for the convenience of the applicant. Although the specified citations are representative of the teachings for the art and are applied to the specific limitations within the individual claim, other passages and figures may be applied as well. It is respectfully requested from the applicant in preparing responses, to fully consider the references entirely as potential teachings all or part of the claimed invention, as well as the context of the passage as taught by the prior art or disclosed by the examiner.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Manav Seth whose telephone number is (571) 272-7456. The examiner can normally be reached on Monday to Friday from 8:30 am to 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vikkram Bali, can be reached on (571) 272-7415. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system,

Application/Control Number: 12/620,092

Page 6

Art Unit: 2624

see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Manav Seth/
Primary Examiner, Art Unit 2624
October 30, 2010

Notice of References Cited	Application/Control No. 12/620,092		Applicant(s)/Patent Under Reexamination PIRIM, PATRICK	
	Examiner MANAV SETH		Art Unit 2624	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-5,912,980	06-1999	Hunke, H. Martin	382/103
*	B	US-7,650,015	01-2010	Pirim, Patrick	382/103
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			


FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

<i>Index of Claims</i> 	Application/Control No. 12620092	Applicant(s)/Patent Under Reexamination PIRIM, PATRICK
	Examiner MANAV SETH	Art Unit 2624


✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

<input type="checkbox"/> Claims renumbered in the same order as presented by applicant			<input type="checkbox"/> CPA			<input type="checkbox"/> T.D.			<input type="checkbox"/> R.1.47		
CLAIM		DATE									
Final	Original	10/30/2010									
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<i>Index of Claims</i> 	Application/Control No. 12620092	Applicant(s)/Patent Under Reexamination PIRIM, PATRICK
	Examiner MANAV SETH	Art Unit 2624

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

<input type="checkbox"/> Claims renumbered in the same order as presented by applicant		<input type="checkbox"/> CPA		<input type="checkbox"/> T.D.		<input type="checkbox"/> R.1.47			
CLAIM		DATE							
Final	Original	10/30/2010							
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	54	✓							

Search Notes 	Application/Control No. 12620092	Applicant(s)/Patent Under Reexamination PIRIM, PATRICK
	Examiner MANAV SETH	Art Unit 2624

SEARCHED			
Class	Subclass	Date	Examiner
382	100,103,107,128-132,168-180,199-206,224,291	10/30/2010	ms

SEARCH NOTES		
Search Notes	Date	Examiner
East search	10/30/2010	ms
IDS Search	10/30/2010	ms
Inventor Search	10/30/2010	ms

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

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Substitute for form 1449PTO

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**

(Use as many sheets as necessary)

Sheet 1 of 3

Complete if Known

Application Number	
Filing Date	November 17, 2009
First Named Inventor	PIRIM
Art Unit	
Examiner Name	
Attorney Docket Number	8042-2-2

U.S. PATENT DOCUMENTS*

Examiner Initials*	Cite No. ¹	Document Number Number Kind Code ² (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
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		US-5,278,921 A	01-11-1994	Nakamura et al.	
		US-5,774,581 A	06-30-1998	Fassnacht et al.	
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		US-6,488,909	11-26-2002	Pirim	
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		US-5,109,425	04-28-1992	Lawton	
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		US-5,088,488	02-18-1992	Markowitz et al.	
		US-5,163,095	11-10-1992	Kosaka	
		US-5,359,533	10-25-1994	Ricka et al.	
		US-5,592,237	01-07-1997	Greenway et al.	
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Examiner Initials*	Cite No. ¹	Foreign Patent Document			Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T ³
		Country Code ³	Number ⁴	Kind Code ⁵ (if known)				
		WO	00/11609	A1	03-02-2000	Holding B.E.V. S.A.		<input type="checkbox"/>
		WO	00/11610	A1	03-02-2000	Holding B.E.V. S.A.		<input type="checkbox"/>
		WO	01/63557	A2	08-30-2001	Holding B.E.V. S.A.		<input type="checkbox"/>
		JP	06-205780	A	07-26-1994	Aloka Co. Ltd.		<input type="checkbox"/>
		WO	98/05002		02/05/1998	Carlus Magnus Limited		<input type="checkbox"/>
		EP	0046110	A1	02/17/1982	Urien et al.		<input type="checkbox"/>
		FR	2751772	A1	01/30/1998	Bev Bureau Etude Vision Soc.		<input type="checkbox"/>
		FR	2611063	A1	08/19/1988	Imapply		<input type="checkbox"/>

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Application Number

Filing Date

November 17, 2009

First Named Inventor

PIRIM

Art Unit

Examiner Name _____

Attorney Docket Number

8042-2-2

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3

[illegible]

Examiner Initials*	Cite No. ¹	Foreign Patent Document			Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T ⁶
		Country Code ³	Number ⁴	Kind Code ⁵ (if known)				
	AU	WO	99/36894		07/22/99	Patrick Pirim		<input type="checkbox"/>
	AV	EP	0 380 659	A1	08/08/90	Makoto Nagao et al.		<input type="checkbox"/>
	AW	EP	0 394 959	A2	10/31/90	Axel Korn		<input type="checkbox"/>
	AX	WO	99/36893		07/22/99	Patrick Pirim et al.		<input type="checkbox"/>

PTO/SB/08B (07-05)

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			Application Number		
			Filing Date	November 17, 2009	
			First Named Inventor		
			Art Unit		
			Examiner Name		
Sheet	3	of	3	Attorney Docket Number	8042-2-2

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T ²
		Stephane G. Mallat, "A Theory for Multiresolution Signal Decomposition: The Wavelet Representation", IEEE Transactions on Pattern Analysis and Machine Intelligence, Vol. 11, No. 7, July 1989, pages 674-693.	
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		Pierre-Francois Rüedi, "Motion Detection Silicon Retina Based on Event Correlations", 1996 IEEE Proceedings of MicroNeuro '96, pages 23-29	
		Revue Trimestrielle Des «Techniques de Lingenieur», "Instantanés Technique" Techniques De ingénieur, Mars 1997-N°5 (40F), ISSN 0994-0758,	
		Es Professionnels de Linformatique En Entreprise Magazine, "Objectif Securite Des Reseaux", N° 24, Janvier, 1997	
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Examiner Signature	/Manav Seth/	Date Considered	10/30/2010
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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BIB DATA SHEET

CONFIRMATION NO. 9882

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.		
12/620,092	11/17/2009	382	2624	8042-2-2		
RULE						
APPLICANTS Patrick Pirim, Paris, FRANCE; ** CONTINUING DATA ***** This application is a CON of 11/676,926 02/20/2007 PAT 7,650,015 which is a DIV of 09/792,294 02/23/2001 PAT 7,181,047 which is a CIP of 09/230,502 09/13/1999 PAT 6,486,909 ** FOREIGN APPLICATIONS ***** EUROPEAN PATENT OFFICE (EPO) PCT/EP98/05383 09/25/1998 FRANCE PCT/FR97/01354 07/22/1997 FRANCE 9609420 07/22/1996 ** IF REQUIRED, FOREIGN FILING LICENSE GRANTED *** SMALL ENTITY ** 04/08/2010						
Foreign Priority claimed <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No 35 USC 119(a-d) conditions met <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Verified and Acknowledged <u>/MANAV SETH/</u> Examiner's Signature		<input type="checkbox"/> Met after Allowance Initials	STATE OR COUNTRY FRANCE	SHEETS DRAWINGS 13	TOTAL CLAIMS 4	INDEPENDENT CLAIMS 1
ADDRESS J. Rodman Steele Novak Druce & Quigg LLP 525 Okeechobee Blvd Suite 1500 West Palm Beach, FL 33401 UNITED STATES						
TITLE IMAGE PROCESSING METHOD						
FILING FEE RECEIVED 462	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:			<input type="checkbox"/> All Fees <input type="checkbox"/> 1.16 Fees (Filing) <input type="checkbox"/> 1.17 Fees (Processing Ext. of time) <input type="checkbox"/> 1.18 Fees (Issue) <input type="checkbox"/> Other _____ <input type="checkbox"/> Credit		



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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/620,092	11/17/2009	Patrick Pirim	8042-2-2

CONFIRMATION NO. 9882

PUBLICATION NOTICE



OC000000043225536

86002

J. Rodman Steele

Novak Druce & Quigg LLP

525 Okeechobee Blvd

Suite 1500

West Palm Beach, FL 33401

Title:IMAGE PROCESSING METHOD

Publication No.US-2010-0215214-A1

Publication Date:08/26/2010

NOTICE OF PUBLICATION OF APPLICATION

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
12/620,092	11/17/2009	2624	462	8042-2-2	4	1

CONFIRMATION NO. 9882

UPDATED FILING RECEIPT



86002
J. Rodman Steele
Novak Druce & Quigg LLP
525 Okeechobee Blvd
Suite 1500
West Palm Beach, FL 33401

Date Mailed: 05/19/2010

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Applicant(s)

Patrick Pirim, Paris, FRANCE;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CON of 11/676,926 02/20/2007 PAT 7,650,015
which is a DIV of 09/792,294 02/23/2001 PAT 7,181,047
which is a CIP of 09/230,502 09/13/1999 PAT 6,486,909

Foreign Applications

EUROPEAN PATENT OFFICE (EPO) PCT/EP98/05383 09/25/1998
FRANCE PCT/FR97/01354 07/22/1997
FRANCE 9609420 07/22/1996

If Required, Foreign Filing License Granted: 04/08/2010

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 12/620,092**

Projected Publication Date: 08/26/2010

Non-Publication Request: No

Early Publication Request: No

**** SMALL ENTITY ****

Title

IMAGE PROCESSING METHOD

Preliminary Class

382

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The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: PIRIM

Confirmation No. 9882

Application No. 12/620,092

Examiner:

Date Filed: November 17, 2009

Group Art Unit: 2624

For: IMAGE PROCESSING METHOD

RESPONSE TO NOTICE TO FILE CORRECTED APPLICATION PAPERS

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This is a timely filed response to the Notice to File Corrected Application Papers mailed April 12, 2010. The Notice requests that replacement drawings in compliance with 37 CFR 1.84 and 37 CFR 1.121(d) be submitted. Accordingly, filed herewith are 13 sheets of drawing containing Figures 1-24.

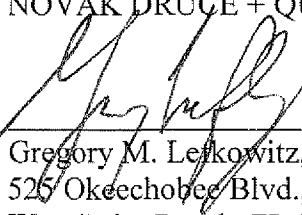
Although no fees are believed to be due, the Commissioner for Patents is hereby authorized to charge any underpayment in fees which may become due during the prosecution of this application to Deposit Account No. 14-1437.

Respectfully submitted,

NOVAK DRUCE + QUIGG LLP

Date:

May 10, 2010



Gregory M. Lefkowitz, Reg. No. 56,216
525 Okeechobee Blvd., 15th Floor
West Palm Beach, FL 33401
Tel: 561-847-7800

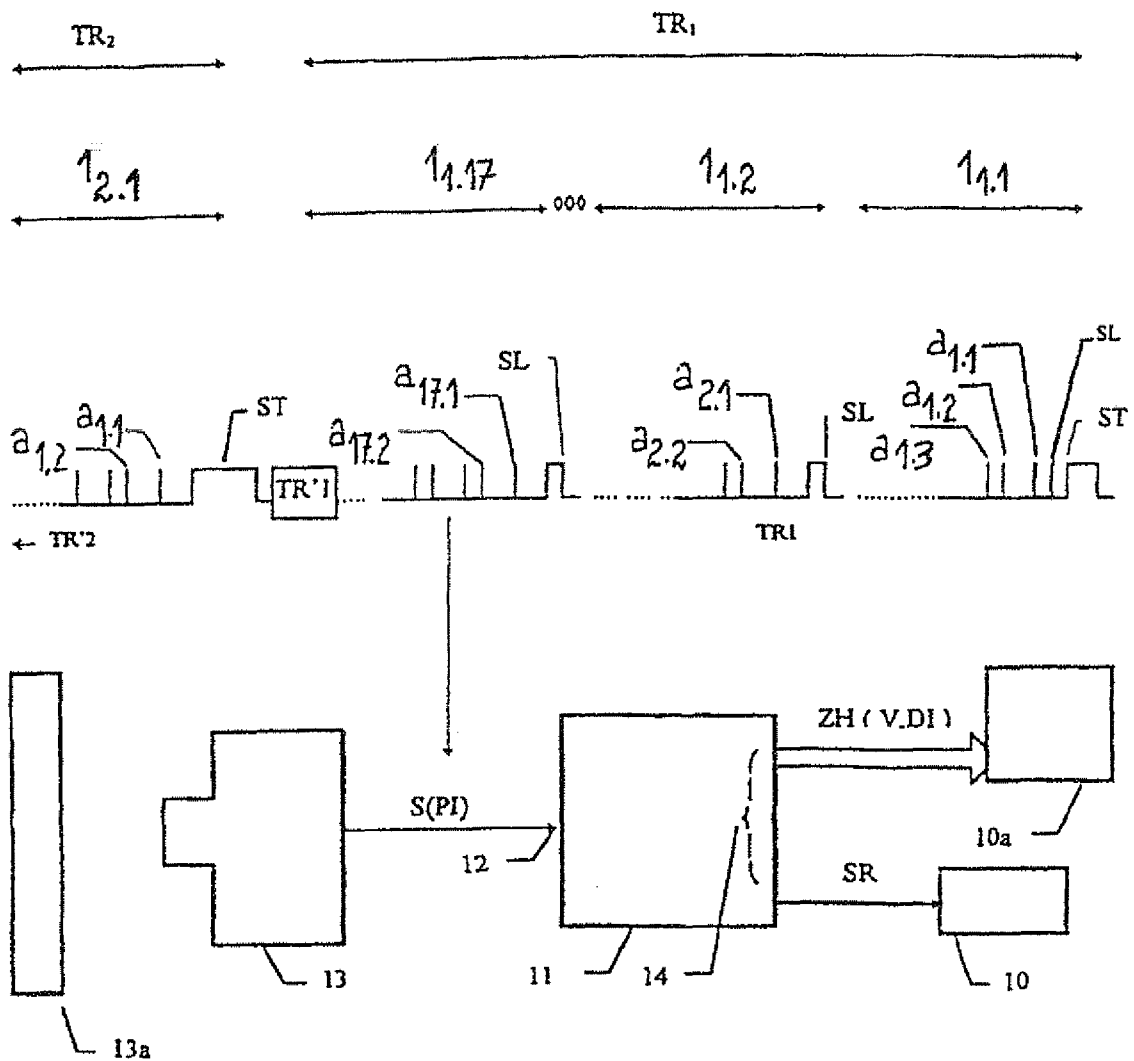


FIG. 1

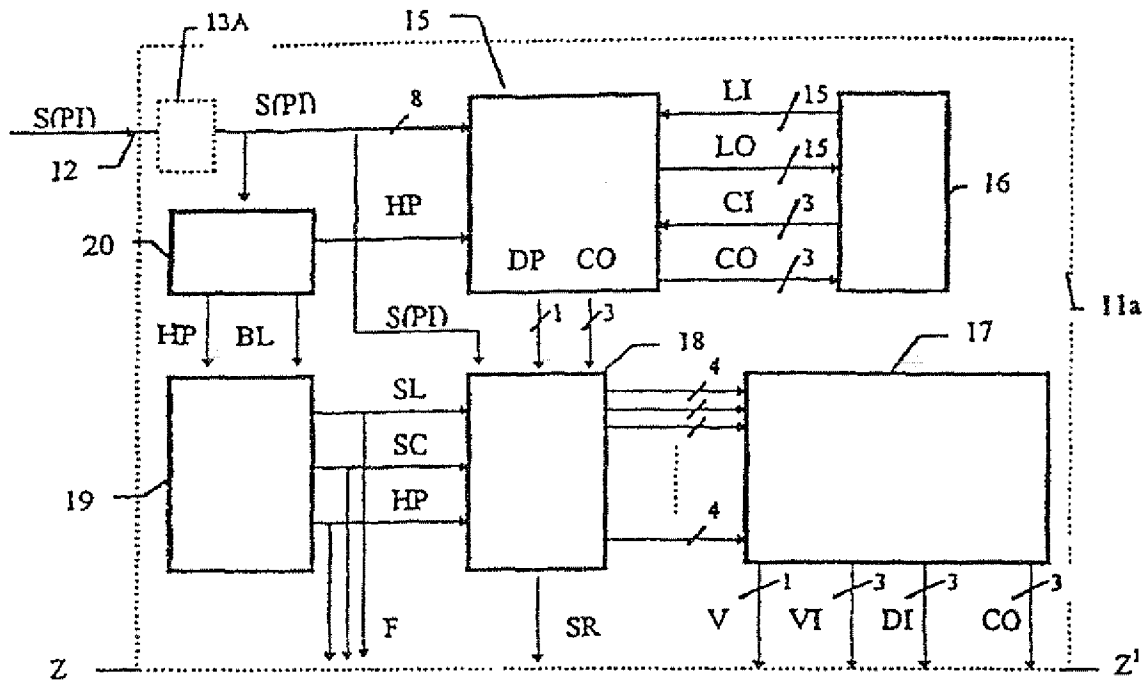


FIG. 2

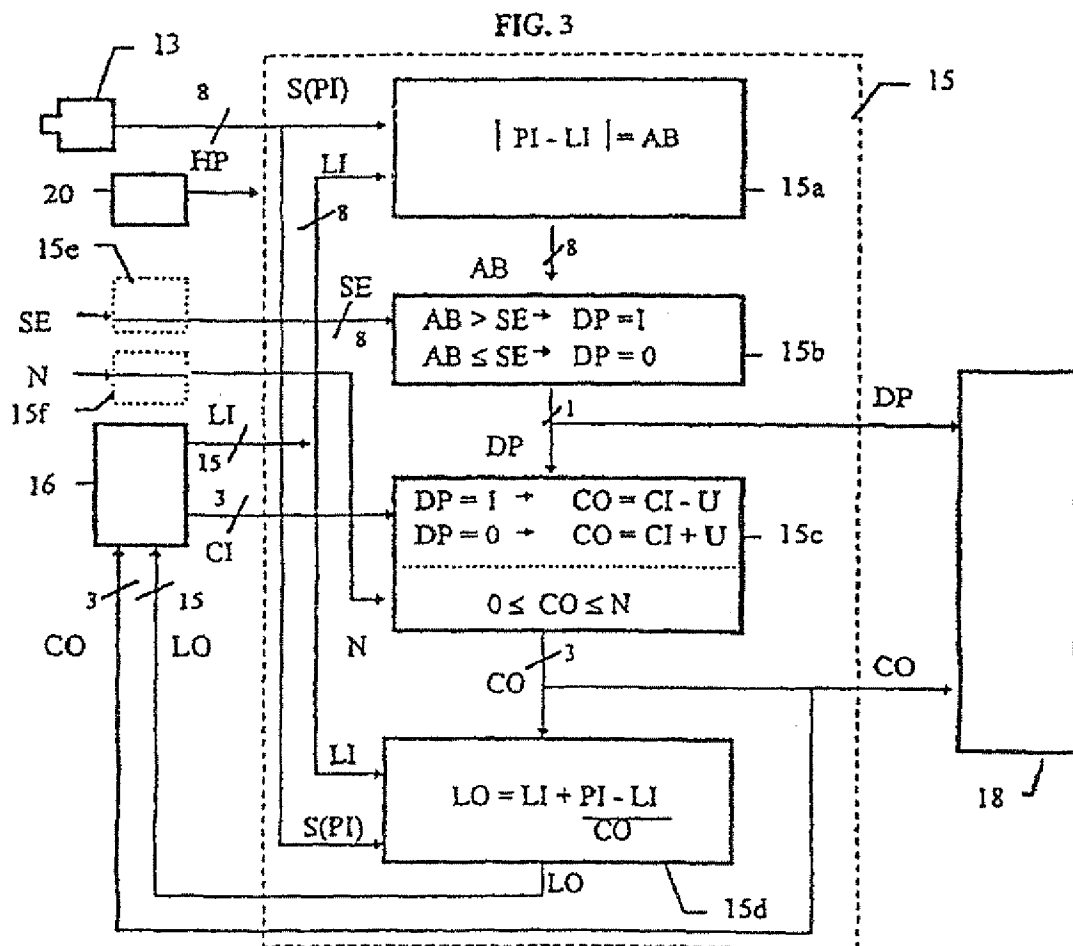


FIG. 3



FIG. 7

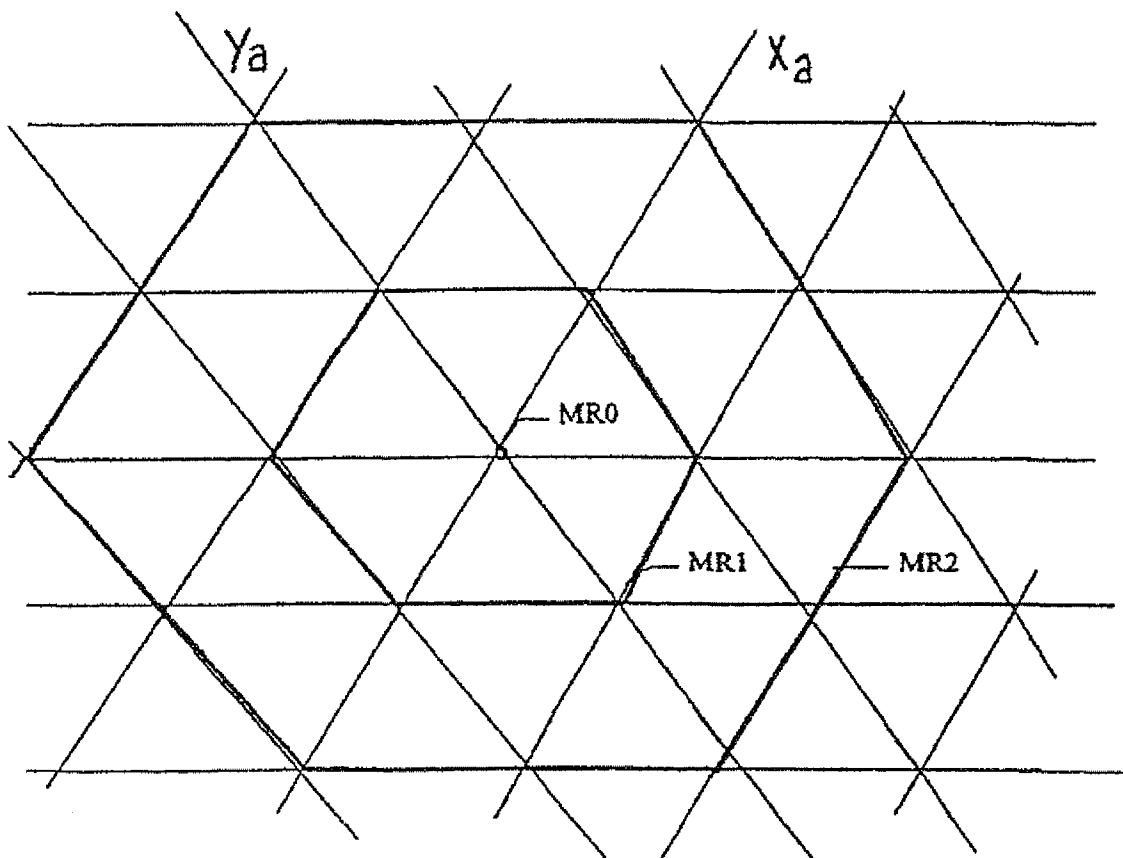
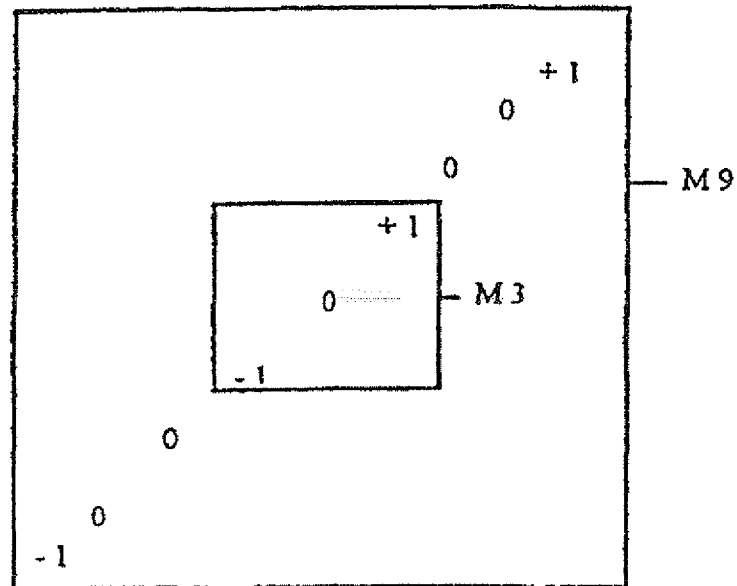


FIG. 8

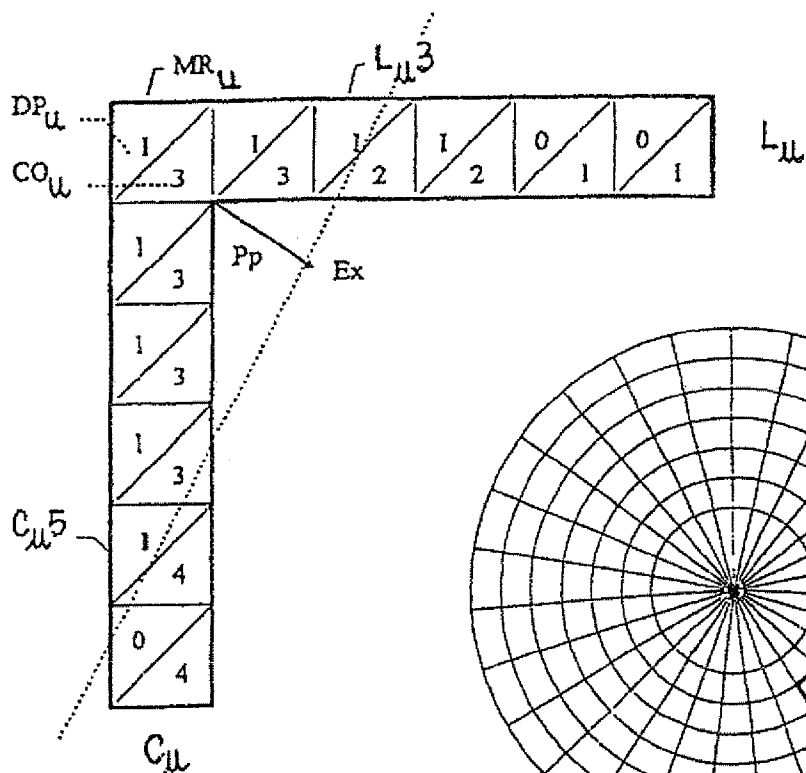


FIG. 9

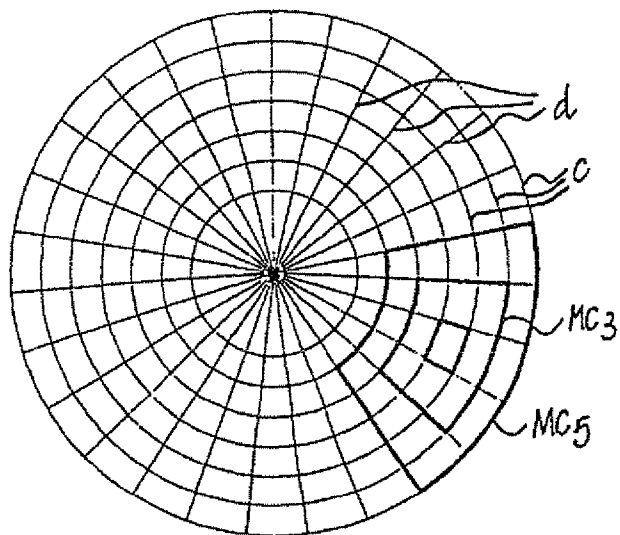


FIG. 9a

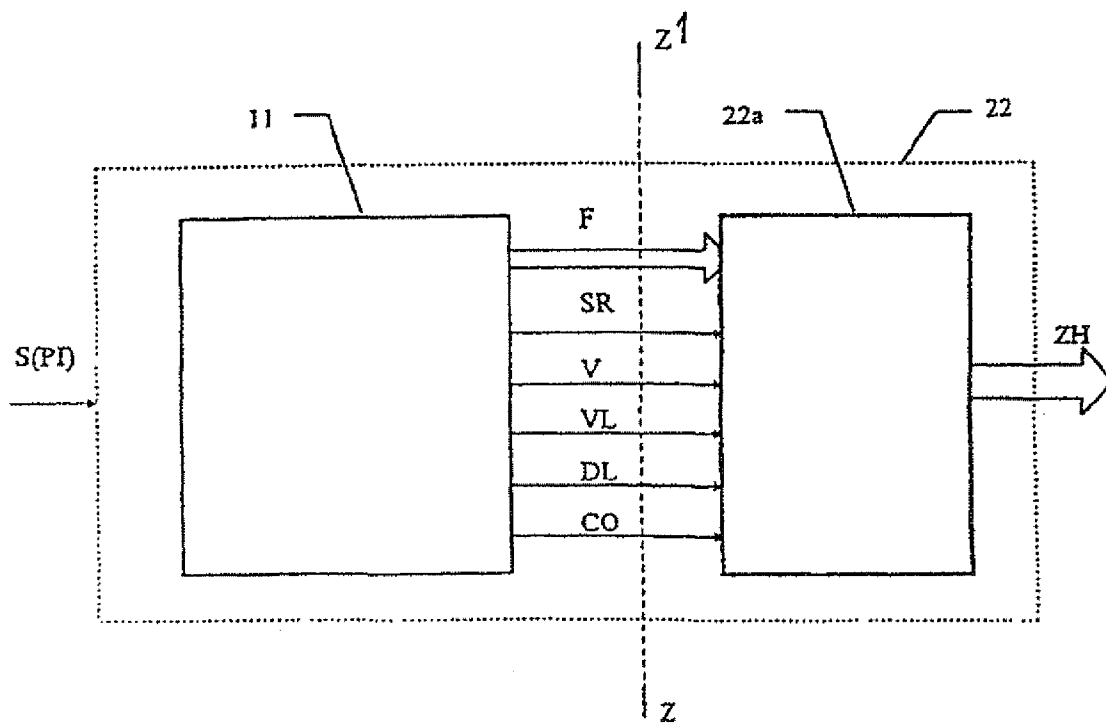


FIG. 10

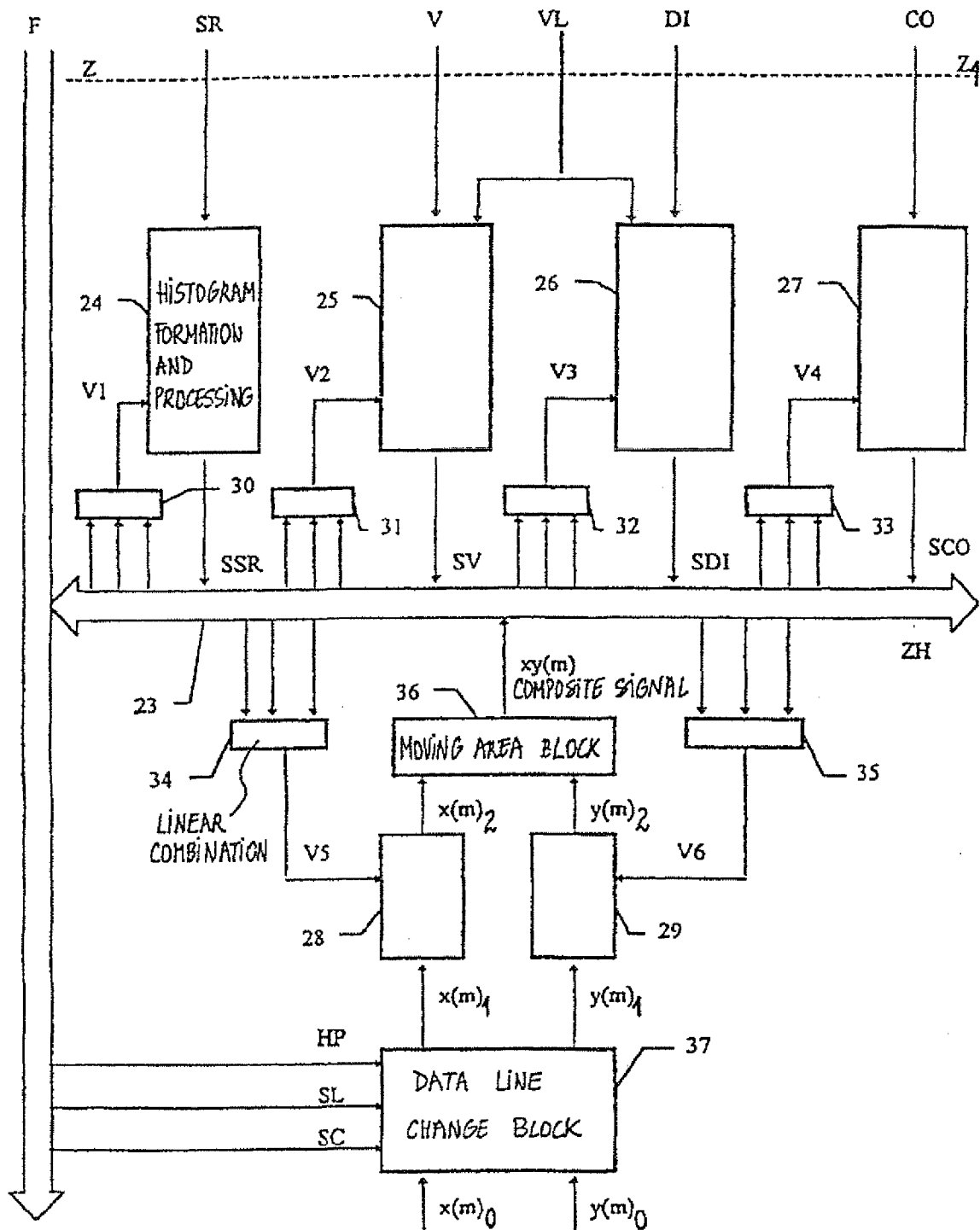


FIG. 11

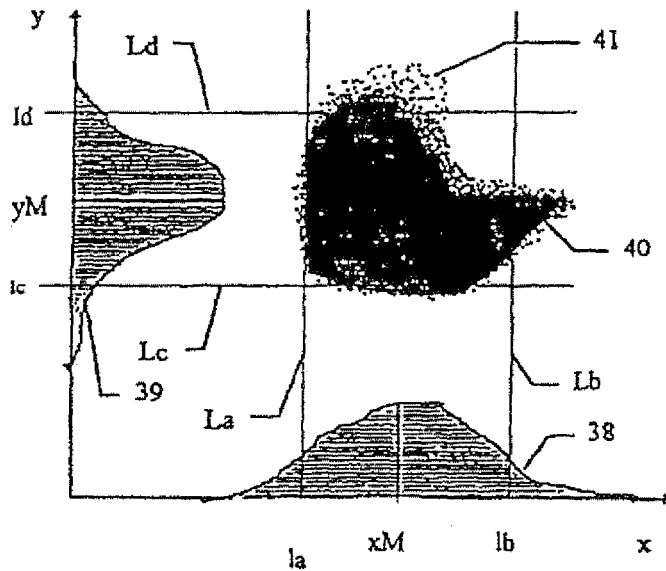


FIG. 12

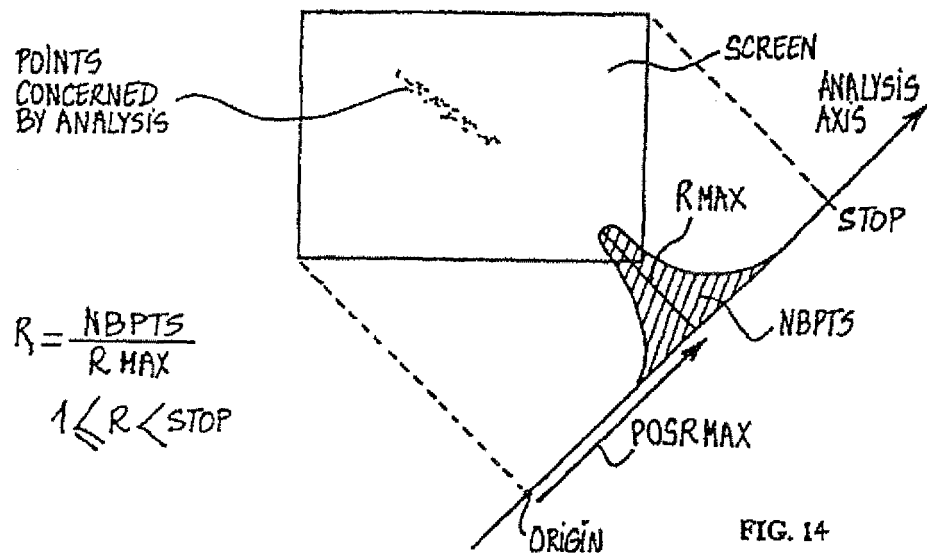


FIG. 14

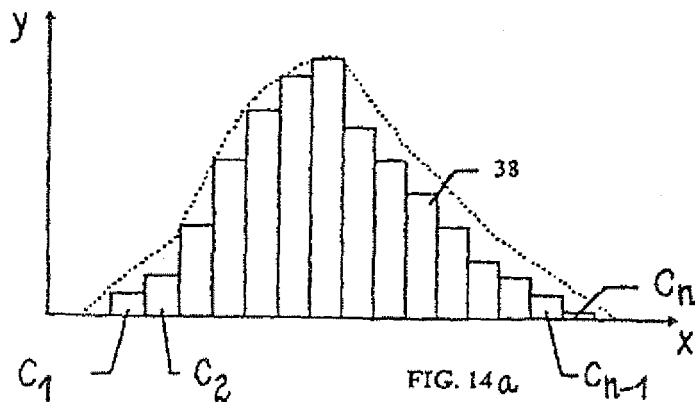


FIG. 14a

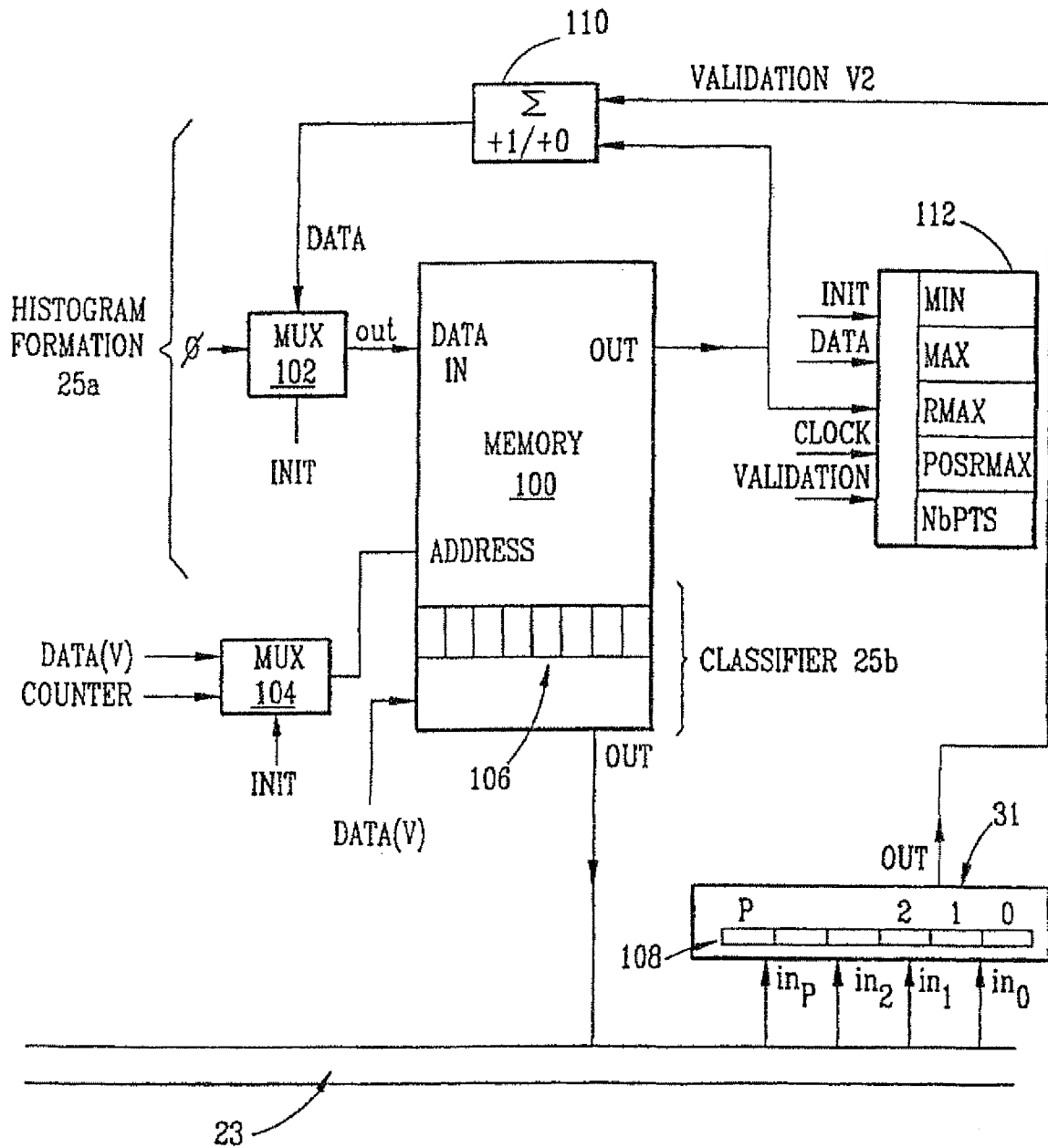


FIG.13

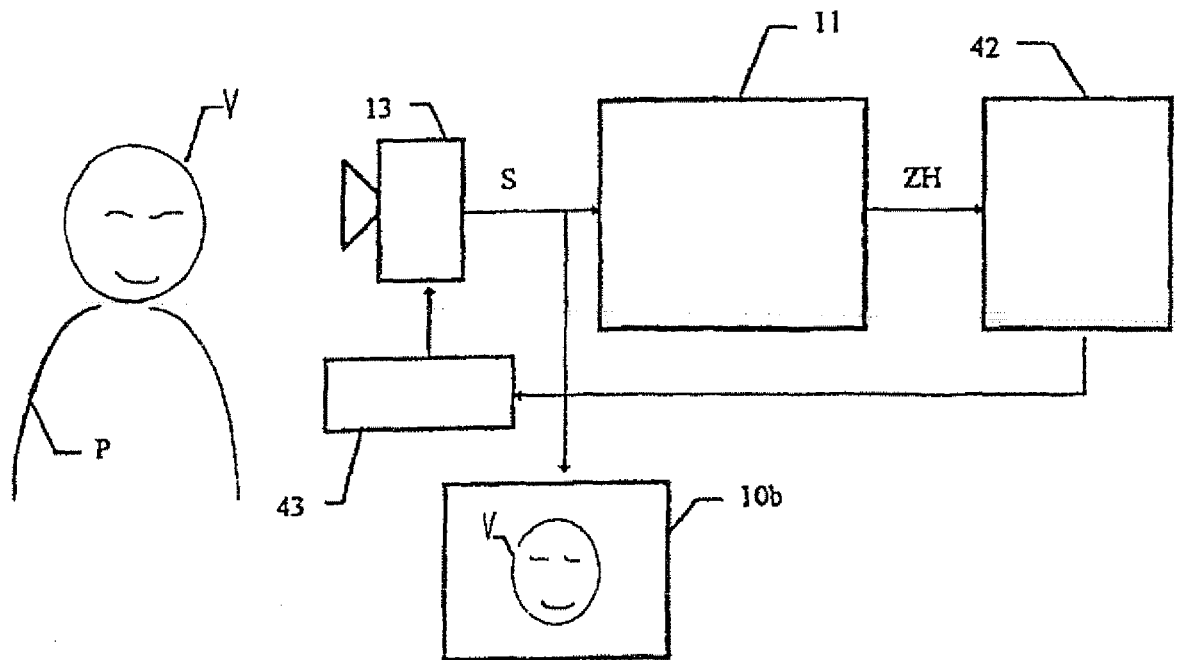


FIG. 15

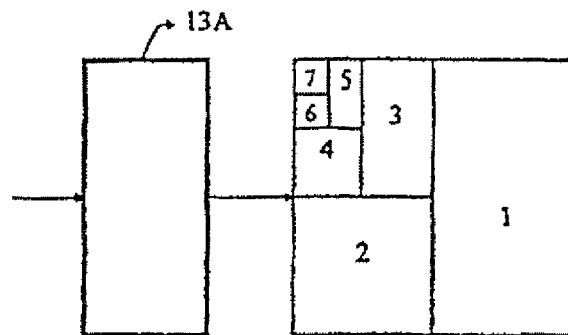


FIG. 24

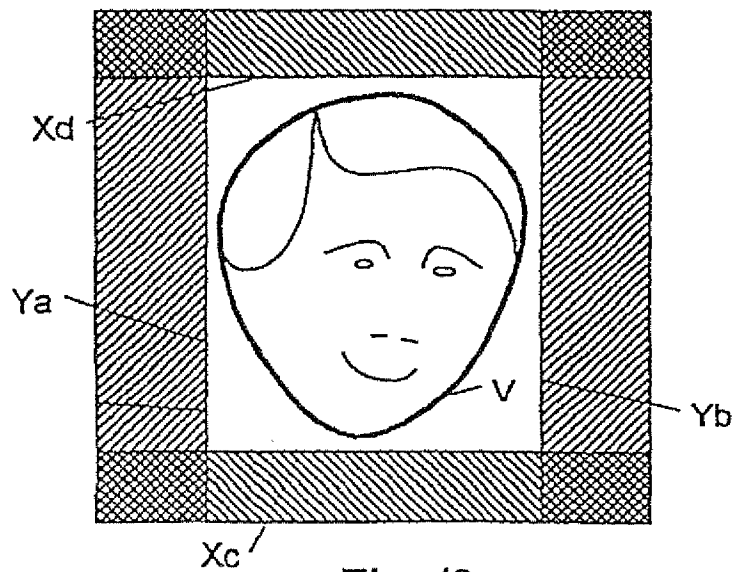
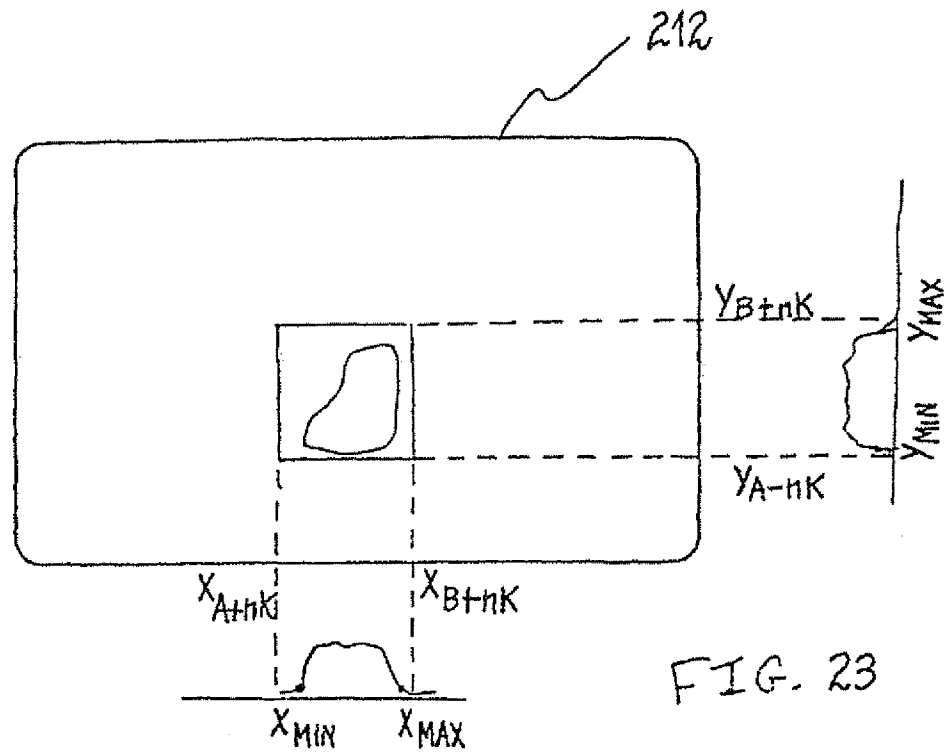


FIG. 19

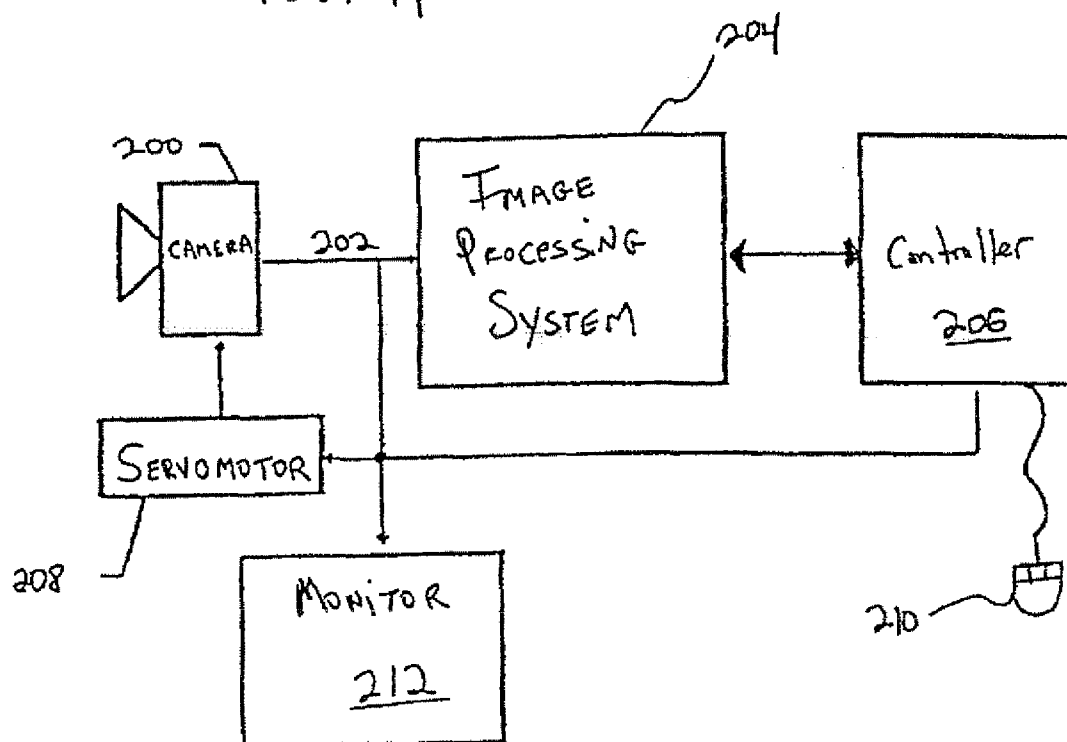
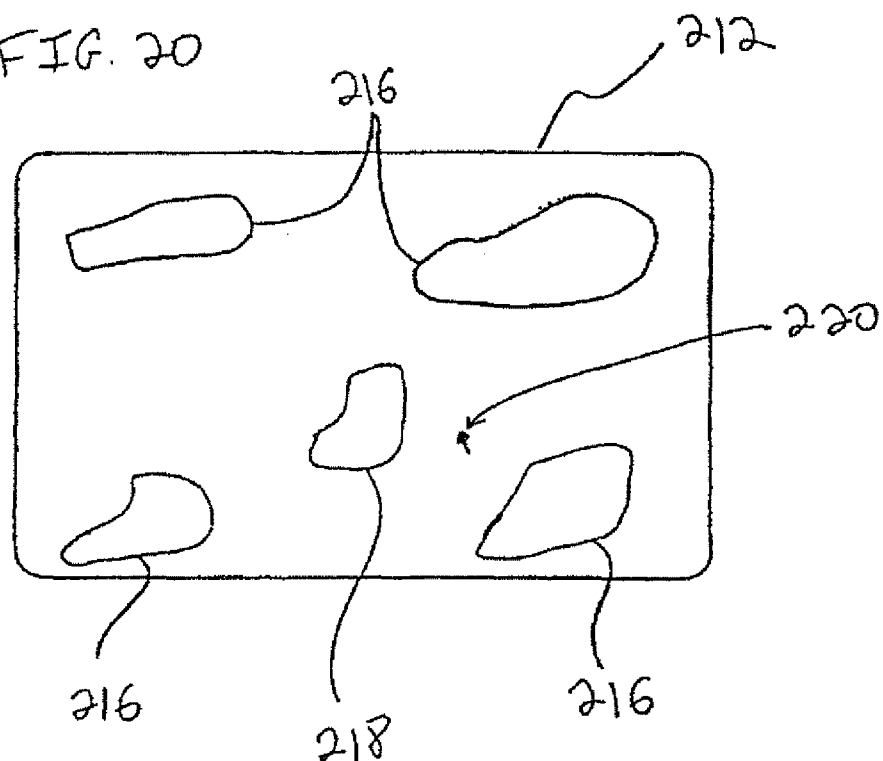
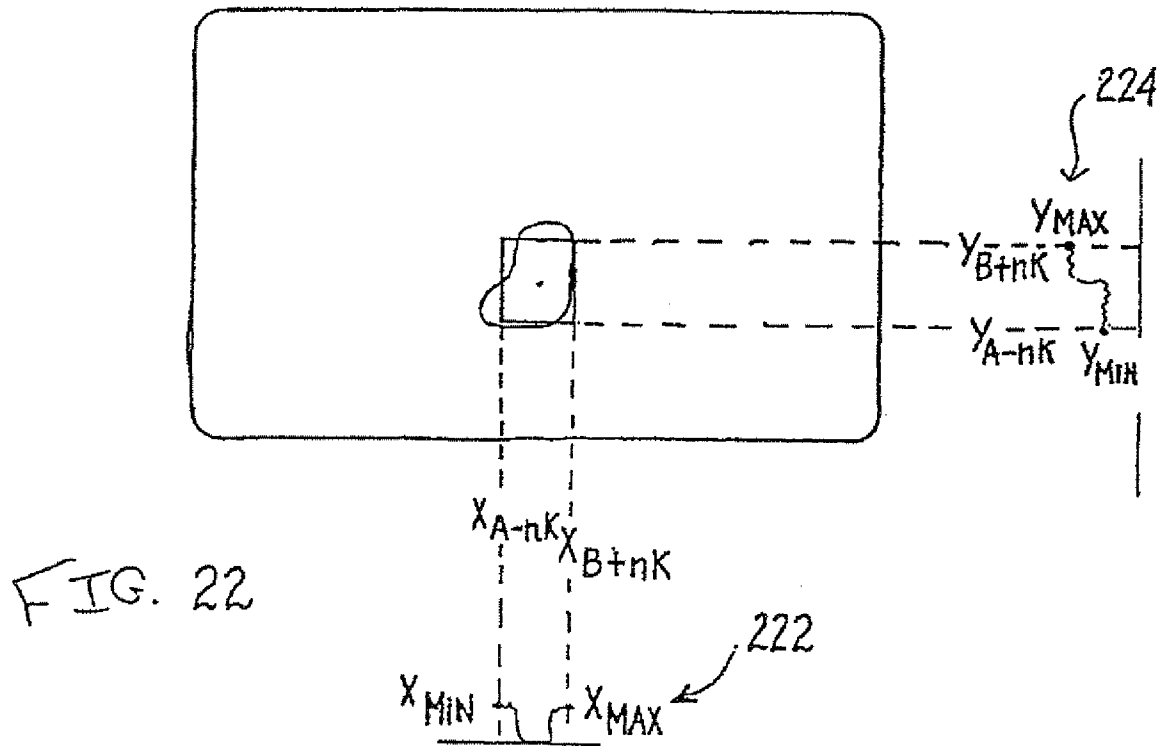
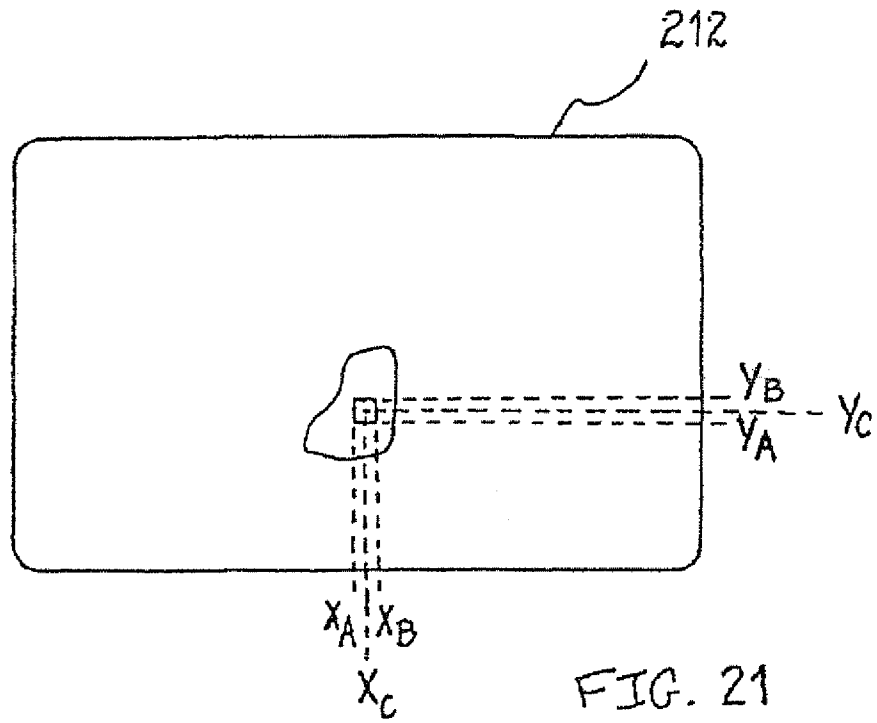


FIG. 20





Electronic Acknowledgement Receipt

EFS ID:	7582252
Application Number:	12620092
International Application Number:	
Confirmation Number:	9882
Title of Invention:	IMAGE PROCESSING METHOD
First Named Inventor/Applicant Name:	Patrick Pirim
Customer Number:	86002
Filer:	Gregory A. Nelson/TJ FATUM
Filer Authorized By:	Gregory A. Nelson
Attorney Docket Number:	8042-2-2
Receipt Date:	10-MAY-2010
Filing Date:	17-NOV-2009
Time Stamp:	16:27:47
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
------------------------	----

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		RESPNMP_05102010.pdf	711516 9e2dbc89ebf2612315a2355e8ce64a0d65d e1f7	yes	14

	Multipart Description/PDF files in .zip description		
	Document Description	Start	End
	Applicant Response to Pre-Exam Formalities Notice	1	1
	Drawings-only black and white line drawings	2	14
Warnings:			
Information:			
Total Files Size (in bytes):		711516	
<p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p>			



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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/620,092	11/17/2009	Patrick Pirim	8042-2-2

CONFIRMATION NO. 9882

FORMALITIES LETTER



OC000000041041271

86002

J. Rodman Steele

Novak Druce & Quigg LLP

525 Okeechobee Blvd

Suite 1500

West Palm Beach, FL 33401

Date Mailed: 04/12/2010

NOTICE TO FILE CORRECTED APPLICATION PAPERS

Filing Date Granted

An application number and filing date have been accorded to this application. The application is informal since it does not comply with the regulations for the reason(s) indicated below. Applicant is given TWO MONTHS from the date of this Notice within which to correct the informalities indicated below. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

The required item(s) identified below must be timely submitted to avoid abandonment:

- Replacement drawings in compliance with 37 CFR 1.84 and 37 CFR 1.121(d) are required. The drawings submitted are not acceptable because:
 - The drawings must be reasonably free from erasures and must be free from alterations, overwriting, interlineations, folds, and copy marks. See Figure(s) 1-4, 8, 9-17, 19-23.

Applicant is cautioned that correction of the above items may cause the specification and drawings page count to exceed 100 pages. If the specification and drawings exceed 100 pages, applicant will need to submit the required application size fee.

Replies should be mailed to:

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Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web.
<https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html>

For more information about EFS-Web please call the USPTO Electronic Business Center at **1-866-217-9197** or visit our website at <http://www.uspto.gov/ebc>.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

/ddinh/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101



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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
12/620,092	11/17/2009	2624	462	8042-2-2	4	1

CONFIRMATION NO. 9882

86002

J. Rodman Steele
Novak Druce & Quigg LLP
525 Okeechobee Blvd
Suite 1500
West Palm Beach, FL 33401

FILING RECEIPT



Date Mailed: 04/12/2010

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Applicant(s)

Patrick Pirim, Paris, FRANCE;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CON of 11/676,926 02/20/2007 PAT 7,650,015
which is a DIV of 09/792,294 02/23/2001 PAT 7,181,047
which is a CIP of 09/230,502 09/13/1999 PAT 6,486,909

Foreign Applications

EUROPEAN PATENT OFFICE (EPO) PCT/EP98/05383 09/25/1998
FRANCE PCT/FR97/01354 07/22/1997
FRANCE 9609420 07/22/1996

If Required, Foreign Filing License Granted: 04/08/2010

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 12/620,092**

Projected Publication Date: To Be Determined - pending completion of Corrected Papers

Non-Publication Request: No

Early Publication Request: No

**** SMALL ENTITY ****

Title

IMAGE PROCESSING METHOD

Preliminary Class

382

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

LICENSE FOR FOREIGN FILING UNDER**Title 35, United States Code, Section 184****Title 37, Code of Federal Regulations, 5.11 & 5.15****GRANTED**

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as

set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.

8042-2-2

First Inventor

PIRIM

Title

IMAGE PROCESSING METHOD

Express Mail Label No.

N/A

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. ☒ **Fee Transmittal Form** (e.g., PTO/SB/17)
2. ☒ **Applicant claims small entity status.**
See 37 CFR 1.27.
3. ☒ **Specification** [Total Pages 51]
Both the claims and abstract must start on a new page
(For information on the preferred arrangement, see MPEP 608.01(a))
4. ☒ **Drawing(s)** (35 U.S.C. 113) [Total Sheets 13]
5. **Oath or Declaration** [Total Sheets 1]
a. ☐ Newly executed (original or copy)
b. ☒ A copy from a prior application (37 CFR 1.63(d))
(for continuation/divisional with Box 18 completed)
i. ☐ **DELETION OF INVENTOR(S)**
Signed statement attached deleting inventor(s)
name in the prior application, see 37 CFR
1.63(d)(2) and 1.33(b).
6. ☒ **Application Data Sheet.** See 37 CFR 1.76
7. ☐ **CD-ROM or CD-R** in duplicate, large table or
Computer Program (Appendix)
☐ Landscape Table on CD
8. **Nucleotide and/or Amino Acid Sequence Submission**
(if applicable, items a. – c. are required)
a. ☐ Computer Readable Form (CRF)
b. ☐ Specification Sequence Listing on:
i. ☐ CD-ROM or CD-R (2 copies); or
ii. ☐ Paper
c. ☐ Statements verifying identity of above copies

ADDRESS TO:

Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

ACCOMPANYING APPLICATION PARTS

9. ☐ **Assignment Papers** (cover sheet & document(s))
Name of Assignee _____
10. ☐ **37 CFR 3.73(b) Statement** ☐ **Power of Attorney**
(when there is an assignee)
11. ☐ **English Translation Document** (if applicable)
12. ☒ **Information Disclosure Statement** (PTO/SB/08 or PTO-1449)
☐ Copies of citations attached
13. ☒ **Preliminary Amendment**
14. ☐ **Return Receipt Postcard** (MPEP 503)
(Should be specifically itemized)
15. ☐ **Certified Copy of Priority Document(s)**
(if foreign priority is claimed)
16. ☐ **Nonpublication Request** under 35 U.S.C. 122(b)(2)(B)(i).
Applicant must attach form PTO/SB/35 or equivalent.
17. ☐ **Other:** _____

18. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in the first sentence of the specification following the title, or in an Application Data Sheet under 37 CFR 1.76:

☒ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No.: 11/676,926
Prior application information: Examiner Seth Manay Art Unit: 2624

19. CORRESPONDENCE ADDRESS

☒ The address associated with Customer Number: 86002 OR ☐ Correspondence address below

Name					
Address					
City	State	Zip Code			
Country	Telephone	Email			

Signature		Date	November 17, 2009
Name (Print/Type)	Gregory M. Lefkowitz	Registration No. (Attorney/Agent)	56,216

This collection of information is required by 37 CFR 1.53(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

SAMSUNG EXHIBIT 1004

APPLICATION DATA SHEET

(1) Applicant Information

Inventor (1) name: PIRIM, Patrick
Residence: Paris, France
Mailing Address: 56 Rue Patay, Paris 75013, France
Citizenship: France

(2) Correspondence Information

Correspondence Address: ***86002***

(3) Application Information

Title: IMAGE PROCESSING METHOD
Total No. of Drawing Sheets: 13
Suggested Figure for Publication: 14
Attorney Docket Number: 8042-2-2
Type of Application: Non-Provisional

(4) Representative Information

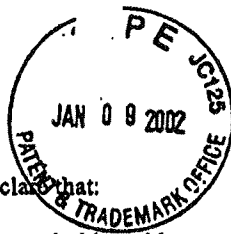
Representative Information: ***86002***
Gregory M. Lefkowitz, Registration No. 56,216
NOVAK DRUCE + QUIGG LLP
525 Okeechobee Blvd., 15th Floor
West Palm Beach, FL 33401
Tel: 561-847-7800
Fax: 561-847-7801

(5) Domestic Priority Information

U.S. Application No. 11/676,926, filed February 20, 2007;
U.S. Application No. 09/792,294, filed February 23, 2001, now
US Patent No. 7,181,047; and
US Application No. 09/230,502, filed September 13, 1999, now
US Patent No. 6,486,909

(6) Foreign Priority Information

International Application No. PCT/EP98/05383, filed
August 25, 1998; International Application No. PCT/FR97/01354,
filed July 22, 1997; and French Application No. FR 96/09420,
filed July 22, 1996



DECLARATION

As a below named inventor, I declare that:

My residence, post office address and citizenship are as stated below next to my name; I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: **IMAGE PROCESSING APPARATUS AND METHOD** the specification of which _____ is attached hereto or X was filed on February 23, 2001 as Application No. 09/792,294 and was amended on _____ (if applicable).

I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56. I claim foreign priority benefits under Title 35, United States Code, Section 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)

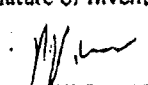
Country	Application No.	Date of Filing	Priority Claimed Under 35 USC 119

I claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, Section 1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Application No.	Date of Filing	Status
09/230,502	01/26/1999	
PCT/EP98/05383	08/25/1998	

Full Name of Inventor 1:	Last Name: PIRIM	First Name: PATRICK	Middle Name or Initial:
Residence & Citizenship:	City: Paris	State/Foreign Country: France	Country of Citizenship: France
Post Office Address:	Post Office Address: 56 Rue Patay	City: Paris	State/Country: France Postal Code: 75013

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Signature of Inventor 1 
Patrick Pirim
Date <u>2-11-2001</u>

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of PIRIM

Application No.

Examiner:

Date Filed: November 17, 2009

Group Art Unit:

For: IMAGE PROCESSING APPARATUS AND METHOD

PRELIMINARY AMENDMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Prior to examination on the merits, entry of the following amendments is respectfully requested.

Amendments to the Specification begin on page 2.

Amendments to the Claims appear in the Claim Listing which begins on page 3.

Remarks begin on page 4.

AMENDMENTS TO THE SPECIFICATION

On page 1, the title of the invention:

IMAGE PROCESSING APPARATUS AND METHOD

On page 1, before the section entitled "BACKGROUND OF THE INVENTION ", insert the following:

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application is a continuation application of U.S. Application No. 11/676,926, filed February 20, 2007; which is a divisional application of U.S. Application No. 09/792,294, filed February 23, 2001, now US Patent No. 7,181,047; which claims priority to U.S. Application No. 09/230,502, filed September 13, 1999, now U. S. Patent No. 6,486,909, International Application No. PCT/EP98/05383, filed August 25, 1998, and International Application No. PCT/FR97/01354, filed July 22, 1997; all of which are incorporated herein by reference in their entirety.

CLAIM LISTING

1. – 50. (Cancelled)

51. (New) A process of tracking a target in an input signal implemented using a system comprising an image processing system, the input signal comprising a succession of frames, each frame comprising a succession of pixels, the target comprising pixels in one or more of a plurality of classes in one or more of a plurality of domains, the process performed by said system comprising, on a frame-by-frame basis: forming at least one histogram of the pixels in the one or more of a plurality of classes in the one or more of a plurality of domains, said at least one histogram referring to classes defining said target, and identifying the target from said at least one histogram.

52. (New) The process according to claim 51 further comprising drawing a tracking box around the target.

53. (New) The process according to claim 51, wherein said image processing system comprises at least one components selected from a memory, a temporal processing unit, and a spatial processing unit.

54. (New) The process according to claim 51, wherein said image processing system comprises at least two components selected from a memory, a temporal processing unit, and a spatial processing unit.

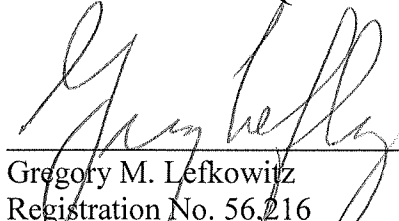
REMARKS

By this Preliminary Amendment, Applicant has added the appropriate priority data. Additionally, claims 1-50 have been cancelled and new claims 51-54 have been added. No new matter has been added by virtue of this Amendment.

The Examiner is invited to contact the undersigned if it is believed that a telephone conference would expedite the prosecution of the subject application. Although no fee is believed to be due, the Commissioner is hereby authorized to charge any underpayment to Deposit Account No. 14-1437

Respectfully submitted,

NOVAK DRUCE + QUIGG LLP



Gregory M. Lefkowitz
Registration No. 56,216
525 Okeechobee Blvd., 15th Floor
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Tel: 561-838-5229
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Date: November 17, 2009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re: Application of PIRIM

Confirmation No.:

Application No.:

Examiner:

Date Filed: November 17, 2009

Group:

For: IMAGE PROCESSING METHOD

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

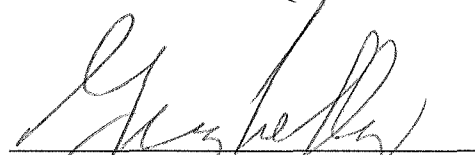
In accordance with the duty of disclosure under 37 C.F.R. §1.56, Applicant hereby notifies the U.S. Patent Office of the documents which are listed on the attached sheets of Form PTO/SB/08A and PTO/SB/08B. All of the listed references were cited in underlying U.S. Application No. 11/676,926 to which the instant application claims priority. Accordingly, copies of the listed references are not attached.

Submission of the listed documents is not intended as an admission that such documents constitute prior art against the present application. Applicant does not waive any right to take any action that would be appropriate to antedate or otherwise remove any of the listed documents as competent references against the present application. Applicant submits that the present invention is patentable over the cited references.

Although no fees are believed to be due, the Commissioner for Patents is hereby authorized to charge any underpayment in fees which may become due during the prosecution of this application to Deposit Account No. 14-1437.

Respectfully submitted,

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Date: November 17, 2009

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**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**

(Use as many sheets as necessary)

Sheet 1 of 3

Complete if Known

Application Number	
Filing Date	November 17, 2009
First Named Inventor	PIRIM
Art Unit	
Examiner Name	
Attorney Docket Number	8042-2-2

U.S. PATENT DOCUMENTS*

Examiner Initials*	Cite No. ¹	Document Number Number Kind Code ² (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US-4,783,828	11-08-1988	Sadjadi	
		US-5,278,921 A	01-11-1994	Nakamura et al.	
		US-5,774,581 A	06-30-1998	Fassnacht et al.	
		US-6,597,738 B1	07-22-2003	Park et al.	
		US-2003/0067978-A1	04-10-2003	Pirim	
		US-2003-0152267-A1	08-14-2003	Pirim	
		US-6,717,518	04-06-2004	Pirim	
		US-5,565,920	10-15-1996	Lee et al.	
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		US-6,256,608 B1	06-03-2001	Malvar	
		US-2002/0120594 A1	08-29-2002	Pirim	
		US-2002/0156753 A1	10-24-2002	Pirim	
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		US-5,793,888	08-11-1998	Delanoy	
		US-5,712,729	01-27-1998	Hashimoto	
		US-5,694,495	12-02-1997	Hara et al.	
		US-5,488,430	01-30-1996	Hong	
		US-6,488,909	11-26-2002	Pirim	
		US-6,304,187	10-18-2001	Pirim	
		US-5,384,865	01-24-1995	Loveridge	
		US-5,109425	04-28-1992	Lawton	
		US-5,008,946	04-16-1991	Ando	
		US-5,088,488	02-18-1992	Markowitz et al.	
		US-5,163,095	11-10-1992	Kosaka	
		US-5,359,533	10-25-1994	Ricka et al.	
		US-5,592,237	01-07-1997	Greenway et al.	
		US-5,625,717	04-29-1997	Hashimoto et al.	
		US-2002/0101432 A1	08-01-2002	Ohara et al.	
		US-6,486,909	11-26-2002	Pirim	
		US-7,181,047	02-20-2007	Pirim	
		US-5,912,980	06-15-1999	Hunke	
		US-2007/0140526	06-21-2007	Pirim	

FOREIGN PATENT DOCUMENTS

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		Country Code ³	Number ⁴	Kind Code ⁵ (if known)				
		WO	00/11609	A1	03-02-2000	Holding B.E.V. S.A.		<input type="checkbox"/>
		WO	00/11610	A1	03-02-2000	Holding B.E.V. S.A.		<input type="checkbox"/>
		WO	01/63557	A2	08-30-2001	Holding B.E.V. S.A.		<input type="checkbox"/>
		JP	06-205780	A	07-26-1994	Aloka Co. Ltd.		<input type="checkbox"/>
		WO	98/05002		02/05/1998	Carlus Magnus Limited		<input type="checkbox"/>
		EP	0046110	A1	02/17/1982	Urien et al.		<input type="checkbox"/>
		FR	2751772	A1	01/30/1998	Bev Bureau Etude Vision Soc.		<input type="checkbox"/>
		FR	2611063	A1	08/19/1988	Imapply		<input type="checkbox"/>

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Application Number	
Filing Date	November 17, 2009
First Named Inventor	PIRIM
Art Unit	
Examiner Name	
Attorney Docket Number	8042-2-2

UNIVERSITY OF CALIFORNIA, BERKELEY

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FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No. ¹	Foreign Patent Document			Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T ⁶
		Country Code ²	Number ⁴	Kind Code ³ (if present)				
	AU	WO	99/36894		07/22/99	Patrick Pirim		<input type="checkbox"/>
	AV	EP	0 380 659	A1	08/08/90	Makoto Nagao et al.		<input type="checkbox"/>
	AW	EP	0 394 959	A2	10/31/90	Axel Korn		<input type="checkbox"/>
	AX	WO	99/36893		07/22/99	Patrick Pirim et al.		<input type="checkbox"/>

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STATEMENT BY APPLICANT**

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Application Number	
Filing Date	November 17, 2009
First Named Inventor	
Art Unit	
Examiner Name	
Attorney Docket Number	8042-2-2

Sheet

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of

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NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T ²
		Stephane G. Mallat, "A Theory for Multiresolution Signal Decomposition: The Wavelet Representation", IEEE Transactions on Pattern Analysis and Machine Intelligence, Vol. 11, No. 7, July 1989, pages 674-693.	
		John G. Daugman, "Complete Discrete 2-D Gabor Transforms by Neural Networks for Image Analysis and Compression", IEEE Transaction on Acoustics, Speech and Signal Processing, Vol. 36, No. 7, July 1988, pages 1169-1179.	
		Alberto Tomita, Jr., et al., "Hand Shape Extraction from a Sequence of Digitized Gray-Scale Images", IECON '94, 20th International Conference on Industrial Electronics, Control and Instrumentation, Vol. 3 of 3, Special Sessions, Signal Processign and Control, pages 1925-1930	
		Giacomo Indiveri et al., "System Implementations of Analog VLSI Velocity Sensors", 1996 IEEE Proceedings of MicroNeuro '96, pages 15-22	
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		Revue Trimestrielle Des «Techniques de Lingenieur», "Instantanés Technique" Techniques De ingénieur, Mars 1997-N°5 (40F), ISSN 0994-0758,	
		Es Professionnels de L'informatique En Entreprise Magazine, "Objectif Securite Des Reseaux", N° 24, Janvier, 1997	
		Electronique International Hebdo, 5 Decembre 1996-N° 245, "Premier... œil", Françoise Gru svelet (with translation)	
		Nabeel Al Adsani, "For Immediate Release The Generic Visual Perception Processor", October 10, 1997, page 1	
		Colin Johnson, "Vision Chip's Circuitry Has Its Eye Out For You", http://192.215.107.74/wire/news/1997/09/0913vision.html , pages 1-3	
		The Japan Times, "British firm has eye on the future", Business & Technology, Tuesday, November 18, 1997, 4th Edition	
		Inside the Pentagon's, Inside Missile Defense, an exclusive biweekly report on U.S. missile defense programs, procurement and policymaking, "Missile Technology" Vol. 3, No. 16-August 13, 1997, page 5	
		Electronique, "Le Mechanisme de la Vision Humaine Dans Le Silicium", Electronique Le Mensuel Des Ingenieurs De Conception, Number 68, Mars 1997, ISSN 1157-1151 (with translation)	
		"Elektronik Revue" ER, Eine Elsevier-Thomas-Publikation, Jahrgang 8, Marz 1997, NR.3, ISSN0939-1134	
		"Un Processor de Perception Visuelle", LeHUT pARLEUR, 25F Des solutions électroniques pour tous, N° 1856, 15 janvier 1997 (with translation)	
		"Realiser Un Decodeur Pour TV Numerique", Electronique, Le Mensuel Des Ingenieurs De Conception, Number 66, Janvier 1997	
		KENICHI YAMADA, et al, "Image Understanding Based on Edge Histogram Method for Rear-End Collision Avoidance System", Vehicle Navigation & Information Systems Conference Proceedings; (1994), pp. 445 450 published 08/31/94; XP 000641348	

Examiner
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

1 Applicant's unique citation designation number (optional). 2 Applicant is to place a check mark here if English language Translation is attached.

This collection of information is required by 37 CFR 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO:

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SAMSUNG EXHIBIT 1004

IMAGE PROCESSING APPARATUS AND METHOD

BACKGROUND OF THE INVENTION

5 1. Field of the Invention

The present invention relates generally to an image processing apparatus, and more particularly to a method and apparatus for identifying and localizing an area in relative movement in a scene and determining the speed and oriented direction of the area in real time.

10

2. Description of the Related Art

The human or animal eye is the best known system for identifying and localizing an object in relative movement, and for determining its speed and direction of movement. Various efforts have been made to mimic the function of
15 the eye. One type of device for this purpose is referred to as an artificial retina, which is shown, for example, in Giacomo Indiveri et. al, Proceedings of MicroNeuro, 1996, pp. 15-22 (analog artificial retina), and Pierre-Francois Ruedii, Proceedings of MicroNeuro, 1996, pp. 23-29, (digital artificial retina which identifies the edges of an object). However, very fast and high capacity
20 memories are required for these devices to operate in real time, and only limited information is obtained about the moving areas or objects observed. Other examples of artificial retinas and similar devices are shown in U.S. Patent Nos. 5,694,495 and 5,712,729.

Another proposed method for detecting objects in an image is to store a
25 frame from a video camera or other observation sensor in a first two-dimensional memory. The frame is composed of a sequence of pixels representative of the scene observed by the camera at time t_0 . The video signal for the next frame, which represents the scene at time t_1 is stored in a second two-dimensional memory. If an object has moved between times t_0 and
30 t_1 the distance d by which the object, as represented by its pixels, has moved in the scene between t_0 and t_1 is determined. The displacement speed is then equal to d/T , where $T = t_1 - t_0$. This type of system requires a very large memory capacity if it is used to obtain precise speed and oriented direction. Information for the movement of the object. There is also a delay in obtaining
35 the speed and displacement direction information corresponding to $t_1 + R$, where R is the time necessary for the calculations for the period $t_0 - t_1$ system.

These two disadvantages limit applications of this type of system.

Another type of prior image processing system is shown in French Patent No. 2, 611, 063, of which the inventor hereof is also an inventor. This patent relates to a method and apparatus for real time processing of a sequenced data flow from the output of a camera in order to perform data compression. A histogram of signal levels from the camera is formed using a first sequence classification law. A representative Gaussian function associated with the histogram is stored, and the maximum and minimum levels are extracted. The signal levels of the next sequence are compared with the signal levels for the first sequence using a fixed time constant identical for each pixel. A binary classification signal is generated that characterizes the next sequence with reference to the classification law. An auxiliary signal is generated from the binary signal that is representative of the duration and position of a range of significant values. Finally, the auxiliary signal is used to generate a signal localizing the range with the longest duration, called the dominant range. These operations are repeated for subsequent sequences of the sequenced signal.

This prior process enables data compression, keeping only interesting parameters in the processed flow of sequenced data. In particular, the process is capable of processing a digital video signal in order to extract and localize at least one characteristic of at least one area in the image. It is thus possible to classify, for example, brightness and/or chrominance levels of the signal and to characterize and localize an object in the image.

Another system is also known from WO 98/05002, of which the inventor hereof is also an inventor. This system enables real time detection, location and determination of the speed and direction of movement of an area of relative movement in a scene. It includes a time processing unit of a spatial processing unit in order to determine said speed and direction of movement.

U. S. Patent No. 5, 488, 430 detects and estimates a displacement by separately determining horizontal and vertical changes of the observed area. Difference signals are used to detect movements from right to left or from left to right, or from top to bottom or bottom to top, in the horizontal and vertical directions respectively. This is accomplished by carrying out an EXCLUSIVE OR function on horizontal/vertical difference signals and on frame difference signals, and by using a ratio of the sums of the horizontal/vertical signals and the sums of frame difference signals with respect to a $K \times 3$ window. Calculated values of the image along orthogonal horizontal and vertical directions are used

with an identical repetitive difference K in the orthogonal directions, this difference K being defined as a function of the displacement speeds that are to be determined. The device determines the direction of movement along each of the two orthogonal directions by applying a set of calculation operations to the difference signals, which requires very complex computations. Additional complex computations are also necessary to obtain the speed and oriented direction of displacement (extraction of a square root to obtain the amplitude of the speed, and calculation of the arctan function to obtain the oriented direction), starting from projections on the horizontal and vertical axes. This device also does not smooth the pixel values using a time constant, especially a time constant that is variable for each pixel, in order to compensate for excessively fast variations in the pixel values.

Finally, Alberto Tomita Sales Representative. and Rokuva Ishii, "Hand Shape Extraction from a Sequence of Digitized Gray-Scale Images," Institute of Electrical and Electronics Engineers, Vol. 3, 1994, pp. 1925-1930, detects movement by subtracting between successive images, and forming histograms based upon the shape of a human hand in order to extract the shape of a human hand in a digitized scene. The histogram analysis is based upon a gray scale inherent to the human hand. It does not include any means of forming histograms in the plane coordinates. The sole purpose of the method is to detect the displacement of a human hand, for example, in order to replace the normal computer mouse by a hand, the movements of which are identified to control a computer.

It would be desirable to have an image processing system which has a relatively simple structure and requires a relatively small memory capacity, and by which information on the movement of objects within an image can be obtained in real-time. It would also be desirable to have a method and apparatus for detecting movements that are not limited to the hand, but to any object (in the widest sense of the term) in a scene, and which does not use histograms based on the gray values of a hand, but rather the histograms of different variables representative of the displacement and histograms of plane coordinates. Such a system would be applicable to many types of applications requiring the detection of moving and non-moving objects.

SUMMARY OF THE INVENTION

The present invention is a process for identifying relative movement of an object in an input signal, the input signal having a succession of frames, each frame having a succession of pixels. For each pixel of the input signal, the input signal is smoothed using a time constant for the pixel in order to generate a smoothed input signal. For each pixel in the smoothed input signal, a binary value corresponding to the existence of a significant variation in the amplitude of the pixel between the current frame and the immediately previous smoothed input frame, and the amplitude of the variation, are determined.

Using the existence of a significant variation for a given pixel, the time constant for the pixel, which is to be used in smoothing subsequent frames of the input signal, is modified. The time constant is preferably in the form 2^p , and is increased or decreased by incrementing or decrementing p . For each particular pixel of the input signal, two matrices are then formed: a first matrix comprising the binary values of a subset of the pixels of the frame spatially related to the particular pixel; and a second matrix comprising the amplitude of the variation of the subset of the pixels of the frame spatially related to the particular pixel. In the first matrix, it is determined whether the particular pixel and the pixels along an oriented direction relative to the particular pixel have binary values of a particular value representing significant variation, and, for such pixels, it is determined in the second matrix whether the amplitude of the pixels along the oriented direction relative to the particular pixel varies in a known manner indicating movement in the oriented direction of the particular pixel and the pixels along the oriented direction relative to the particular pixel. The amplitude of the variation of the pixels along the oriented direction determines the velocity of movement of the particular pixel and the pixels along the oriented direction relative to the particular pixel.

In each of one or more domains, a histogram of the values distributed in the first and second matrices falling in each such domain is formed. For a particular domain, an area of significant variation is determined from the histogram for that domain. Histograms of the area of significant variation along coordinate axes are then formed. From these histograms, it is determined whether there is an area in movement for the particular domain. The domains are preferably selected from the group consisting of i) luminance, ii) speed (V), iii) oriented direction (D1), iv) time constant (CO), v) hue, vi) saturation, and vii)

first axis ($x(m)$), and viii) second axis ($y(m)$).

In one embodiment, the first and second matrices are square matrices, with the same odd number of rows and columns, centered on the particular pixel. In this embodiment, the steps of determining in the first matrix whether the particular pixel and the pixels along an oriented direction relative to the particular pixel have binary values of a particular value representing significant variation, and the step of determining in the second matrix whether the amplitude signal varies in a predetermined criteria along an oriented direction relative to the particular pixel, comprise applying nested $n \times n$ matrices, where n is odd, centered on the particular pixel to the pixels within each of the first and second matrices. The process then includes the further step of determining the smallest nested matrix in which the amplitude signal varies along an oriented direction around the particular pixel.

In an alternative embodiment, the first and second matrices are hexagonal matrices centered on the particular pixel. In this embodiment, the steps of determining in the first matrix whether the particular pixel and the pixels along an oriented direction relative to the particular pixel have binary values of a particular value representing significant variation, and the step of determining in the second matrix whether the amplitude signal varies in a predetermined criteria along an oriented direction relative to the particular pixel, comprise applying nested hexagonal matrices of varying size centered on the particular pixel to the pixels within each of the first and second matrices. The process then further includes determining the smallest nested matrix in which the amplitude signal varies along an oriented direction around the particular pixel.

In a still further embodiment of the invention, the first and second matrices are inverted L-shaped matrices with a single row and a single column. In this embodiment, the steps of determining in the first matrix whether the particular pixel and the pixels along an oriented direction relative to the particular pixel have binary values of a particular value representing significant variation, and the step of determining in the second matrix whether the amplitude signal varies in a predetermined criteria along an oriented direction relative to the particular pixel, comprise applying nested $n \times n$ matrices, where n is odd, to the single line and the single column to determine the smallest matrix in which the amplitude varies on a line with the steepest slope and constant quantification.

If desired, successive decreasing portions of frames of the input signal

may be considered using a Mallat time-scale algorithm, and the largest of these portions, which provides displacement, speed and orientation indications compatible with the value of p , is selected.

In a process of smoothing an input signal, for each pixel of the input signal, i) the pixel is smoothed using a time constant (CO) for that pixel, thereby
 5 generating a smoothed pixel value (LO), ii) it is determined whether there exists a significant variation between such pixel and the same pixel in a previous frame, and iii) the time constant (CO) for such pixel to be used in smoothing the pixel in subsequent frames of the input signal is modified based upon the
 10 existence or non-existence of a significant variation.

The step of determining the existence of a significant variation for a given pixel preferably comprises determining whether the absolute value of the difference (AB) between the given pixel value (PI) and the value of such pixel in a smoothed prior frame (LI) exceeds a threshold (SE). The step of smoothing
 15 the input signal preferably comprises, for each pixel, i) modifying the time constant (CO) for pixel such based upon the existence of a significant variation as determined in the prior step, and ii) determining a smoothed value for the pixel (LO) as follows:

$$20 \quad LO = LI + \frac{PI - LI}{CO}$$

Time constant (CO) is preferably in the form 2^p , and p is incremented in the event that $AB < SE$ and decremented in the event $AB \geq SE$.

25 In this process, the system generates an output signal comprising, for each pixel, a binary value (DP) indicating the existence or non-existence of a significant variation, and the value of the time constant (CO). The binary values (DP) and the time constants (CO) are preferably stored in a memory sized to correspond to the frame size.

30 A process for identifying an area in relative movement in an input signal includes the steps of:

generating a first array indicative of the existence of significant variation in the magnitude of each pixel between a current frame and a prior frame;
 generating a second array indicative of the magnitude of significant
 35 variation of each pixel between the current frame and a prior frame;
 establishing a first moving matrix centered on a pixel under consideration

and comprising pixels spatially related to the pixel under consideration, the first moving matrix traversing the first array for consideration of each pixel of the current frame; and

5 determining whether the pixel under consideration and each pixel of the pixels spatially related to the pixel under consideration along an oriented direction relative thereto within the first matrix are a particular value representing the presence of significant variation, and if so, establishing in a second matrix within the first matrix, centered on the pixel under consideration, and determining whether the amplitude of the pixels in the second matrix
10 spatially related to the pixel under consideration along an oriented direction relative thereto are indicative of movement along such oriented direction, the amplitude of the variation along the oriented direction being indicative of the velocity of movement, the size of the second matrix being varied to identify the matrix size most indicative of movement.

15 The process further comprises, in at least one domain selected from the group consisting of i) luminance, ii) speed (V), iii) oriented direction (DI), iv) time constant (CO), v) hue, vi) saturation, and vii) first axis (x(m)), and viii) second axis (y(m)), and ix) data characterized by external inputs, forming a first histogram of the values in such domain for pixels indicative of movement along
20 an oriented direction relative to the pixel under consideration. If desired, for the pixels in the first histogram, histograms of the position of such pixels along coordinate axes may be formed, and from such histograms, an area of the image meeting criteria of the at least one domain may be determined.

25 A process for identifying pixels in an input signal in one of a plurality of classes in one of a plurality of domains comprises, on a frame-by-frame basis:

for each pixel of the input signal, analyzing the pixel and providing an output signal for each domain containing information to identify each domain in which the pixel is classified;

30 providing a classifier for each domain, the classifier enabling classification of pixels within each domain to selected classes within the domain;

providing a validation signal for the domains, the validation signal selecting one or more of the plurality of domains for processing; and

35 forming a histogram for pixels of the output signal within the classes selected by the classifier within each domain selected by the validation signal.

The process further includes the steps of forming histograms along

coordinate axes for the pixels within the classes selected by the classifier within each domain selected by the validation signal, and forming a composite signal corresponding to the spatial position of such pixels within the frame. Pixels falling within limits I_a , I_b , I_c , I_d in the histograms along the coordinate axes are then identified, and a composite signal from the pixels falling within these limits is formed.

A process for identifying the velocity of movement of an area of an input signal comprises:

for each particular pixel of the input signal, forming a first matrix comprising binary values indicating the existence or non-existence of a significant variation in the amplitude of the pixel signal between the current frame and a prior frame for a subset of the pixels of the frame spatially related to such particular pixel, and a second matrix comprising the amplitude of such variation;

determining in the first matrix whether the particular pixel and the pixels along an oriented direction relative to the particular pixel have binary values of a particular value representing significant variation, and, for such pixels, determining in the second matrix whether the amplitudes of the pixels along an oriented direction relative to the particular pixel vary in a known manner indicating movement of the pixel and the pixels along an oriented direction relative to the particular pixel, the amplitude of the variation along the oriented direction determining the velocity of movement of the particular pixel.

A process for identifying a non-moving area in an input signal comprises:

forming histograms along coordinate axes for pixels of the input signal without significant variation between the current frame and a prior frame; and forming a composite signal corresponding to the spatial position of such pixels within the frame.

An apparatus for identifying relative movement in an input signal comprises:

means for smoothing the input signal using a time constant for each pixel, thereby generating a smoothed input signal;

means for determining for each pixel in the smoothed input signal a binary value corresponding to the existence of a significant variation in the amplitude of the pixel signal between the current frame and the immediately previous smoothed input frame, and for determining the amplitude of the variation;

means for using the existence of a significant variation for a given pixel to modify the time constant for the pixel to be used in smoothing subsequent frames of the input signal;

5 means for forming a first matrix comprising the binary values of a subset of the pixels of the frame spatially related to each particular pixel, and for forming a second matrix comprising the amplitude of the variation of the subset of the pixels of the frame spatially related to such particular pixel;

means for determining in the first matrix a particular area in which the binary value for each pixel is a particular value representing significant variation, and, for such particular area, for determining in the second matrix whether the amplitude varies along an oriented direction relative to the particular pixel in a known manner indicating movement of the pixel in the oriented direction, the amplitude of the variation along the oriented direction determining the velocity of movement of the pixel.

15 An apparatus for smoothing an input signal comprises:

means for smoothing each pixel of the input signal using a time constant (CO) for such pixel, thereby generating a smoothed pixel value (LO);

20 means for determining the existence of a significant variation for a given pixel, and modifying the time constant (CO) for the pixel to be used in smoothing the pixel in subsequent frames of the input signal based upon the existence of such significant variation.

An apparatus for identifying an area in relative movement in an input signal comprises:

25 means for generating a first array indicative of the existence of significant variation in the magnitude of each pixel between a current frame and a prior frame;

means for generating a second array indicative of the magnitude of significant variation of each pixel between the current frame and a prior frame;

30 means for establishing a first moving matrix centered on a pixel under consideration and comprising pixels spatially related to the pixel under consideration, the first moving matrix traversing the first array for consideration of each pixel of the current frame;

35 means for determining whether the pixel under consideration and each pixel along an oriented direction relative to the pixel under consideration within the first matrix is a particular value representing the presence of significant variation, and if so, for establishing a second matrix within the first matrix,

centered on the pixel under consideration, and for determining whether the amplitude of the pixels in the second matrix are indicative of movement along an oriented direction relative to the pixel under consideration, the amplitude of the variation along the oriented direction being indicative of the velocity of movement, the size of the second matrix being varied to identify the matrix size most indicative of movement.

An apparatus for identifying pixels in an input signal in one of a plurality of classes in one of a plurality of domains comprises:

means for analyzing each pixel of the input signal and for providing an output signal for each domain containing information to identify each domain in which the pixel is classified;

a classifier for each domain, the classifier classifying pixels within each domain in selected classes within the domain;

a linear combination unit for each domain, the linear combination unit generating a validation signal for the domain, the validation signal selecting one or more of the plurality of domains for processing; and

means for forming a histogram for pixels of the output signal within the classes selected by the classifier within each domain selected by the validation signal.

An apparatus for identifying the velocity of movement of an area of an input signal comprises:

means for determining for each pixel in the input signal a binary value corresponding to the existence of a significant variation in the amplitude of the pixel signal between the current frame and the immediately previous smoothed input frame, and for determining the amplitude of the variation,

means for forming, for each particular pixel of the input signal, a first matrix comprising the binary values of a subset of the pixels spatially related to such particular pixel, and a second matrix comprising the amplitude of the variation of the subset of the pixels spatially related to such particular pixel; and

means for determining in the first matrix whether for a particular pixel, and other pixels along an oriented direction relative to the particular pixel, the binary value for each pixel is a particular value representing significant variation, and, for such particular pixel and other pixels, determining in the second matrix whether the amplitude varies along an oriented direction relative to the particular pixel in a known manner indicating movement of the pixel and the other pixels, the amplitude of the variation along the oriented direction

determining the velocity of movement of the pixel and the other pixels.

An apparatus for identifying a non-moving area in an input signal comprises:

5 means for forming histograms along coordinate axes for pixels of a current frame without a significant variation from such pixels in a prior frame; and

means for forming a composite signal corresponding to the spatial position of such pixels within the frame.

10 BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a diagrammatic illustration of the system according to the invention.

Fig. 2 is a block diagram of the temporal and spatial processing units of the invention.

15 Fig. 3 is a block diagram of the temporal processing unit of the invention.

Fig. 4 is a block diagram of the spatial processing unit of the invention.

Fig. 5 is a diagram showing the processing of pixels in accordance with the invention.

20 Fig. 6 illustrates the numerical values of the Freeman code used to determine movement direction in accordance with the invention.

Fig. 7 illustrates two nested matrices as processed by the temporal processing unit.

Fig. 8 illustrates hexagonal matrices as processed by the temporal processing unit.

25 Fig. 9 illustrates reverse-L matrices as processed by the temporal processing unit.

Fig. 9a illustrates angular sector shaped matrices as processed by the temporal processing unit.

30 Fig. 10 is a block diagram showing the relationship between the temporal and spatial processing units, and the histogram formation units.

Fig. 11 is a block diagram showing the interrelationship between the various histogram formation units.

Fig. 12 shows the formation of a two-dimensional histogram of a moving area from two one-dimensional histograms.

35 Fig. 13 is a block diagram of an individual histogram formation unit.

Fig. 14 illustrates the use of the classifier for finding an alignment of

points relative to the direction of an analysis axis.

Fig. 14a illustrates a one-dimensional histogram.

Fig. 15 illustrates the use of the system of the invention for video-conferencing.

5 Fig. 16 is a top view of the system of the invention for video-conferencing.

Fig. 17 is a diagram illustrating histograms formed on the shape of the head of a participant in a video conference.

10 Fig. 18 illustrates the system of the invention eliminating unnecessary information in a video-conferencing application.

Fig. 19 is a block diagram showing use of the system of the invention for target tracking.

Fig. 20 is an illustration of the system of the invention selecting a target for tracking.

15 Figs. 21-23 illustrate the system of the invention locking on to a selected target.

Fig. 24 illustrates the processing of the system using a Mallat diagram.

DETAILED DESCRIPTION OF THE INVENTION

20 The present invention is a method and apparatus for detection of relative movement or non-movement of an area within an image. Relative movement, as used herein, means movement of an area, which may be an "object" in the broadest sense of the term, e.g., a person, a portion of a person, or any animals or inanimate object, in an approximately motionless environment, or
25 approximate immobility of an area in an environment that is at least partially in movement.

Referring to Fig. 1, image processing system 11 includes an input 12 that receives a digital video signal S originating from a video camera or other imaging device 13 which monitors a scene 13a. Imaging device 13 is preferably
30 a conventional CMOS type CCD camera. It is, however, foreseen that the system of the invention may be used with any appropriate sensor e.g., ultrasound, IR, Radar, tactile array, etc., that generates an output in the form of an array of information corresponding to information observed by the imaging device. Imaging device 13 may have a direct digital output, or an analog output
35 that is converted by an A/D converter into digital signal S.

While signal S may be a progressive signal, in a preferred embodiment,

in which imaging device 13 is a conventional video camera, signal S is composed of a succession of pairs of interlaced frames, TR_1 and TR'_1 and TR_2 and TR'_2 , each consisting of a succession of horizontal scanned lines, e.g. $l_{1,1}$, $l_{1,2}$, ..., $l_{1,17}$ in TR_1 and $l_{2,1}$ in TR_2 . Each line consists of a succession of pixels or
 5 image-points PI, e.g., a1.1, a1.2 and a1.3, for line $l_{1,1}$; a17.1 and a17.22 for line $l_{1,17}$; a1.1 and a1.2 for line $l_{2,1}$. Signal S(PI) represents signal S composed of pixels PI.

As known in the art, S(PI) includes a frame synchronization signal (ST) at the beginning of each frame, a line synchronization signal (SL) at the
 10 beginning of each line, and a blanking signal (BL). Thus, S(PI) includes a succession frames, which are representative of the time domain, and within each frame, a series of lines and pixels, which are representative of the spatial domain.

In the time domain, "successive frames" shall refer to successive frames
 15 of the same type (i. e. , odd frames such as TR_1 , or even frames such as TR'_1), and "successive pixels in the same position" shall denote successive values of the pixels (PI) in the same location in successive frames of the same type, e.g., a1.1 of $l_{1,1}$ in frame TR_1 and a1.1 of $l_{1,1}$ in the next corresponding frame TR_2 .

Image processing system 11 generates outputs ZH and SR 14, which
 20 are preferably digital signals. Complex signal ZH comprises a number of output signals generated by the system, preferably including signals indicating the existence and localization of an area or object in motion, and the speed V and the oriented direction of displacement DI of pixels of the image. Also output from the system, if desired, is input digital video signal S, which is delayed (SR)
 25 to make it synchronous with the output ZH for the frame, taking into account the calculation time for the data in composite signal ZH (one frame). The delayed signal SR is used to display the image received by camera 13 on a monitor or television screen 10, which may also be used to display the information contained in composite signal ZH. Composite signal ZH may also be
 30 transmitted to a separate processing assembly 10a in which further processing of the signal may be accomplished.

Referring to Fig. 2, image processing system 11 includes a first assembly 11a, which consists of a temporal processing unit 15 having an associated memory 16, a spatial processing unit 17 having a delay unit 18 and
 35 sequencing unit 19, and a pixel clock 20, which generates a clock signal HP, and which serves as a clock for temporal processing unit 15 and sequencing

unit 19. Clock pulses HP are generated by clock 20 at the pixel rate of the image, which is preferably 13.5 MHZ.

Fig. 3 shows the operation of temporal processing unit 15, the function of which is to smooth the video signal and generate a number of outputs that are utilized by spatial processing unit 17. During processing, temporal processing unit 15 retrieves from memory 16 the smoothed pixel values LI of the digital video signal from the immediately prior frame, and the values of a smoothing time constant CI for each pixel. As used herein, LO and CO shall be used to denote the pixel values (L) and time constants (C) stored in memory 16 from temporal processing unit 15, and LI and CI shall denote the pixel values (L) and time constants (C) respectively for such values retrieved from memory 16 for use by temporal processing unit 15. Temporal processing unit 15 generates a binary output signal DP for each pixel, which identifies whether the pixel has undergone significant variation, and a digital signal CO, which represents the updated calculated value of time constant C.

Referring to Fig. 3, temporal processing unit 15 includes a first block 15a which receives the pixels PI of input video signal S. For each pixel PI, the temporal processing unit retrieves from memory 16 a smoothed value LI of this pixel from the immediately preceding corresponding frame, which was calculated by temporal processing unit 15 during processing of the immediately prior frame and stored in memory 16 as LO. Temporal processing unit 15 calculates the absolute value AB of the difference between each pixel value PI and LI for the same pixel position (for example $a_{1,1}$ of $I_{1,1}$ in TR_1 and of $I_{1,1}$ in TR_2 :

$$AB = |PI - LI|$$

Temporal processing unit 15 is controlled by clock signal HP from clock 20 in order to maintain synchronization with the incoming pixel stream. Test block 15b of temporal processing unit 15 receives signal AB and a threshold value SE. Threshold SE may be constant, but preferably varies based upon the pixel value PI, and more preferably varies with the pixel value so as to form a gamma correction. Known means of varying SE to form a gamma correction is represented by the optional block 15e shown in dashed lines. Test block 15b compares, on a pixel-by-pixel basis, digital signals AB and SE in order to determine a binary signal DP. If AB exceeds threshold SE, which indicates that pixel value PI has undergone significant variation as compared to the smoothed

value LI of the same pixel in the prior frame, DP is set to "1" for the pixel under consideration. Otherwise, DP is set to "0" for such pixel.

When DP = 1, the difference between the pixel value PI and smoothed value LI of the same pixel in the prior frame is considered too great, and temporal processing unit 15 attempts to reduce this difference in subsequent frames by reducing the smoothing time constant C for that pixel. Conversely, if DP = 0, temporal processing unit 15 attempts to increase this difference in subsequent frames by increasing the smoothing time constant C for that pixel. These adjustments to time constant C as a function of the value of DP are made by block 15c. If DP = 1, block 15c reduces the time constant by a unit value U so that the new value of the time constant CO equals the old value of the constant CI minus unit value U.

$$CO = CI - U$$

15

If DP = 0, block 15c increases the time constant by a unit value U so that the new value of the time constant CO equals the old value of the constant CI plus unit value U.

$$CO = CI + U$$

20

Thus, for each pixel, block 15c receives the binary signal DP from test unit 15b and time constant CI from memory 16, adjusts CI up or down by unit value U, and generates a new time constant CO which is stored in memory 16 to replace time constant CI.

25

In a preferred embodiment, time constant C, is in the form 2^p , where p is incremented or decremented by unit value U, which preferably equals 1, in block 15c. Thus, if DP = 1, block 15c subtracts one (for the case where U=1) from p in the time constant 2^p which becomes 2^{p-1} . If DP = 0, block 15c adds one to p in time constant 2^p , which becomes 2^{p+1} . The choice of a time constant of the form 2^p facilitates calculations and thus simplifies the structure of block 15c.

30

Block 15c includes several tests to ensure proper operation of the system. First, CO must remain within defined limits. In a preferred embodiment, CO must not become negative ($CO \geq 0$) and it must not exceed a limit N ($CO \leq N$), which is preferably seven. In the instance in which CI and CO are in the

35

form 2^p , the upper limit N is the maximum value for p.

The upper limit N may either be constant or variable. If N is variable, an optional input unit 15f includes a register or memory that enables the user, or another controller to vary N. The consequence of increasing N is to increase the sensitivity of the system to detecting displacement of pixels, whereas reducing N improves detection of high speeds. N may be made to depend on PI (N may vary on a pixel-by-pixel basis, if desired) in order to regulate the variation of LO as a function of the level of PI, i.e., $N_{ijt} = f(PI_{ijt})$, the calculation of which is done in block 15f, which in this case would receive the value of PI from video camera 13.

Finally, a calculation block 15d receives, for each pixel, the new time constant CO generated in block 15c, the pixel values PI of the incoming video signal S, and the smoothed pixel value LI of the pixel in the previous frame from memory 16. Calculation block 15d then calculates a new smoothed pixel value LO for the pixel as follows:

$$LO = LI + (PI - LI)/CO$$

If $CO = 2^p$, then

$$LO = LI + (PI - LI)/2^{p_0}$$

where "po", is the new value of p calculated in unit 15c and which replaces previous value of "pi" in memory 16.

The purpose of the smoothing operation is to normalize variations in the value of each pixel PI of the incoming video signal for reducing the variation differences. For each pixel of the frame, temporal processing unit 15 retrieves LI and CI from memory 16, and generates new values LO (new smoothed pixel value) and CO (new time constant) that are stored in memory 16 to replace LI and CI respectively. As shown in Fig. 2, temporal processing unit 15 transmits the CO and DP values for each pixel to spatial processing unit 17 through the delay unit 18.

The capacity of memory 16 assuming that there are R pixels in a frame, and therefore 2R pixels per complete image, must be at least $2R(e+f)$ bits, where e is the number of bits required to store a single pixel value LI (preferably eight bits), and f is the number of bits required to store a single time constant CI

(preferably 3 bits). If each video image is composed of a single frame (progressive image), it is sufficient to use $R(e+f)$ bits rather than $2R(e+f)$ bits.

Spatial processing unit 17 is used to identify an area in relative movement in the images from camera 13 and to determine the speed and oriented direction of the movement. Spatial processing unit 17, in conjunction with delay unit 18, cooperates with a control unit 19 that is controlled by clock 20, which generates clock pulse HP at the pixel frequency. Spatial processing unit 17 receives signals DP_{ij} and CO_{ij} (where i and j correspond to the x and y coordinates of the pixel) from temporal processing unit 15 and processes these signals as discussed below. Whereas temporal processing unit 15 processes pixels within each frame, spatial processing unit 17 processes groupings of pixels within the frames.

Fig. 5 diagrammatically shows the temporal processing of successive corresponding frame sequences TR_1 , TR_2 , TR_3 and the spatial processing in the these frames of a pixel PI with coordinates x , y , at times t_1 , t_2 , and t_3 . A plane in Fig. 5 corresponds to the spatial processing of a frame, whereas the superposition of frames corresponds to the temporal processing of successive frames.

Signals DP_{ij} and CO_{ij} from temporal processing unit 15 are distributed by spatial processing unit 17 into a first matrix 21 containing a number of rows and columns much smaller than the number of lines L of the frame and the number of pixels M per line. Matrix 21 preferably includes $2l+1$ lines along the y axis and $2m+1$ columns along the x axis (in Cartesian coordinates), where l and m are small integer numbers. Advantageously, l and m are chosen to be powers of 2, where for example l is equal to 2^a and m is equal to 2^b , a and b being integer numbers of about 2 to 5, for example. To simplify the drawing and the explanation, m will be taken to be equal to l (although it may be different) and $m = l = 2^3 = 8$. In this case, matrix 21 will have $2 \times 8 + 1 = 17$ rows and 17 columns. Fig. 4 shows a portion of the 17 rows $Y_0, Y_1, \dots, Y_{15}, Y_{16}$ and 17 columns $X_0, X_1, \dots, X_{15}, X_{16}$ which form matrix 21.

Spatial processing unit 17 distributes into $1 \times m$ matrix 21 the incoming flows of DP_{ijt} and CO_{ijt} from temporal processing unit 15. It will be appreciated that only a subset of all DP_{ijt} and CO_{ijt} values will be included in matrix 21, since the frame is much larger, having L lines and M pixels per row (e.g., 312.5 lines and 250-800 pixels), depending upon the TV standard used.

In order to distinguish the $L \times M$ matrix of the incoming video signal from

the $l \times m$ matrix 21 of spatial processing unit 17, the indices i and j will be used to represent the coordinates of the former matrix (which will only be seen when the digital video signal is displayed on a television screen or monitor) and the indices x and y will be used to represent the coordinates of the latter. At a given instant, a pixel with an instantaneous value PI_{ijt} is characterized at the input of the spatial processing unit 17 by signals DP_{ijt} and CO_{ijt} . The $(2l+1) \times (2m+1)$ matrix 21 is formed by scanning each of the $L \times M$ matrices for DP and CO.

In matrix 21, each pixel is defined by a row number between 0 and 16 (inclusive), for rows Y_0 to Y_{16} respectively, and a column number between 0 and 16 (inclusive), for columns X_0 to X_{16} respectively, in the case in which $l = m = 8$. In this case, matrix 21 will be a plane of $17 \times 17 = 289$ pixels.

In Fig. 4, elongated horizontal rectangles Y_0 to Y_{16} (only four of which have been shown, i.e., Y_0 , Y_1 , Y_{15} and Y_{16}) and vertical lines X_0 to X_{16} (of which only four have been shown, i.e., X_0 , X_1 , X_{15} and X_{16}) illustrate matrix 21 with 17×17 image points or pixels having indices defined at the intersection of an ordinate row and an abscissa column. For example, the P_{88} is at the intersection of column 8 and row 8 as illustrated in Fig. 4 at position e, which is the center of matrix 21.

In response to the HP and BL signals from clock 20 (Fig. 2), a rate control or sequencing unit 19: i) generates a line sequence signal SL at a frequency equal to the quotient of 13.5 MHZ (for an image with a corresponding number of pixels) divided by the number of columns per frame (for example 400) to delay unit 18, ii) generates a frame signal SC, the frequency of which is equal to the quotient $13.5/400$ MHZ divided by the number of rows in the video image, for example 312.5, iii) and outputs the HP clock signal. Blanking signal BL is used to render sequencing unit 19 non-operational during synchronization signals in the input image.

A delay unit 18 carries out the distribution of portions of the $L \times M$ matrix into matrix 21. Delay unit 18 receives the DP, CO, and incoming pixel $S(PI)$ signals, and distributes these into matrix 21 using clock signal HP and line sequence and column sequence signals SL and SC.

In order to form matrix 21 from the incoming stream of DP and CO signals, the successive rows Y_0 to Y_{16} for the DP and CO signals must be delayed as follows:

- row Y_0 - not delayed;
- row Y_1 - delayed by the duration of a frame line TP;

row Y_2 - delayed by 2 TP;
 and so on until
 row Y_{16} - delayed by 16 TP.

The successive delays of the duration of a frame row TP, are carried out
 5 in a cascade of sixteen delay circuits r_1, r_2, \dots, r_{16} that serve rows $Y_1, Y_2 \dots Y_{16}$,
 respectively, row Y_0 being served directly by the DP and CO signals without
 any delay upon arriving from temporal processing unit 15. All delay circuits r_1, r_2 ,
 $\dots r_{16}$ may be built up by a delay line with sixteen outputs, the delay imposed by
 any section thereof between two successive outputs being constant and equal
 10 to TP.

Rate control unit 19 controls the scanning of the entire $L \times M$ frame
 matrix over matrix 21. The circular displacement of pixels in a row of the frame
 matrix on the 17×17 matrix, for example from X_0 to X_{16} on row Y_0 , is done by a
 cascade of sixteen shift registers d on each of the 17 rows from Y_0 to Y_{16} (giving
 15 a total of $16 \times 17 = 272$ shift registers) placed in each row between two
 successive pixel positions, namely the register d_{01} between positions Pl_{00} and
 Pl_{01} register d_{02} between positions Pl_{01} and Pl_{02} , etc. Each register imposes a
 delay TS equal to the time difference between two successive pixels in a row or
 line, using column sequence signal SC. Because rows $l_1, l_2 \dots l_{17}$ in a frame TR1
 20 (Fig. 1), for S(PI) and for DP and CO, reach delay unit 18 shifted by TP
 (complete duration of a row) one after the other, and delay unit 18 distributes
 them with gradually increasing delays of TP onto rows $Y_0, Y_1 \dots Y_{17}$, these rows
 display the DP and CO signals at a given time for rows $l_1, l_2 \dots l_{17}$ in the same
 frame portion. Similarly in a given row, e.g., l_1 , successive pixel signals $a_{1,1}, a_{1,2}$
 25 \dots arrive shifted by TS and shift registers d impose a delay also equal to TS. As
 a result, the pixels of the DP and CO signals in a given row Y_0 to Y_{16} in matrix
 21, are contemporary, i.e., they correspond to the same frame portion.

The signals representing the COs and DPs in matrix 21 are available at
 a given instant on the $16 \times 17 = 272$ outputs of the shift registers, as well as
 30 upstream of the registers ahead of the 17 rows, i.e. registers $d_{0,1}, d_{1,1} \dots d_{16,1}$
 which makes a total of $16 \times 17 + 17 = 17 \times 17$ outputs for the 17×17 positions
 $P_{0,0}, P_{0,1} \dots P_{8,8} \dots P_{16,16}$.

In order to better understand the process of spatial processing, the
 system will be described with respect to a small matrix M3 containing 3 rows
 35 and 3 columns where the central element of the 9 elements thereof is pixel e
 with coordinates $x = 8, y = 8$ as illustrated below:

a b c
d e f (M3)
g h i

5 In matrix M3, positions a, b, c, d, f, g, h, i around the central pixel e correspond to eight oriented directions relative to the central pixel. The eight directions may be identified using the Freeman code illustrated in Fig. 6, the directions being coded 0 to 7 starting from the x axis, in steps of 45°. In the Freeman code, the eight possible oriented directions, may be represented by a
10 3-bit number since $2^3 = 8$.

Considering matrix M3 the 8 directions of the Freeman code are as follows:

3 2 1
15 4 e 0
5 6 7

Returning to matrix 21 having 17 x 17 pixels, a calculation unit 17a examines at the same time various nested square second matrices centered on
20 e, with dimensions 15 x 15, 13 x 13, 11 x 11, 9 x 9, 7 x 7, 5 x 5 and 3 x 3, within matrix 21, the 3 x 3 matrix being the M3 matrix mentioned above. Spatial processing unit 17 determines which matrix is the smallest in which pixels with DP = 1 are aligned along a straight line which determines the direction of movement of the aligned pixels.

25 For the aligned pixels in the matrix, the system determines if CO varies on each side of the central position in the direction of alignment, from +a in an oriented direction and -a in the opposite oriented direction, where $1 < a < N$. For example, if positions g, e, and c of M3 have values -1, 0, +1, then a displacement exists in this matrix from right to left in the (oriented) direction 1 in the Freeman code (Fig. 6). However, positions g, e, and c must at the same
30 time have DP = 1. The displacement speed of the pixels in motion is greater when the matrix, among the 3 x 3 to 15 x 15 nested matrices, in which CO varies from +1 or -1 between two adjacent positions along a direction is larger. For example, if positions g, e, and c in the 9 x 9 matrix denoted M9 have values
35 -1, 0, +1 in oriented direction 1, the displacement will be faster than for values -1, 0, +1 in 3 x 3 matrix M3 (Fig. 7). The smallest matrix for which a line meets

the test of $DP=1$ for the pixels in the line and CO varies on each side of the central position in the direction of alignment, from $+a$ in an oriented direction and $-a$ in the opposite oriented direction, is chosen as the principal line of interest.

5 In a further step in the smallest matrix 3×3 , the validity of the calculation with a variation of plus or minus two units (Co) with $DP=1$ determines a subpixel movement i.e. one half of pixel per image.

 In the same way if the variation is of plus or minus 3, the movement is still slower i.e. one third of pixel per image.

10 One improvement for reducing the power of calculation is to test only the values which are symmetrical relative to the central value. The test $DP=1$ and $CO=\pm 1$ or $CO=\pm 2$ and ± 3 in the smallest matrix allows to simplify the hardware.

 Since CO is represented as a power of 2 in a preferred embodiment, an extended range of speeds may be identified using only a few bits for CO , while
15 still enabling identification of relatively low speeds. Varying speed may be detected because, for example $-2, 0, +2$ in positions g, e, c in 3×3 matrix $M3$ indicates a speed half as fast as the speed corresponding to $1, 0, +1$ for the same positions in matrix $M3$.

 Two tests are preferably performed on the results to remove
20 uncertainties. The first test chooses the strongest variation, in other words the highest time constant, if there are variations of CO along several directions in one of the nested matrices. The second test arbitrarily chooses one of two (or more) directions along which the variation of CO is identical, for example by choosing the smallest value of the Freeman code, in the instance when
25 identical lines of motion are directed in a single matrix in different directions. This usually arises when the actual direction of displacement is approximately between two successive coded directions in the Freeman code, for example between directions 1 and 2 corresponding to an (oriented) direction that can be denoted 1.5 (Fig. 6) of about 67.5° with the x axis direction (direction 0 in the
30 Freeman code).

 The scanning of an entire frame of the digital video signal S preferably occurs in the following sequence. The first group of pixels considered is the first 17 rows or lines of the frame, and the first 17 columns of the frame. Subsequently, still for the first 17 rows of the frame, the matrix is moved column
35 by column from the left of the frame to the right, as shown in Fig. 5, i.e. from portion TM_1 at the extreme left, then TM_2 offset by one column with respect to

5 TM_1 until TM_M (where M is the number of pixels per frame line or row) at the extreme right. Once the first 17 rows have been considered for each column from left to right, the process is repeated for rows 2 to 18 in the frame. This process continues, shifting down one row at a time until the last group of lines at the bottom of the frame, i.e., lines $L-16 \dots L$ (where L is the number of lines per frame) are considered.

10 Spatial processing unit 17 generates the following output signals for each pixel: i) a signal V representing the displacement speed for the pixel, based upon the amplitude of the maximum variation of CO surrounding the pixel, the value of which may be, for example, represented by an integer in the range 0 - 7 if the speed is in the form of a power of 2, and therefore may be stored in 3 bits, ii) a signal DI representing the direction of displacement of the pixel, which is calculated from the direction of maximum variation, the value of DI being also preferably represented by an integer in the range 0 - 7
 15 corresponding to the Freeman code, stored in 3 bits, iii) a binary validation signal VL which indicates whether the result of the speed and oriented direction is valid, in order to be able to distinguish a valid output with $V = 0$ and $DI = 0$, from the lack of an output due to an incident, this signal being 1 for a valid output or 0 for an invalid output, iv) a time constant signal CO , stored in 3 bits,
 20 for example, and v) a delayed video signal SR consisting of the input video signal S delayed in the delay unit 18 by 16 consecutive line durations TR and therefore by the duration of the distribution of the signal S in the 17×17 matrix 21, in order to obtain a video signal timed to matrix 21, which may be displayed on a television set or monitor. Also output are the clock signal HP , line
 25 sequence signal SL and column sequence signal SC from control unit 19.

An improvement in the calculation of the motion where several directions are responsive at the same time consists in testing by group of 3 contiguous directions the validity of the operations and to select only the central value.

30 Nested hexagonal matrices (Fig 8) or an inverted L-shaped matrix (Fig. 9) may be substituted for the nested rectangular matrices in Figs. 4 and 7. In the case shown in Fig. 8, the nested matrices (in which only the most central matrices $MR1$ and $MR2$ have been shown) are all centered on point $MR0$ which corresponds to the central point of matrices $M3$, $M9$ in Fig. 7. The advantage of a hexagonal matrix system is that it allows the use of oblique coordinate axes
 35 x_a , y_a , and a breakdown into triangles with identical sides, to carry out an isotropic speed calculation.

The matrix in Fig. 9 is composed of a single row (L_u) and a single column (C_u) starting from the central position MR_u in which the two signals DP and CO respectively are equal to "1" for DP and increase or decrease by one unit for CO, if movement occurs.

- 5 If movement is in the direction of the x coordinate, the CO signal is identical in all positions (boxes) in column C_u , and the binary signal DP is equal to 1 in all positions in row L_u , from the origin MR_u , with the value CO_u , up to the position in which CO is equal to $CO_u + 1$ or -1 inclusive. If movement is in the direction of the y coordinate, the CO signal is identical in all positions (boxes) in row L_u , and the binary signal DP is equal to 1 in all positions in column C_u , from the origin MR_u , with the value CO_u , up to the position in which CO is equal to $CO_u + 1$ or -1 inclusive. If movement is oblique relative to the x and y coordinates, the binary signal DP is equal to 1 and CO is equal to CO_u in positions (boxes) of L_u and in positions (boxes) of C_u , the slope being determined by the perpendicular to the line passing through the two positions in which the signal CO_u changes by the value of one unit, the DP signal always being equal to 1.

- Fig 9 shows the case in which $DP = 1$ and CO_u changes value by one unit in the two specific positions L_{u3} and C_{u5} and indicates the corresponding slope P_p . In all cases, the displacement speed is a function of the position in which CO changes value by one unit. If CO changes by one unit in L_u or C_u only, it corresponds to the value of the CO variation position. If CO changes by one unit in a position in L_u and in a position in C_u , the speed is proportional to the distance between MR_u and E_x (intersection of the line perpendicular to $C_u - L_u$ passing through MR_u).

Fig. 9a shows an imaging device with sensors located at the crossings of concentric lines c and radial lines d, said lines corresponding to the rows and columns of a rectangular matrix imaging device.

- An angular sector shaped odd matrix $n \times n$ M_c is associated to said imaging device.

The operation of such imaging arrangement is controlled by a circular scanning sequencer.

Except the sequencing differences, the operation of this arrangement is identical to that of the square matrix arrangement.

- As shown in Figs 10 - 14, image processing system 11 is used in connection with a histogram processor 22a for identifying objects within the

input signal based upon user specified criteria for identifying such objects. A bus Z-Z₁ (See Figs. 2, 10 and 11) transfers the output signals of image processing system 11 to histogram processor 22a. Histogram processor 22a generates composite output signal ZH which contains information on the areas
 5 in relative movement in the scene.

Referring to Fig. 11, histogram processor 22a includes a bus 23 for communicating signals between the various components thereof. Histogram formation and processing blocks 24 - 29 receive the various input signals, i.e., delayed digital video signal SR, speed V, oriented directions (in Freeman code)
 10 DI, time constant CO, first axis x(m) and second axis y(m), which are discussed in detail below. The function of each histogram formation block is to enable a histogram to be formed for the domain associated with that block. For example, histogram formation block 24 receives the delayed digital video signal SR and enables a histogram to be formed for the luminance values of the video signal.
 15 Since the luminance of the signal will generally be represented by a number in the range of 0-255, histogram formation block 24 is preferably a memory addressable with 8 bits, with each memory location having a sufficient number of bits to correspond to the number of pixels in a frame.

Histogram formation block 25 receives speed signal V and enables a
 20 histogram to be formed for the various speeds present in a frame. In a preferred embodiment, the speed is an integer in the range 0-7. Histogram formation block 25 is then preferably a memory addressable with 3 bits, with each memory location having a sufficient number of bits to correspond to the number of pixels in a frame.

Histogram formation block 26 receives oriented direction signal D1 and enables a histogram to be formed for the oriented directions present in a frame. In a preferred embodiment the oriented direction is an integer in the range 0-7, corresponding to the Freeman code. Histogram formation block 26 is then preferably a memory addressable with 3 bits, with each memory location having
 25 a sufficient number of bits to correspond to the number of pixels in a frame.
 30

Histogram formation block 27 receives time constant signal CO and enables a histogram to be formed for the time constants of the pixels in a frame. In a preferred embodiment, the time constant is an integer in the range 0-7.
 35 Histogram formation block 27 is then preferably a memory addressable with 3 bits, with each memory location having a sufficient number of bits to correspond

to the number of pixels in a frame.

Histogram formation blocks 28 and 29 receive the x and y positions respectively of pixels for which a histogram is to be formed, and form histograms for such pixels, as discussed in greater detail below. Histogram formation block 28 is preferably addressable with the number of bits corresponding to the number of pixels in a line, with each memory location having a sufficient number of bits to correspond to the number of lines in a frame, and histogram formation block 29 is preferably addressable with the number of bits corresponding to the number of lines in a frame, with each memory location having a sufficient number of bits to correspond to the number of pixels in a line.

Referring to Figs. 12 and 13, each of the histogram formation blocks 24 - 29 has an associated validation block 30 - 35 respectively, which generates a validation signal VI - V6 respectively. In general, each of the histogram formation blocks 24-29 is identical to the others and functions in the same manner. For simplicity, the invention will be described with respect to the operation of histogram formation block 25, it being appreciated that the remaining histogram formation blocks operate in a like manner. Histogram formation block 25 includes a histogram forming portion 25a, which forms the histogram for that block, and a classifier 25b, for selecting the criteria of pixels for which the histogram is to be formed. Histogram forming portion 25a and classifier 25b operate under the control of computer software in an integrated circuit 25c, which extracts certain limits of the histogram generated by the histogram formation block.

Referring to Fig. 13, histogram forming portion 25a includes a memory 100, which is preferably a conventional digital memory. In the case of histogram formation block 25 which forms a histogram of speed, memory 100 is sized to have addresses 0-7, each of which may store up to the number of pixels in an image. Between frames, memory 100 is initiated, i.e., cleared of all memory, by setting *init*=1 in multiplexors 102 and 104. This has the effect, with respect to multiplexor 102 of selecting the "0" input, which is output to the Data In line of memory 100. At the same time, setting *init*=1 causes multiplexor 104 to select the Counter input, which is output to the Address line of memory 100. The Counter input is connected to a counter (not shown) that counts through all of the addresses for memory 100, in this case $0 \leq \text{address} \leq 7$. This has the effect of placing a zero in all memory addresses of memory 100. Memory 100 is

preferably cleared during the blanking interval between each frame. After memory 100 is cleared, the *init* line is set to zero, which in the case of multiplexor 102 results in the content of the Data line being sent to memory 100, and in the case of multiplexor 104 results in the data from spatial processing unit 117, i.e., the V data, being sent to the Address line of memory 100.

Classifier 25b enables only data having selected classification criteria to be considered further, meaning to possibly be included in the histograms formed by histogram formation blocks 24-29. For example, with respect to speed, which is preferably a value in the range of 0-7, classifier 25b may be set to consider only data within a particular speed category or categories, e.g., speed 1, speeds 3 or 5, speed 3-6, etc. Classifier 25b includes a register 106 that enables the classification criteria to be set by the user, or by a separate computer program. By way of example, register 106 will include, in the case of speed, eight registers numbered 0-7. By setting a register to "1", e.g., register number 2, only data that meets the criteria of the selected class, e.g., speed 2, will result in a classification output of "1". Expressed mathematically, for any given register in which $R(k) = b$, where k is the register number and b is the Boolean value stored in the register:

20

$$\text{Output} = R(\text{data}(V))$$

So for a data point V of magnitude 2, the output of classifier 25b will be "1" only if $R(2)=1$. The classifier associated with histogram formation block 24 preferably has 256 registers, one register for each possible luminance value of the image. The classifier associated with histogram formation block 26 preferably has 8 registers, one register for each possible direction value. The classifier associated with histogram formation block 27 preferably has 8 registers, one register for each possible value of CO. The classifier associated with histogram formation block 28 preferably has the same number of registers as the number of pixels per line. Finally, the classifier associated with histogram formation block 29 preferably has the same number of registers as the number of lines per frame. The output of each classifier is communicated to each of the validation blocks 30-35 via bus 23, in the case of histogram formation blocks 28 and 29, through combination unit 36, which will be discussed further below.

Validation units 30-35 receive the classification information in parallel

from all classification units in histogram formation blocks 24 - 29. Each validation unit generates a validation signal which is communicated to its associated histogram formation block 24 - 29. The validation signal determines, for each incoming pixel, whether the histogram formation block will utilize that pixel in forming its histogram. Referring again to Fig. 13, which shows histogram formation block 25, validation unit 31 includes a register block 108 having a register associated with each histogram formation block, or more generally, a register associated with each data domain that the system is capable of processing, in this case, luminance, speed, direction, CO, and x and y position. The content of each register in register block 108 is a binary value that may be set by a user or by a computer controller. Each validation unit receives via bus 23 the output of each of the classifiers, in this case numbered 0 ... p, keeping in mind that for any data domain, e.g., speed, the output of the classifier for that data domain will only be "1" if the particular data point being considered is in the class of the registers set to "1" in the classifier for that data domain. The validation signal from each validation unit will only be "1" if for each register in the validation unit that is set to "1", an input of "1" is received from the classifier for the domain of that register. This may be expressed as follows:

$$\text{out} = (\bar{\text{in}}_0 + \text{Reg}_0) \cdot (\bar{\text{in}}_1 + \text{Reg}_1) \dots (\bar{\text{in}}_n + \text{Reg}_n) \cdot (\text{in}_0 + \text{in}_1 + \dots + \text{in}_n)$$

where Reg_0 is the register in the validation unit associated with input in_0 . Thus, using the classifiers in combination with validation units 30 - 35, the system may select for processing only data points in any selected classes within any selected domains. For example, the system may be used to detect only data points having speed 2, direction 4, and luminance 125 by setting each of the following registers to "1": the registers in the validation units for speed, direction, and luminance, register 2 in the speed classifier, register 4 in the direction classifier, and register 125 in the luminance classifier. In order to form those pixels into a block, the registers in the validation units for the x and y directions would be set to "1" as well.

Referring again to Fig. 13, validation signal V2 is updated on a pixel-by-pixel basis. If, for a particular pixel, validation signal V2 is "1", adder 110 increments the output of memory 100 by one. If, for a particular pixel, validation signal V2 is "0", adder 100 does not increment the output of memory. In any

case, the output of adder 100 is stored in memory 100 at the address corresponding to the pixel being considered. For example, assuming that memory 100 is used to form a histogram of speed, which may be categorized as speeds 0-7, and where memory 100 will include 0-7 corresponding memory locations, if a pixel with speed 6 is received, the address input to multiplexor 104 through the data line will be 6. Assuming that validation signal V2 is "1", the content in memory at location 6 will be incremented. Over the course of an image, memory 100 will contain a histogram of the pixels for the image in the category associated with the memory. If, for a particular pixel, validation signal V2 is "0" because that pixel is not in a category for which pixels are to be counted (e.g., because that pixel does not have the correct direction, speed, or luminance), that pixel will not be used in forming the histogram.

For the histogram formed in memory 100, key characteristics for that histogram are simultaneously computed in a unit 112. Unit 112 includes memories for each of the key characteristics, which include the minimum (MIN) of the histogram, the maximum (MAX) of the histogram, the number of points (NBPTS) in the histogram, the position (POSRMAX) of the maximum of the histogram, and the number of points (RMAX) at the maximum of the histogram. These characteristics are determined in parallel with the formation of the histogram as follows:

For each pixel with a validation signal V2 of "1":

- (a) if the data value of the pixel < MIN (which is initially set to the maximum possible value of the histogram), then write data value in MIN,
- (b) if the data value of the pixel > MAX (which is initially set to the minimum possible value of the histogram), then write data value in MAX;
- (c) if the content of memory 100 at the address of the data value of the pixel > RMAX (which is initially set to the minimum possible value of the histogram), then i) write data value in POSRMAX and ii) write the memory output in RMAX.
- (d) increment NBPTS (which is initially set to zero).

At the completion of the formation of the histogram in memory 100 at the end of each frame, unit 112 will contain important data characterizing the histogram. The histogram in each memory 100, and the characteristics of the histogram in units 112 are read during the scanning spot of each frame by a separate processor, and the memories 100 are cleared and units 112 are re-initialized for processing the next frame.

Figure 14 shows the determination of the orientation of an alignment of points relative to the direction of an analysis axis.

In this figure, the analysis axis extends with an angle relative to the horizontal side of the screen and the histogram built along the analysis axis
 5 refers to points concerned by the analysis appearing on the screen.

For the histogram calculation device five particular values are calculated:
 MIN, MAX, NBPTS, RMAX, POSRMAX

The use of these values allows to obtain some rapid results.

For example, the calculation of the ratio NBPTS/RMAX i.e. the number
 10 of points involved in the histogram and the number of points in the maximal line allows to find an alignment of points perpendicular to the scanning axis.

The smaller is R and the most the alignment is perpendicular to the scanning axis.

One improvement of the calculation for example for positioning a vehicle
 15 on the road is to carryout for each pixel simultaneously an analysis according all the possible analysis axis. In an analysis region, the calculation of the ration R for all the analysis axes and the search of the smallest value of R allows to find the axis perpendicular of the analyzed points and consequently to know the alignment with a positioning, from the value POSRMAX.

20 Presently the map is divided by 16 ($180^\circ/16$).

The use of the moving pixels histogram, direction histogram and velocity histograms allows to find by reading POSRMAX the overall motion of the scene (moving camera) and in the classifying unit to inhibit these preponderant classes.

25 The device thus becomes responsive to elements which are subject to relative motion in the image. The use of histograms according to two perpendicular axes with these elements in relative motion as validation element allows to detect and track an object in relative motion.

The calculation of the histogram according to a projection axis is carried
 30 out in a region delimited by the associated classifier between points a and b on the analysis axis.

An important improvement is to associate anticipation by creating an histogram of the same points with orientation and intensity of motion as input parameters. The nominal values O-MVT corresponding to orientation of the
 35 movement and I-MVT corresponding to intensity of movement allow to modify the values a and b of the classifier of the unit connected to the calculation of the

analysis axis for the calculation for the next frame.

The result is greatly improved. Fig. 14a shows an example of the successive classes C_1 C_2 ... C_{n-1} C_n , each representing a particular velocity, for a hypothetical velocity histogram, with their being categorization for up to 16 velocities (15 are shown) in this example. Also shown is envelope 38, which is a smoothed representation of the histogram.

In order to locate the position of an object having user specified criteria within the image, histogram blocks 28 and 29 are used to generate histograms for the x and y positions of pixels with the selected criteria. These are shown in Fig. 12 as histograms along the x and y coordinates. These x and y data are output to moving area formation block 36 which combines the abscissa and ordinal information $x(m)_2$ and $y(m)_2$ respectively into a composite signal $xy(m)$ that is output onto bus 23. A sample composite histogram 40 is shown in Fig. 12. The various histograms and composite signal $xy(m)$ that are output to bus 23 are used to determine if there is a moving area in the image, to localize this area, and/or to determine its speed and oriented direction. Because the area in relative movement may be in an observation plane along directions x and y which are not necessarily orthogonal, (e.g., as discussed below with respect to Figs. 15 and 16), a data change block 37 may be used to convert the x and y data to orthogonal coordinates. Data change block 37 receives orientation signals $x(m)_0$ and $y(m)_0$ for $x(m)_0$ and $y(m)_0$ axes, as well as pixel clock signals HP, line sequence and column sequence signals SL and SC (these three signals being grouped together in bundle F in Figs. 2, 4, and 10) and generates the orthogonal $x(m)_1$ and $y(m)_1$ signals that are output to histogram formation blocks 28 and 29 respectively.

In order to process pixels only within a user-defined area, the x-direction histogram formation unit may be set to process pixels only in a class of pixels defined by boundaries, i.e. XMIN and XMAX. Any pixels outside of this class will not be processed. Similarly, the y-direction histogram formation unit may be set to process pixels only in a class of pixels defined by boundaries YMIN and YMAX. Thus, the system can process pixels only in a defined rectangle by setting the XMIN and XMAX, and YMIN and YMAX values as desired. Of course, the classification criteria and validation criteria from the other histogram formation units may be set in order to form histograms of only selected classes of pixels in selected domains in selected areas.

Fig 12 diagrammatically represents the envelopes of histograms 38 and

39, respectively in x and y coordinates, for velocity data. In this example, x_M and y_M represent the x and y coordinates of the maxima of the two histograms 38 and 39, whereas I_a and I_b for the x axis and I_c and I_d for the y axis represent the limits of the range of significant or interesting speeds, I_a and I_c being the longer limits and I_b and I_d being the upper limited of the significant portions of the histograms. Limits I_a , I_b , I_c and I_d may be set by the user or by an application program using the system, may be set as a ratio of the maximum of the histogram, e.g., $x_M/2$, or may be set as otherwise desired for the particular application.

10 The vertical lines L_a and L_b , of abscises I_a and I_b and the horizontal lines L_c and L_d of ordinates I_c and I_d form a rectangle that surrounds the cross hatched area 40 of significant speeds (for all x and y directions). A few smaller areas 41 with longer speeds, exist close to the main area 40, and are typically ignored. In this example, all that is necessary to characterize the area with the largest variation of the parameter for the histogram, the speed V in this particular case, is to identify the coordinates of the limits I_a , I_b , I_c and I_d and the maxima x_M and y_M , which may be readily derived for each histogram from memory 100, the data in units 112, and the xy(m) data block.

20 Thus, the system of the invention generates in real time, histograms of each of the parameters being detected. Assuming that it were desired to identify an object with a speed of "2" and a direction of "4", the validation units for speed and direction would be set to "1", and the classifiers for speed "2" and direction "4" would be set to "1". In addition, since it is desired to locate the object (s) with this speed and direction on the video image, the validation signals for histogram formation blocks 28 and 29, which correspond to the x and y coordinates, would be set to "1" as well. In this way, histogram formation blocks 28 and 29 would form histograms of only the pixels with the selected speed and direction, in real-time. Using the information in the histogram, and especially POSRMAX, the object with the greatest number of pixels at the selected speed and direction could be identified on the video image in real-time. More generally, the histogram formation blocks can localize objects in real-time meeting user-selected criteria, and may produce an output signal, e.g., a light or a buzzer if an object is detected. Alternatively, the information may be transmitted, e.g., by wire, optical fiber or radio relay for remote applications, to a control unit, such as unit 10a in Fig. 1, which may be near or remote from image processing system 11.

Fig. 15 shows an example of use of the system of the invention to perform automatic framing of a person moving, for example, during a video conference. A video camera 13 observes the subject P, who may or may not be moving. A video signal S from the video camera is transmitted by wire, optical
 5 fiber, radio relay, or other communication means to a monitor 10b and to the image processing system of the invention 11. The image processing system determines the position and movement of the subject P, and controls servo motors 43 of camera 13 to direct the optical axis of the camera towards the subject and particularly towards the face of the subject, as a function of the
 10 location, speed and direction of the subject, and may vary the zoom, focal distance and/or the focus of the camera to provide the best framing and image of the subject.

Referring to Fig. 18, the system of the invention may be used to center the face of the subject in the video signal while eliminating superfluous portions
 15 of the image received by the camera 13 above, below, and to the right and left of the head of the subject. Camera 13 has a field of view 123, which is defined between directions 123a and 123b. The system rotates camera 13 using servomotors 43 so that the head T of the subject is centered on central axis 2a within cortical field 123, and also adjusts the zoom of camera 13 to ensure that
 20 the head T of the subject occupies a desired amount of the frames of the video signal, preferably as represented by a desired ratio of the number of pixels comprising head T to the total number of pixels per frame.

In order to accomplish this, the system of the invention may focus on the head using its luminance or motion. By way of example only, the system will be
 25 described with respect to detecting the head of the user based upon its motion. The peripheral edges of the head of the user are detected using the horizontal movements of the head, in other words, movements right and left, and the vertical movements, in other words, movements up and down. As the horizontal and vertical motion of the head is determined by the system, it is analyzed
 30 using preferred coordinate axes, preferably Cartesian coordinates Ox and Oy , in moving, area block 36 (Fig.11).

The pixels with greatest movement within the image will normally occur at the peripheral edges of the head of the subject, where even due to slight
 35 movements, the pixels will vary between the luminance of the head of the subject and the luminance of the background. Thus, if the system of the invention is set to identify only pixels with $DP=1$, and to form a histogram of

these pixels, the histogram will detect movement peaks along the edges of the face where variations in brightness, and therefore in pixel value, are the greatest, both in the horizontal projection along Ox and in the vertical projection along Oy.

5 This is illustrated in Fig. 17 m which axes Ox and Oy are shown, as are histograms 124x, along Ox, and 124y, along Oy, i.e., in horizontal and vertical projections, respectively. Histograms 124x and 124y would be output from histogram formation units 28 and 29 respectively (Fig. 11). Peaks 125a and 125b of histogram 124x, and 125c and 125d of histogram 124y, delimit, by their
10 respective coordinates 126a, 126b, 126c and 126d, a frame bounded by straight lines Ya, Yb, Xc, and Xd, which encloses the face V of the video-conference participant, and which denote areas 127a, 127b, 127c and 127d, which are areas of slight movement of the head T, which will be the areas of greatest variation in pixel intensity during these movements.

15 Location of the coordinates 126a, 126b, 126c and 126d, corresponding to the four peaks 125a, 125b, 125c and 125d, is preferably determined by computer software reading the x and y coordinate histograms during the spot scanning sequence of each frame. The location of the coordinates 126a, 126b, 126c and 126d of peaks 125a, 125b, 125c and 125d of histograms 124x and
20 124y make it possible to better define and center the position of the face V of the subject in the image. In a video conferencing system, the remainder of the image, i.e. the top bottom, right and left portions of the image, as illustrated in Fig. 18 by the cross-hatched areas surrounding the face V, may be eliminated to reduce the bandwidth required to transmit the image. The center of face V may be determined, for example, by locating the pixel position of the center of the box bounded by Ya, Yb, Xc, and Xd ($(Xc + (Xd - Xc)/2)$, $(Ya + (Yb - Ya)/2)$) and by comparing this position to a desired position of face V on the screen. Servomotors 43 (Fig. 13) are then actuated to move camera 13 to better center face V on the screen. Similarly, if face V is in movement, the system may detect
25 the position of face V on the screen as it moves, and follow the movement by generating commands to servomotors 43.

If desired, the center position of face V may be determined at regular intervals, and preferably in each frame, and the average value (over time) of coordinates 126a, 126b, 126c and 126d used to modify the movement of
35 camera 13 to center face V.

With face V centered, the system may adjust the zoom of camera 13 so

that face V covers a desired amount of the image. The simple method to accomplish this zoom function is to determine the dimensions of (or number of pixels in) the box bounded by Y_a , Y_b , X_c , and X_d . Camera 13 may then be zoomed in or out until desired dimensions (or pixel count) are achieved.

5 Another application of the invention relates to automatic tracking of a target by, for example, a spotlight or a camera. Using a spotlight, the invention might be used on a helicopter to track a moving target on the ground, or to track a performer on a stage during an exhibition. The invention would similarly be applicable to weapons targeting systems. Referring to Fig. 19, the system
10 includes a camera 200, which is preferably a conventional CCD camera which communicates an output signal 202 to image processing system 204 of the invention. Especially for covert and military applications, it will be appreciated that the system may be used with sensor such as Radar and IR, in lieu of, or in combination with, camera 200. A controller 206, which is preferably a
15 conventional microprocessor-based controller, is used to control the various elements of the system and to enable user input of commands and controls, such as with computer mouse 210, a keyboard (not shown), or other input device. As in the prior embodiment, the system includes one or more servomotors 208 that control movement of camera 200 to track the desired
20 target. It will be appreciated that any appropriate means may be used to control the area of interest of camera 200, including use of moving mirrors relative to a fixed camera, and the use of a steered beam, for example in a Radar system, to track the target without physically moving the sensor.

In the example shown in Fig. 20, monitor 212 is shown with five
25 simulated objects, which may be, for example, vehicles, or performers on a stage, including four background targets 216, and one target to be tracked 218. Computer mouse 210 is used to control an icon 220 on monitor 212. The user of the system selects the target for tracking by moving icon 220 over target 218, and depressing a predetermined button on mouse 210. The pixel position of
30 icon 220 is then used as a starting position for tracking target 216.

Referring to Fig. 21, the initial pixel starting position is shown as x_c , y_c . In order to process the pixels surrounding the starting position, image processing system 204 will process the pixels in successively larger areas surrounding the pixel, adjusting the center of the area based upon the shape of the object, until
35 substantially the entire target area is being tracked. The initial area is set by controller 206 to include an area bounded by X_A , X_B , Y_C , Y_D . This is

accomplished by setting these boundaries in the classification units of x and y histogram formation units 28 and 29. Thus, the only pixels that will be processed by the system are those falling within the bounded area. Assuming that in the example given, the target is in motion, the system may be set to track pixels with DP=1. Those pixels with DP=1 would normally be located on the peripheral edges of target 218, unless the target had a strong color or luminance variation throughout, in which case, many of the pixels of the target would have DP=1. In any case, in order to locate pixels with DP=1, the validation units would be set to detect pixels with DP=1. Thus, the only pixels that will be considered by the system are those in the bounded area with DP=1. Alternatively, the system may be set to detect a velocity greater than zero, or any other criteria that define the edges of the object.

Histograms are then formed by x and y histogram formation units 28 and 29. In the example shown in Fig. 21, an insignificant number of pixels would be identified as having DP=1, since the selected area does not include the border of target 218, so no histogram would be formed. The size of the area under consideration is then successively increased, preferably by a constant size K, so that in subsequent iterations, the pixels considered would be in the box bounded by x_{A-nK} , x_{B+nK} , y_{A-nK} , y_{B+nK} , where n is the number of the current iteration.

This process is continued until the histogram formed by either of histogram formation units 28 and 29 contains meaningful information, i.e., until the box overlaps the boundary of the target. Referring to Fig. 22, when the area under consideration begins to cross the borders of target 218, the histograms 222 and 224 for the x and y projections will begin to include pixels in which DP=1 (or any other selected criteria to detect the target edge). Prior to further enlarging the area under consideration, the center of the area under consideration, which until this point has been the pixel selected by the user, will be adjusted based upon the content of histograms 222 and 224. In a preferred embodiment, the new center of the area is determined to be $(X_{MIN} + X_{MAX})/2$, $(Y_{MIN} + Y_{MAX})/2$, where X_{MIN} and X_{MAX} are the positions of the minima and maxima of the x projection histogram, and Y_{MIN} and Y_{MAX} are the positions of the minima and maxima of the y projection histogram. This serves to adjust the area under consideration for the situation in which the initial starting position is nearer to one edge of the target than to another. Other methods of relocating the center of the target box may be used if desired.

After additional iterations, as shown in Fig. 23, it being understood

that the center of the box bounding the area of consideration may have moved from the prior iteration, the box will be larger than the target in that $X_{A-nK} < X_{MIN}$, $X_{A+nK} > X_{MAX}$, $Y_{A-nK} < Y_{MIN}$, and $Y_{A+nK} > Y_{MAX}$. When this occurs, the entire target is bounded, and the constant K may then be reduced, to thereby reduce the size of the tracking box. In a preferred embodiment, when initially tracking a target, constant K is preferably relatively large, e.g., 10-20 pixels or more, in order that the system may lock on the target expeditiously. Once a target has been locked onto, K may be reduced. It will be appreciated that in the course of tracking a target, the tracking box will be enlarged and reduced as appropriate to maintain a track of the target, and is preferably adjusted on a frame by-frame basis.

Assuming that the system is to be used to train a spotlight on the target, for example from an airborne vehicle or in a theater, the camera is preferably synchronized with the spotlight so that each is pointing at the same location. In this way, where the camera has centered the target on its image, the spotlight will be centered on the target. Having acquired the target, controller 206 controls servomotors 208 to maintain the center of the target in the center of the image. For example, if the center of the target is below and to the left of the center of the image, the camera is moved downward and to the left as required to center the target. The center of the target may be determining in real time from the contents of POSRMAX for the x and histogram formation units.

It will be appreciated that as the target moves, the targeting box will move with the target, constantly adjusting the center of the targeting box based upon the movement of the target, and enlarging and reducing the size of the targeting box. The targeting box may be displayed on monitor 212, or on another monitor as desired to visually track the target.

A similar tracking box may be used to track an object in an image based upon its characteristics. For example, assuming it is desired to track a target moving only to the right in the image. The histogram formation units are set up so that the only validation units set to "1" are for direction and for the x and y projections. The classification unit for direction is set so that only direction "right" is set to "1". The histograms for the x and y projections will then classify only pixels moving to the right. Using these histograms, a box bounding the target may be established. For example, referring to Fig. 12, the box surrounding the target may be established using I_a , I_b , I_c , and I_d as the bounds of the box. The target box may be displayed on the screen using techniques known in the art.

After a very short initialization period on the order of about 10 frames, the invention determines the relative displacement parameters instantaneously after the end of each frame on which the temporal and spatial processing was performed due to the recursive ness of calculations according to the invention.

5 The invention, including components 11a and 22a is preferably formed on a single integrated circuit, or on two integrated circuits. If desired, a micro controller, for enabling user-input to the system, e.g., to program the validation and classification units, may be integrated on the same integrated circuit.

10 It will be appreciated that the present invention is subject to numerous modifications. In an embodiment in which a color camera is used, the system of the invention preferably includes histogram formation units for hue and saturation. This enables classification of targets to be made using these characteristics as well. In fact, the invention may be modified by adding histogram formation units for any possible other measurable characteristics of
15 the pixels. Moreover, while the invention has been described with respect to tracking a single target, it is foreseen that multiple targets may be tracked, each with user-defined classification criteria, by replicating the various elements of the invention. For example, assuming the system of the invention included additional histogram formation units for hue and saturation, the system could be
20 programmed, using a common controller attached to two histogram formation processors of the type shown in Fig. 11, to track a single target by its velocity, and/or color, and/or direction, etc. In this manner, the system could continue to track a target if, for example, the target stopped and the track based upon velocity and direction was lost, since the target could still be tracked by color.

25 It will also be appreciated that the limitation of eight speeds may be increased by using a greater bit count to represent the speeds. Moreover, while the invention has been described with respect to detection of eight different directions, it may be applied to detect 16 or more directions by using different size matrices, e.g., sixteen directions may be detected in a 5x5 matrix, to detect
30 a greater number of directions.

 Finally, Fig. 24 shows a method of tracking a wider range of speeds V if the limited number provided by p bits for time constant CO is insufficient. Using Mallat's diagram (see article by S. Mallat "A Theory for multi-resolution signal decomposition" in IEEE Transactions on Pattern Analysis and Machine
35 Intelligence, July 1989 p. 674-693), the video image is successively broken down into halves, identified as 1, 2, 3, 4, 5, 6, 7. This creates a compression

that only processes portions of the image. For example, with $p=4$ ($2^p = 16$), the system may determine speeds within a wider range.

If initially, while processing the entire image, the system determines that the speed of an object exceeds the maximum speed determinable with $2^p=16$ for the time constant, the system uses partial observed images 1, 2, 3, 4, ... until the speed of the object does not exceed the maximum speed within the partial image after compression. To use Mallat compression with wavelets, a unit 13A (Fig. 24) is inserted into the system shown in Fig. 1 to perform the compression. For example, this unit could be composed of the "DV 601 Low Cost Multiformat Video Codec "by Analog Devices. Fig. 2 shows an optional compression unit 13a of this type.

Although the present invention has been described with respect to certain embodiments and examples, variations exist that are within the scope of the invention as described in the following claims.

CLAIMS

1 1. A process for identifying pixels in an input signal in one of a
2 plurality of classes in one of a plurality of domains, the input signal comprising a
3 succession of frames, each frame comprising a succession of pixels, the
4 process comprising, on a frame-by-frame basis:
5 for each pixel of the input signal, analyzing the pixel and providing an
6 output signal for each domain containing information to identify each domain in
7 which the pixel is classified;
8 providing a classifier for each domain, the classifier enabling
9 classification of pixels within each domain to selected classes within the
10 domain;
11 providing a validation signal for the domains, the validation signal
12 selecting one or more of the plurality of domains for processing; and
13 forming a histogram for pixels of the output signal within the classes
14 selected by the classifier within each domain selected by the validation signal.

1 2. The process according to claim 1 further comprising:
2 forming histograms along coordinate axes for the pixels within the
3 classes selected by the classifier within each domain selected by the validation
4 signal; and forming a composite signal corresponding to the spatial position of
5 such pixels within the frame.

1 3. The process according to claim 1 comprising identifying the
2 velocity of movement of an area of an input signal, the input signal comprising a
3 succession of frames, each frame comprising a succession of pixels, said
4 identifying of the velocity of movement comprising:
5 for each particular pixel of the input signal, forming a first matrix
6 comprising binary values indicating the existence or non-existence of a
7 significant variation in the amplitude of the pixel signal between the current
8 frame and a prior frame for a subset of the pixels of the frame spatially related
9 to such particular pixel, and a second matrix comprising the amplitude of such
10 variation;
11 determining in the first matrix whether the particular pixel and the pixels
12 along an oriented direction relative to the particular pixel have binary values of
13 a particular value representing significant variation, and, for such pixels,

14 determining in the second matrix whether, the amplitudes of the pixels along an
 15 oriented direction relative to the particular pixel vary in a known manner
 16 indicating movement of the pixel and the pixels along an oriented direction
 17 relative to the particular pixel, the amplitude of the variation along the oriented
 18 direction determining the velocity of movement of the particular pixel.

1 4. The process according to claim 3 further comprising:
 2 prior to determining the binary values for each pixel, smoothing each
 3 pixel of the input signal using a time constant for such pixel, thereby generating
 4 a smoothed input signal, the determination of the existence of a significant
 5 variation in the amplitude of the pixel being performed for each pixel of the
 6 smoothed input signal; and using the existence of a significant variation for a
 7 given pixel to modify the time constant for the pixel to be used in smoothing
 8 subsequent frames of the input signal.

1 5. A process according to claim 1 for identifying a non-moving
 2 area in an input signal, the input signal comprising a succession of frames,
 3 each frame comprising a succession of pixels, the process comprising
 4 forming histograms along coordinate axes for pixels of the input signal
 5 without significant variation between the current frame and a prior frame; and
 6 forming a composite signal corresponding to the spatial position of such
 7 pixels within the frame.

1 6. The process according to claim 2 or 5 further comprising
 2 identifying pixels falling within limits I_a, I_b, I_c, I_d in the histograms along the
 3 coordinate axes, and forming the composite signal from the pixels falling within
 4 such limits.

1 7. The process according to claim 4 further comprising:
 2 prior to the histogram forming step i) smoothing the input signal for each
 3 pixel thereof using a time constant for such pixel, thereby generating a
 4 smoothed input signal, and ii) determining for each pixel in the smoothed input
 5 signal a binary value corresponding to the non-existence of a significant
 6 variation in the amplitude of the pixel signal between the current frame and the
 7 immediately previous smoothed input frame.

1 8. The process according to claim 6 further comprising using
 2 the existence of a significant variation for a given pixel to modify the time

3 constant for the pixel to be used in smoothing subsequent frames of the input
4 signal.

1 9. A process according to claim 1 comprising identifying
2 relative movement in an input signal, the input signal comprising a succession
3 of frames, each frame comprising a succession of pixels, wherein the
4 identifying of relative movement comprises:

5 for each pixel of the input signal, smoothing the input signal using a time
6 constant for such pixel, thereby generating a smoothed input signal;

7 determining for each pixel in the smoothed input signal a binary value
8 corresponding to the existence of a significant variation in the amplitude of the
9 pixel between the current frame and the immediately previous smoothed input
10 frame, and the amplitude of the variation:

11 using the existence of a significant variation for a given pixel, modifying
12 the time constant for the pixel to be used in smoothing subsequent frames of
13 the input signal; for each particular pixel of the input signal, forming a first
14 matrix comprising the binary values of a subset of the pixels of the frame
15 spatially related to such particular pixel, and a second matrix comprising the
16 amplitude of the variation of the subset of the pixels of the frame spatially
17 related to such particular pixel;

18 determining in the first matrix whether the particular pixel and the pixels
19 along an oriented direction relative to the particular pixel have binary values of
20 a particular value representing significant variation, and, for such pixels,
21 determining in the second matrix whether the amplitude of the pixels along the
22 oriented direction relative to the particular pixel varies in a known manner
23 indicating movement in the oriented direction of the particular pixel and the
24 pixels along the oriented direction relative to the particular pixel, the amplitude
25 of the variation of the pixels along the oriented direction determining the velocity
26 of movement of the pixel and the pixels along the oriented direction relative to
27 the particular pixel,

28 in each of one or more domains, forming a histogram of the values
29 distributed in the first and second matrices falling in each such domain,

30 for a particular domain, determining from the histogram for such domain
31 an area of significant variation;

32 forming histograms of the area of significant variation along coordinate
33 axes; and determining from the histograms along the coordinate axes, whether
34 there is an area in movement for the particular domain.

1 10. The process according to one of claims 1 and 9 wherein
2 the domains are selected from the group consisting of i) luminance, ii) speed
3 (V), iii) oriented direction (D1), iv) time constant (CO), v) hue, vi) saturation, vii)
4 first axis (x(m)), and viii) second axis (y(m)) and ix) data characterized by
5 external inputs.

1 11. The process according to claim 9 wherein the first and
2 second matrices are square matrices with the same odd number of rows and
3 columns, centered on the particular pixel.

1 12. The process according to claim 11 wherein the steps of
2 determining in the first matrix whether the particular pixel and the pixels along
3 an oriented direction relative to the particular pixel have binary values of a
4 particular value representing significant variation, and the step of determining in
5 the second matrix whether the amplitude signal varies in a predetermined
6 criteria along an oriented direction relative to the particular pixel, comprise
7 applying nested $n \times n$ matrices, where n is odd, centered on the particular pixel
8 to the pixels within each of the first and second matrices, the process further
9 comprising:
10 determining the smallest nested matrix in which the amplitude signal
11 varies of predetermined values symmetrical relative to the particular pixel along
12 an oriented direction around said particular pixel.

1 13. The process according to claim 9 wherein the first and
2 second matrices are hexagonal matrices centered on the particular pixel.

1 14. The process according to claim 13 wherein the steps of
2 determining in the first matrix whether the particular pixel and the pixels along
3 an oriented direction relative to the particular pixel have binary values of a
4 particular value representing significant variation, and the step of determining in
5 the second matrix whether the amplitude signal varies in a predetermined
6 criteria along an oriented direction relative to the particular pixel, comprise
7 applying nested hexagonal matrices of varying size centered on the particular
8 pixel to the pixels within each of the first and second matrices, the process
9 further comprising
10 determining the smallest nested matrix in which the amplitude signal
11 varies of predetermined values symmetrical relative to the particular pixel along

12 an oriented direction around said particular pixel.

1 15. The process according to claim 9 wherein the first and
2 second matrices are inverted L-shaped matrices with a single row and a single
3 column.

1 16. The process according to claim 15 wherein the steps of
2 determining in the first matrix whether the particular pixel and the pixels along
3 an oriented direction relative to the particular pixel have binary values of a
4 particular value representing significant variation, and the step of determining in
5 the second matrix whether the amplitude signal varies in a predetermined
6 criteria along an oriented direction relative to the particular pixel, comprise
7 applying nested $n \times n$ matrices, where n is odd, to the single line and the single
8 column to determine the smallest matrix in which the amplitude varies on a line
9 with the steepest slope and constant quantification.

1 17. The process according to claim 9 wherein the first and
2 second matrices are angular sector shaped matrices reproducing a portion of
3 an eye.

1 18. The process according to claim 17 wherein the steps of
2 determining in the first matrix whether the particular pixel and the pixels along
3 an oriented direction relative to the particular pixel have binary values of a
4 particular value representing significant variation, and the step of determining in
5 the second matrix whether the amplitude signal varies in a predetermined
6 criteria along an oriented direction relative to the particular pixel, comprise
7 applying nested angular sector shaped matrices of varying size centered on the
8 particular pixel to the pixels within each of the first and second matrices, the
9 process further comprising
10 determining the smallest nested matrix in which the amplitude signal
11 varies of predetermined values symmetrical relative to the particular pixel along
12 an oriented direction around said particular pixel.

1 19. The process according to claim 9 wherein the time constant
2 is in the form 2^p , the time constant being reduced or increased by incrementing
3 or decrementing p .

1 20. The process according to claim 19 wherein successive

2 decreasing portions of complete frames of the input signal are considered using
 3 a Mallat time-scale algorithm and the largest of these portions, which provides
 4 displacement, speed and orientation indications compatible with the value of p,
 5 is selected.

1 21. The process according to claim 4, comprising:
 2 for each pixel of the input signal, i) smoothing the pixel using a time
 3 constant (CO) for such pixel, thereby generating a smoothed pixel value (LO),
 4 ii) determining whether there exists a significant variation between such pixel
 5 and the same pixel in a previous frame, and iii) modifying the time constant
 6 (CO) for such pixel to be used in smoothing the pixel in subsequent frames of
 7 the input signal based upon the existence or non-existence of a significant
 8 variation.

1 22. The process according to claim 21 wherein:
 2 (a) the step of determining the existence of a significant variation for a
 3 given pixel comprises determining whether the absolute value of the difference
 4 (AB) between the given pixel value (PI) and the value of such pixel in a
 5 smoothed prior frame (L1) exceeds a threshold (SE); and
 6 (b) the step of smoothing the input signal comprises, for each pixel, i)
 7 modifying a time constant (CO) for pixel such based upon the existence of a
 8 significant variation as determined in step (a), and ii) determining a smoothed
 9 value for the pixel (LO) as follows:

10

$$11 \quad LO = LI + \frac{PI - LI}{CO}$$

12

1 23. The process according to claim 21 wherein the time
 2 constant (CO) is in the form 2^p , and wherein p is incremented in the event that
 3 $AB < SE$, and wherein p is decremented in the event $AB \geq SE$.

1 24. The process according to claim 23 wherein p is
 2 incremented or decremented by one. 25.

3 The process according to claim 22 further comprising generating an
 4 output signal comprising, for each pixel, a binary value (DP) indicating the
 5 existence or nonexistence of a significant variation, and the value of the time
 6 constant (CO).

1 25. The process according to claim 24 wherein the binary
2 values (DP) and the time constants (CO) are stored in a memory sized to
3 correspond to the frame size.

1 26. The process according to claim 1 comprising identifying an
2 area in relative movement in said input signal, through:
3 generating a first array indicative of the existence of significant variation
4 in the magnitude of each pixel between a current frame and a prior frame;
5 generating a second array indicative of the magnitude of significant
6 variation of each pixel between the current frame and a prior frame,
7 establishing a first moving matrix centered on a pixel under consideration and
8 comprising pixels spatially related to the pixel under consideration, the first
9 moving matrix traversing the first array for consideration of each pixel of the
10 current frame; and
11 determining whether the pixel under consideration and each pixel of the
12 pixels spatially related to the pixel under consideration along an oriented
13 direction relative thereto within the first matrix are a particular value
14 representing the presence of significant variation, and if so, establishing in a
15 second matrix within the first matrix, centered on the pixel under consideration,
16 and determining whether the amplitude of the pixels in the second matrix
17 spatially related to the pixel under consideration along an oriented direction
18 relative thereto are indicative of movement along such oriented direction, the
19 amplitude of the variation along the oriented direction being indicative of the
20 velocity of movement, the size of the second matrix being varied to identify the
21 matrix size most indicative of movement.

1 27. The process according to claim 26 further comprising:
2 in at least one domain selected from the group consisting of i)
3 luminance, ii) speed (V), iii) oriented direction (D1), iv) time constant (CO), v)
4 hue, vi) saturation, and vii) first axis (x(m)), and viii) second axis (y(m)), and ix)
5 data characterized by external inputs, forming at least one histogram of the
6 values in such domain for pixels indicative of movement along an oriented
7 direction relative to the pixel under consideration.

1 28. The process according to claim 27 further comprising:
2 for the pixels in said at least one histogram, forming histograms of the
3 position of such pixels along coordinate axes.

1 29. The process according to claim 28 further comprising
2 determining from the histograms along the coordinate axes an area of the
3 image meeting criteria of the at least one domain.

1 30. The process according to claim 26 wherein the first and
2 second matrices are square, and the sizes of the second matrix are nested $n \times$
3 n matrices, where n is odd.

1 31. The process according to claim 30 wherein the matrix most
2 indicative of movement is the smallest nested matrix containing pixels indicative
3 of movement along an oriented direction relative to the pixel under
4 consideration.

1 32. The process according to claim 26 wherein the first and
2 second matrices are selected from the group consisting of hexagonal matrices
3 and inverted L-shaped matrices.

1 33. An apparatus for identifying pixels in an input signal in one
2 of a plurality of classes in one of a plurality of domains, the input signal
3 comprising a succession of frames, each frame comprising a succession of
4 pixels, the apparatus comprising:
5 means for analyzing each pixel of the input signal and for providing an
6 output signal for each domain containing information to identify each domain in
7 which the pixel is classified;
8 a classifier for each domain, the classifier classifying pixels within each
9 domain in selected classes within the domain;
10 a linear combination unit for each domain, the linear combination unit
11 generating a validation signal for the domain, the validation signal selecting one
12 or more of the plurality of domains for processing; and
13 means for forming a histogram for pixels of the output signal within the
14 classes selected by the classifier within each domain selected by the validation
15 signal.

1 34. The apparatus according to claim 34 further comprising:
2 means for forming histograms along coordinate axes for the pixels within
3 the classes selected by the classifier within each domain selected by the
4 validation signal; and
5 means for forming a composite signal corresponding to the spatial

6 position of such pixels within the frame.

1 35. he apparatus according to claim 33 wherein the domains
2 are selected from the groups consisting of i) luminance, ii) speed (V), iii)
3 oriented direction (DI), iv) time constant (CO), v) hue, vi) saturation, and vii) first
4 axis (x(m)), and viii) second axis (y(m)) and ix) data characterized by external
5 inputs.

1 36. The apparatus according to claim 33 for identifying the
2 velocity of movement of an area of an input signal, the input signal comprising a
3 succession of frames, each frame comprising a succession of pixels the
4 apparatus, comprising:

5 means for determining for each pixel in the input signal a binary value
6 corresponding to the existence of a significant variation in the amplitude of the
7 pixel signal between the current frame and the immediately previous smoothed
8 input frame, and for determining the amplitude of the variation;

9 means for forming, for each particular pixel of the input signal, a first
10 matrix comprising the binary values of a subset of the pixels spatially related to
11 such particular pixel, and a second matrix comprising the amplitude of the
12 variation of the subset of the pixels spatially related to such particular pixel; and

13 means for determining in the first matrix whether for a particular pixel,
14 and other pixels along an oriented direction relative to the particular pixel, the
15 binary value for each pixel is a particular value representing significant
16 variation, and, for such particular pixel and other pixels, determining in the
17 second matrix whether the amplitude varies along an oriented direction relative
18 to the particular pixel in a known manner indicating movement of the pixel and
19 the other pixels, the amplitude of the variation along the oriented direction
20 determining the velocity of movement of the pixel and the other pixels.

1 37. The apparatus according to claim 36 further comprising
2 means for smoothing each pixel of the input signal using a time constant for
3 such pixel prior to determining a binary value for each pixel, the binary values
4 being determined on the smoothed pixels.

1 38. The apparatus according to claim 33 for identifying a non-
2 moving area in an input signal, the input signal comprising a succession of
3 frames, each frame comprising a succession of pixels, the apparatus
4 comprising:

5 means for forming histograms along coordinate axes for pixels of a
6 current frame without a significant variation from such pixels in a prior frame;
7 and

8 means for forming a composite signal corresponding to the spatial
9 position of such pixels within the frame.

1 39. The apparatus according to any one of claims 33 and 38
2 further comprising means for identifying pixels falling within limits I_a, I_b, I_c, I_d in the
3 histograms along the coordinate axes, and forming the composite signal from
4 the pixels falling within such limits.

1 40. The apparatus according to claim 38 further comprising:
2 means for smoothing the input signal using a time constant for each
3 pixel, thereby generating a smoothed input signal; and
4 means for determining for each pixel in the smoothed input signal a
5 binary value corresponding to the existence or non-existence of the significant
6 variation in the amplitude of the pixel signal between the current frame and the
7 immediately previous smoothed input frame.

1 41. The apparatus according to claim 40 further comprising
2 means for using the existence of a significant variation for a given pixel to
3 modify the time constant for the pixel to be used in smoothing subsequent
4 frames of the input signal.

1 42. A process according to any one of claims 1-32 for tracking
2 a target in an input signal, the input signal comprising a succession of frames,
3 each frame comprising a succession of pixels, the target comprising pixels in
4 one or more of a plurality of classes in one or more of a plurality of domains, the
5 process comprising:
6 selecting a pixel of the target as a starting pixel;
7 on a frame-by-frame basis:
8 forming a tracking box around the starting pixel and for each pixel of the
9 input signal in the tracking box forming a histogram of the pixels in the one or
10 more of a plurality of classes in the one or more of a plurality of domains;
11 successively increasing the size of the tracking box and for each pixel of
12 the input signal, in each successive tracking box forming a histogram of the
13 pixels in the one or more of a plurality of classes in the one or more of a
14 plurality of domains;

15 determining when the target is substantially within the tracking box,
16 stopping the size increasing of said tracking box, and adjusting the center of the
17 tracking box based upon the histograms.

1 43. A process of tracking a target in an input signal, the input
2 signal comprising a succession of frames, each frame comprising a succession
3 of pixels, the target comprising pixels in one or more of a plurality of classes in
4 one or more of a plurality of domains, the process comprising, on a frame-by-
5 frame basis: forming at least one histogram of the pixels in the one or more of a
6 plurality of classes in the one or more of a plurality of domains, said at least one
7 histogram referring to classes defining said target, and identifying the target
8 from said at least one histogram.

1 44. The process according to claim 43 further comprising
2 drawing a tracking box around the target.

1 45. The process according to claims 42 and 44, comprising
2 centering the tracking box relative to the optical axis of the image.

1 46. The apparatus according any one of claims 32-41,
2 comprising a histogram formation block forming histograms of speed, a memory
3 storing up to the number of pixels in an image, multiplexors controlling setting
4 an clearing of said memory, a classifier enabling only data having selected
5 classification criteria to be considered further, meaning to possibly be included
6 in histograms formed by corresponding histogram formation block.

1 47. The apparatus of claim 46 wherein the classifier includes a
2 register that enables the classification criteria to be set by the user or by a
3 separate program.

1 48. The apparatus according to claim 46, comprising a
2 computing unit for comprising the key characteristics for histograms formed in
3 said memory said computing unit including memories for each of the key
4 characteristics which include the minimum (MIN) of the histogram, the
5 maximum (MAX) of the histogram, the number of points (NBPTS) in the
6 histogram, the position (POSRMAX) of the maximum of the histogram and the
7 number of points (RMAX) at the maximum of the histogram.

1 49. The apparatus according to claims 46-48 further

2 comprising an adder incrementing output of said memory, said adder being
3 controlled by a validation signal from a corresponding validation unit receiving
4 via a bus the output of said classifier so as to select only data points in any
5 selected classes within any selected domains.

1 50. The process according to claims 42-45 comprising
2 calculating a histogram according to a projection axis in a region delimited by
3 an associated classifier, between two points on the projection axis, creating a
4 histogram of the same points with orientation and intensity of motion as input
5 parameters and modifying the values corresponding to said two points of the
6 classifier and calculate an anticipated next frame.

ABSTRACT OF THE DISCLOSURE

IMAGE PROCESSING APPARATUS AND METHOD

5 A method and apparatus for localizing an area in relative movement and for determining the speed and direction thereof in real time is disclosed. Each pixel of an image is smoothed using its own time constant. A binary value corresponding to the existence of a significant variation in the amplitude of the smoothed pixel from the prior frame, and the amplitude of the variation, are
10 determined, and the time constant for the pixel is updated. For each particular pixel, two matrices are formed that include a subset of the pixels spatially related to the particular pixel. The first matrix contains the binary values of the subset of pixels. The second matrix contains the amplitude of the variation of the subset of pixels. In the first matrix, it is determined whether the pixels along
15 an oriented direction relative to the particular pixel have binary values representative of significant variation, and, for such pixels, it is determined in the second matrix whether the amplitude of these pixels varies in a known manner indicating movement in the oriented direction. In each of several domains, histogram of the values in the first and second matrices falling in such
20 domain is formed. Using the histograms, it is determined whether there is an area having the characteristics of the particular domain. The domains include luminance, hue, saturation, speed (V), oriented direction (D1), time constant (CO), first axis (x(m)), and second axis (y(m)).

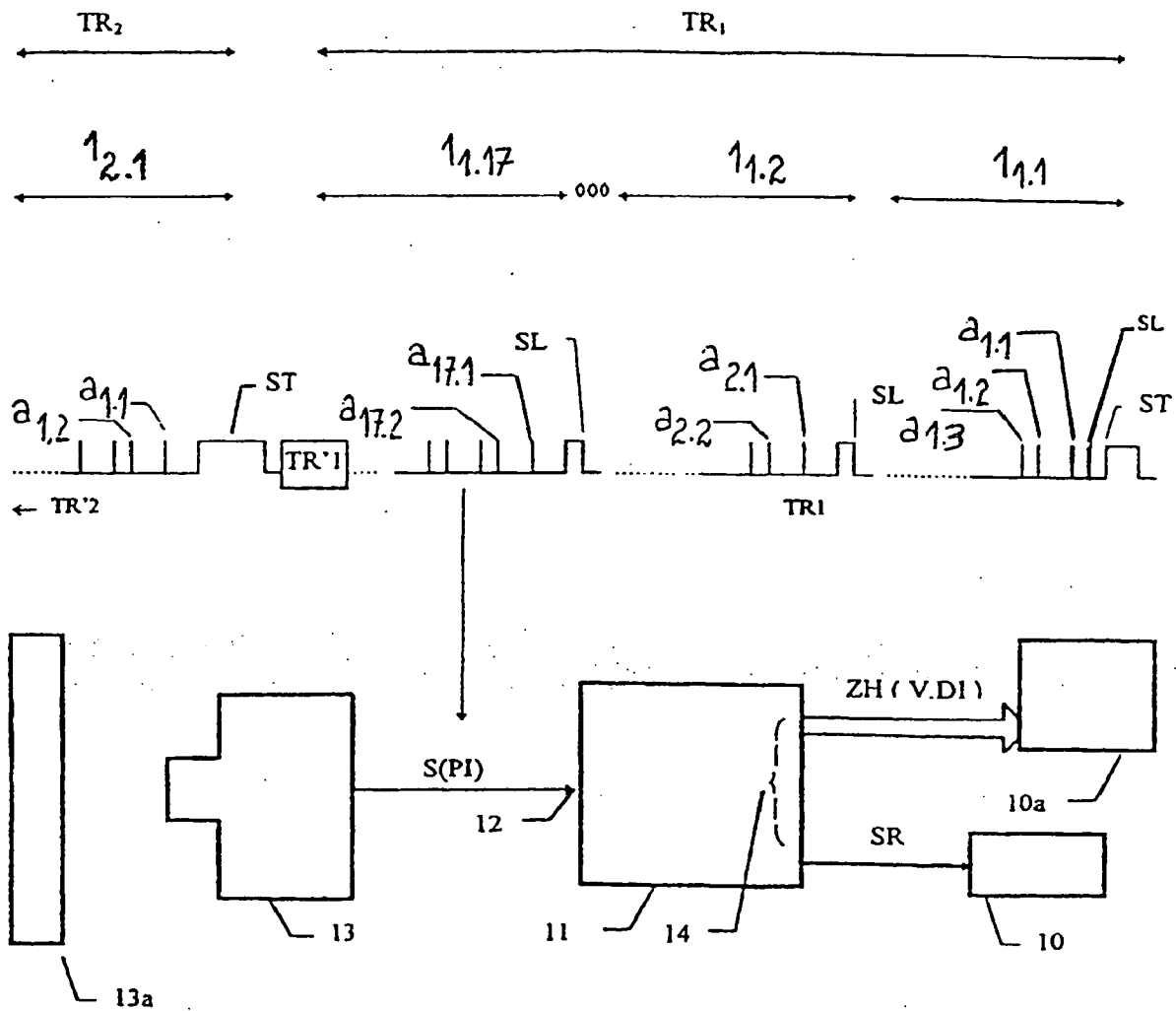


FIG. 1

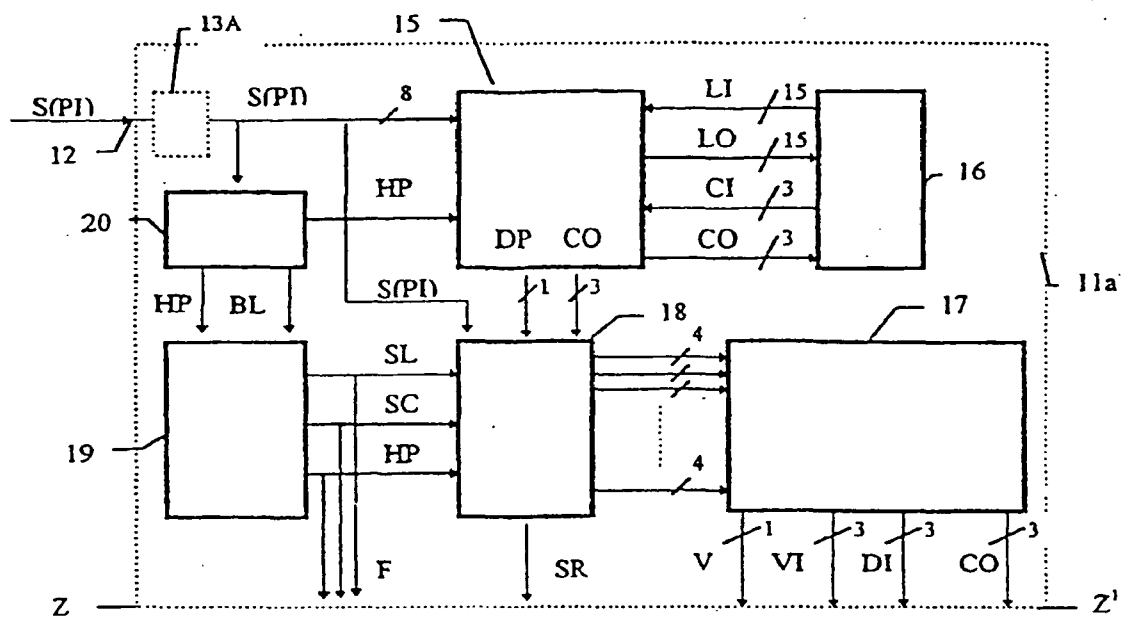


FIG. 2

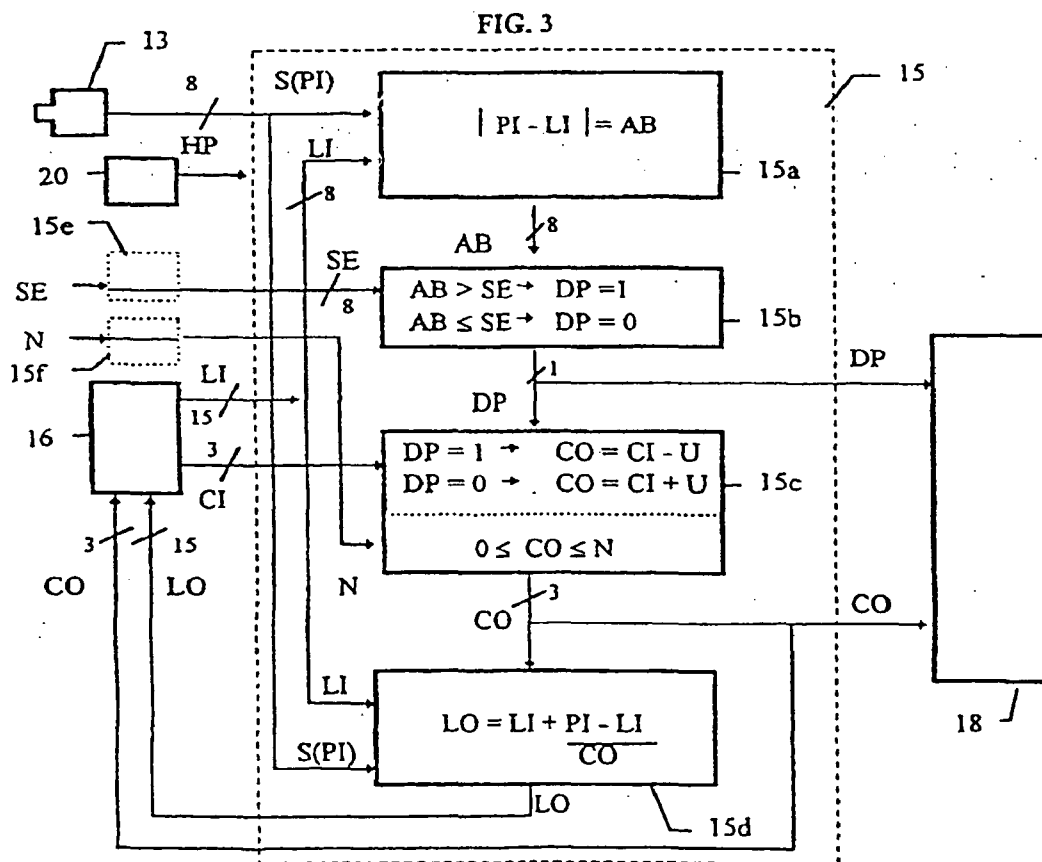


FIG. 3

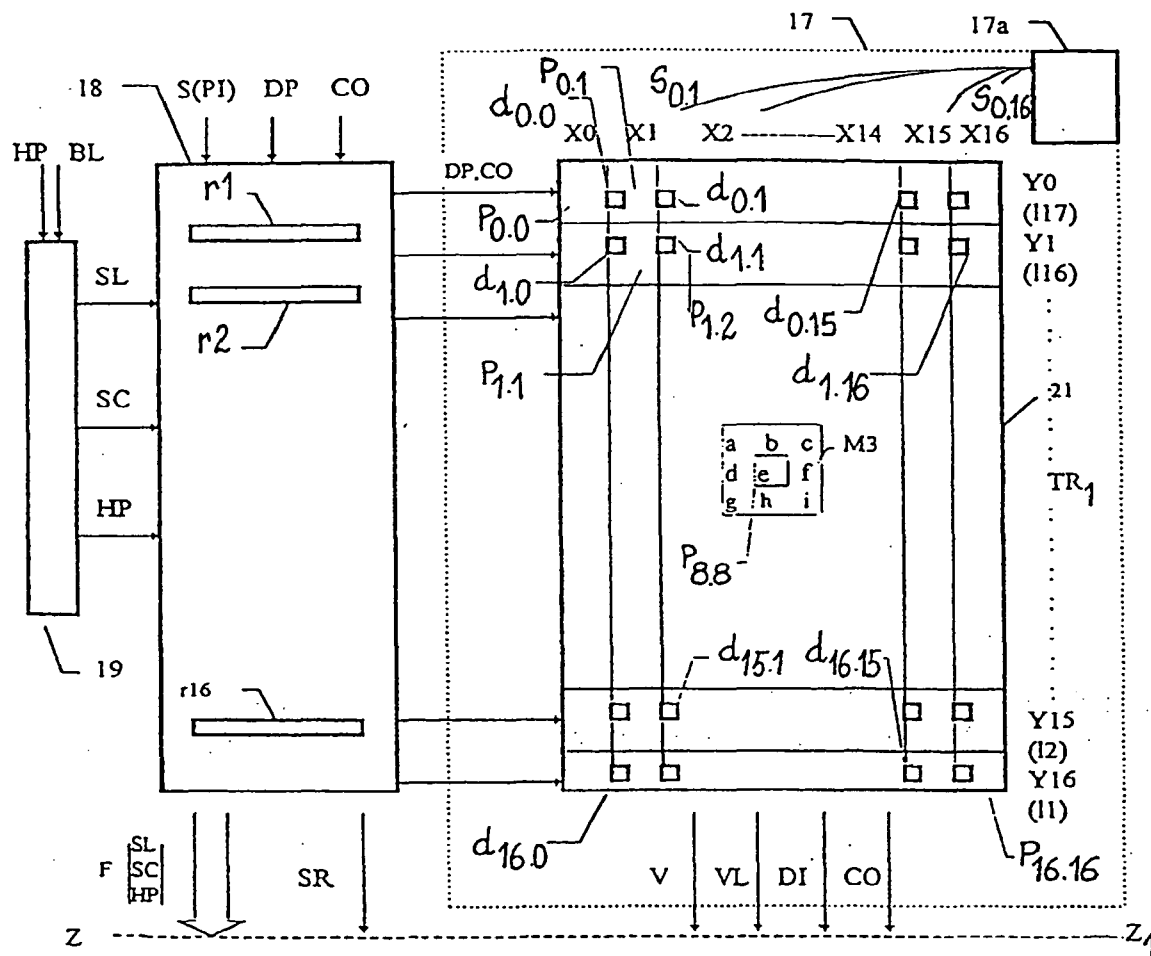


FIG. 4

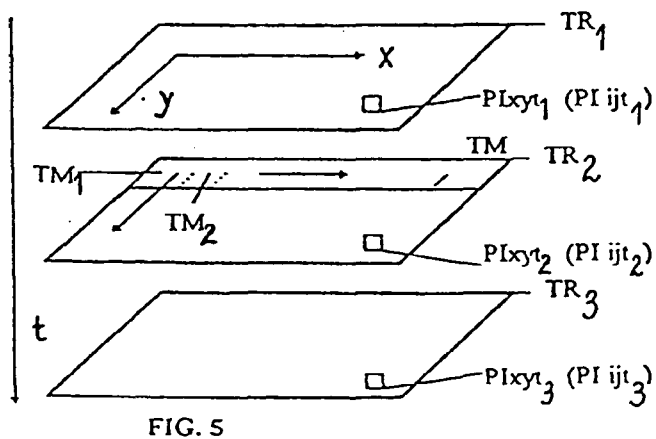


FIG. 5

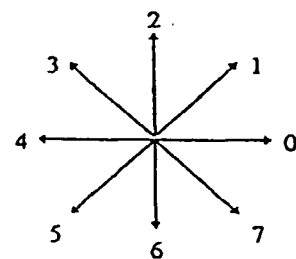


FIG. 6

FIG. 7

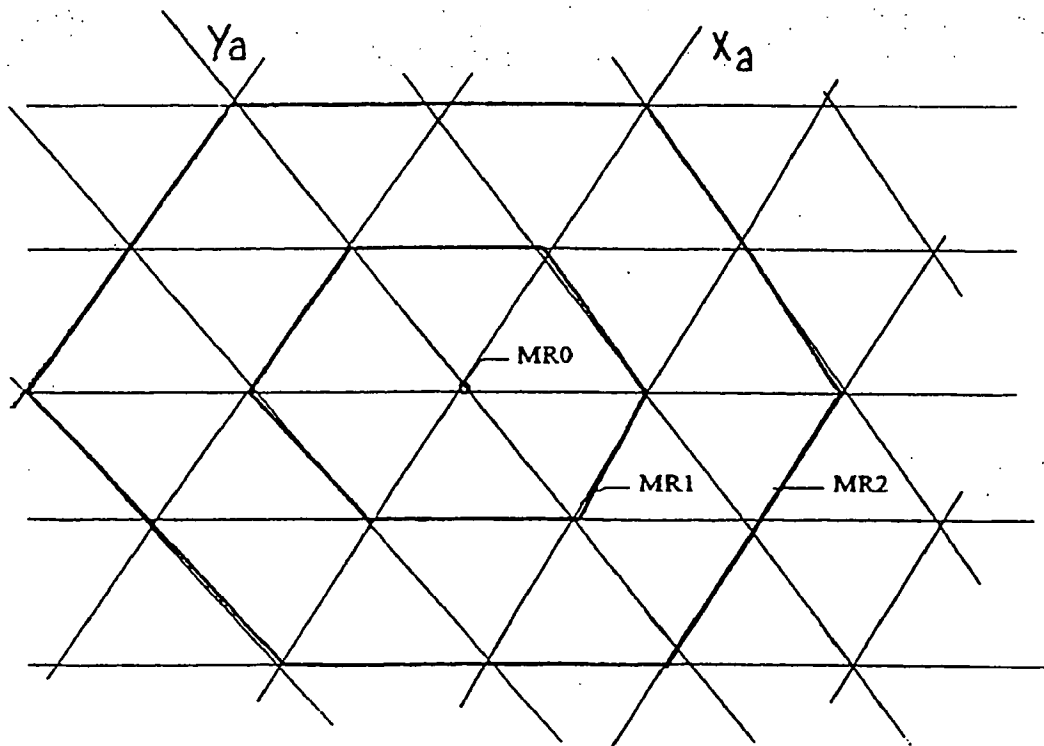
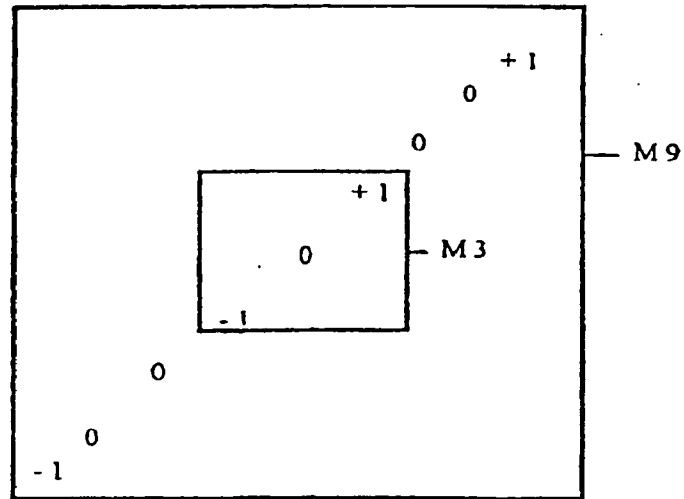


FIG. 8

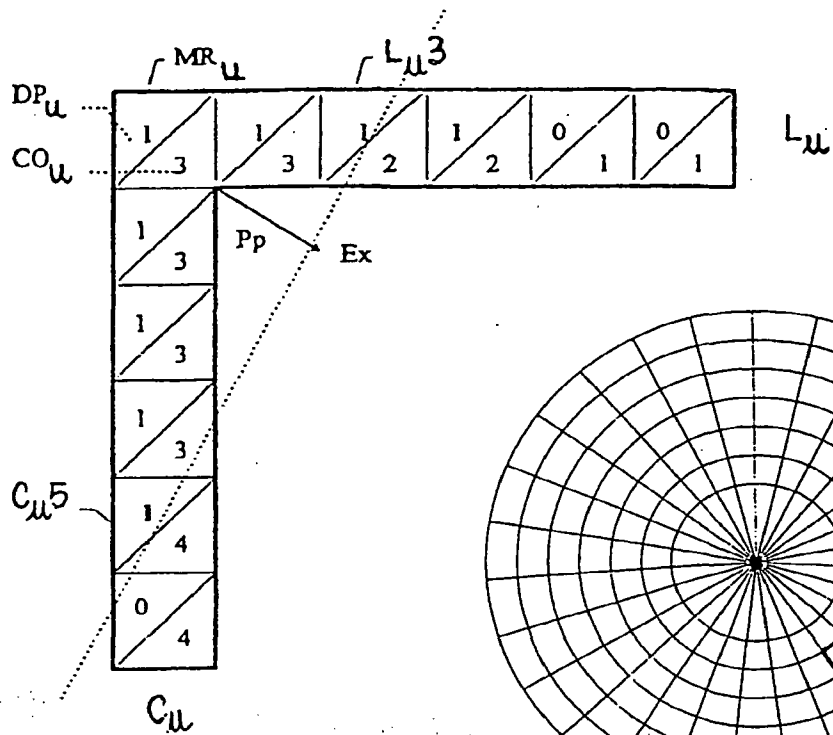


FIG. 9

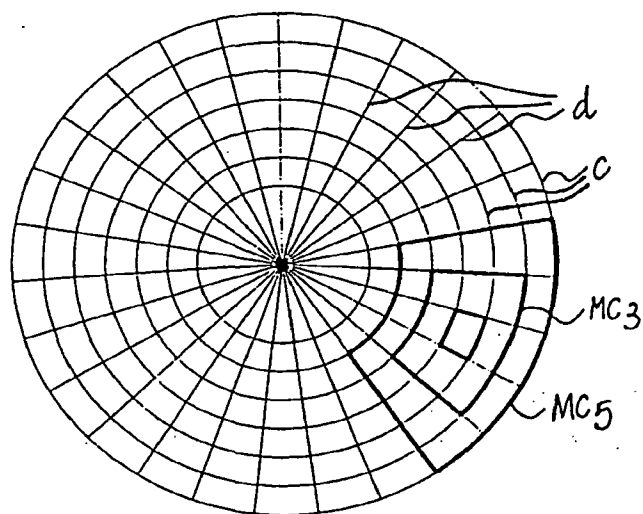


FIG. 9a

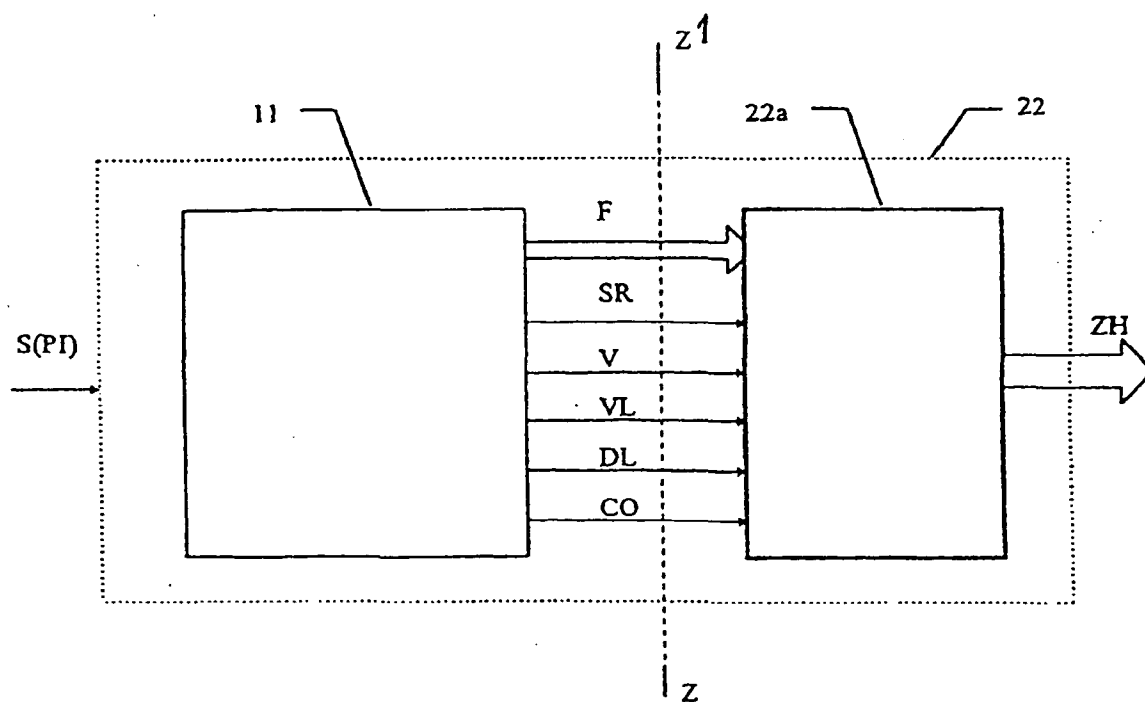


FIG. 10

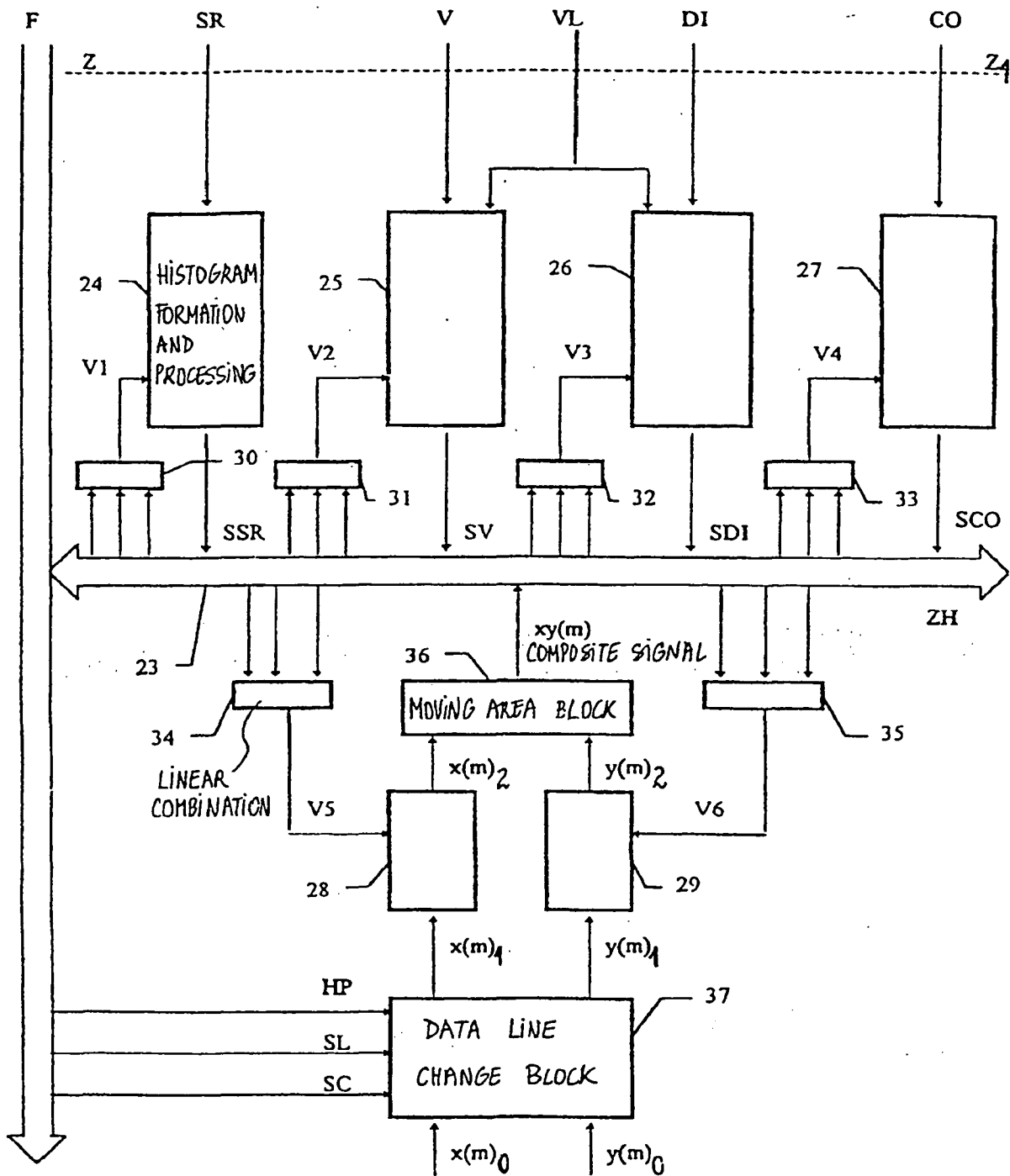


FIG. 11

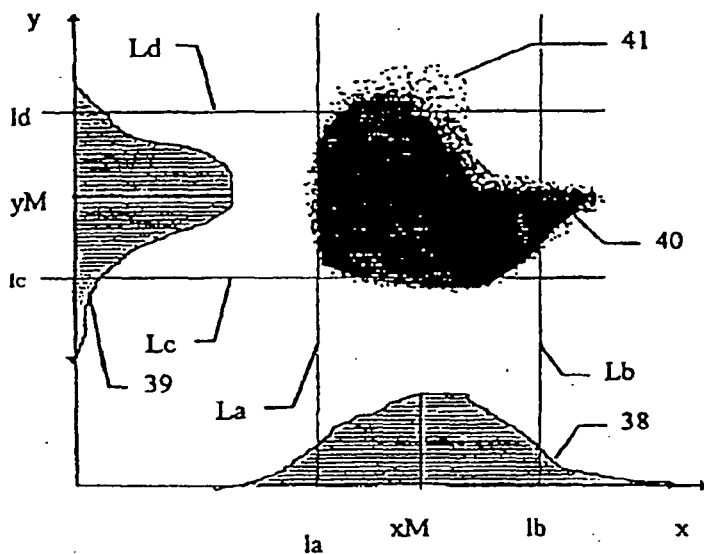


FIG. 12

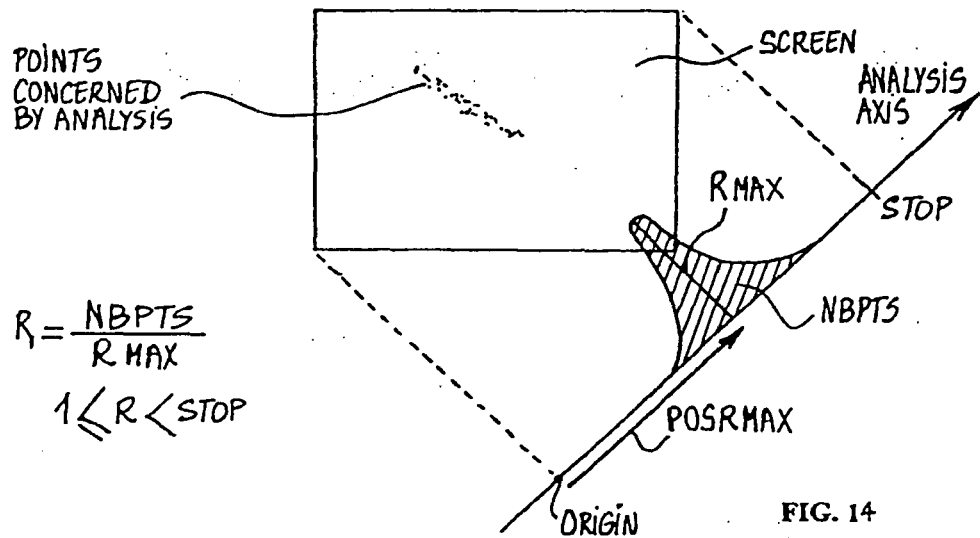


FIG. 14

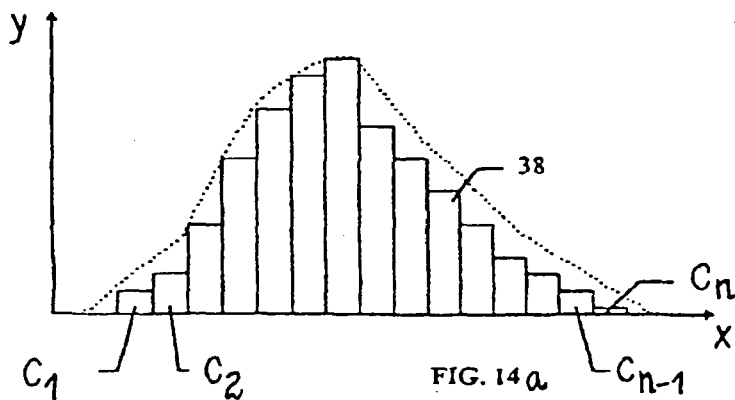


FIG. 14a



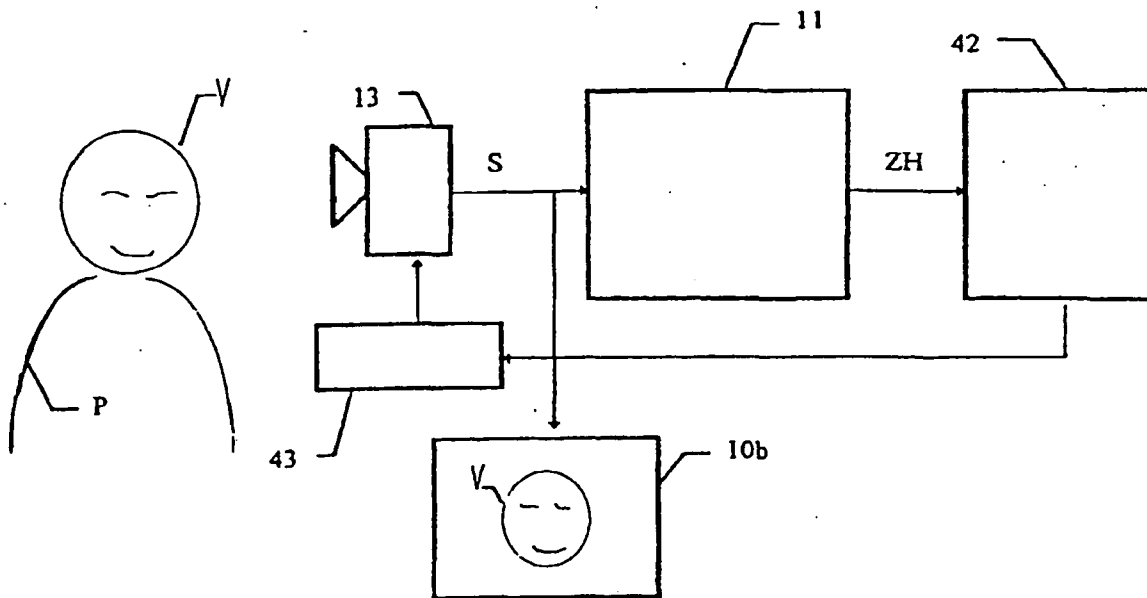


FIG.15

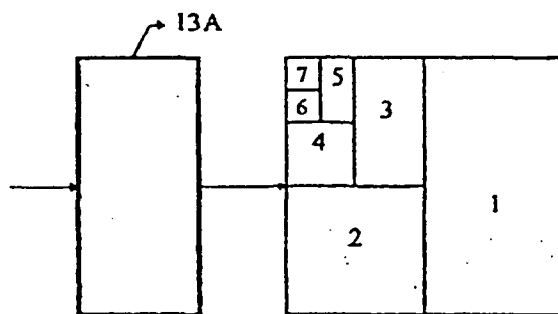


FIG.24

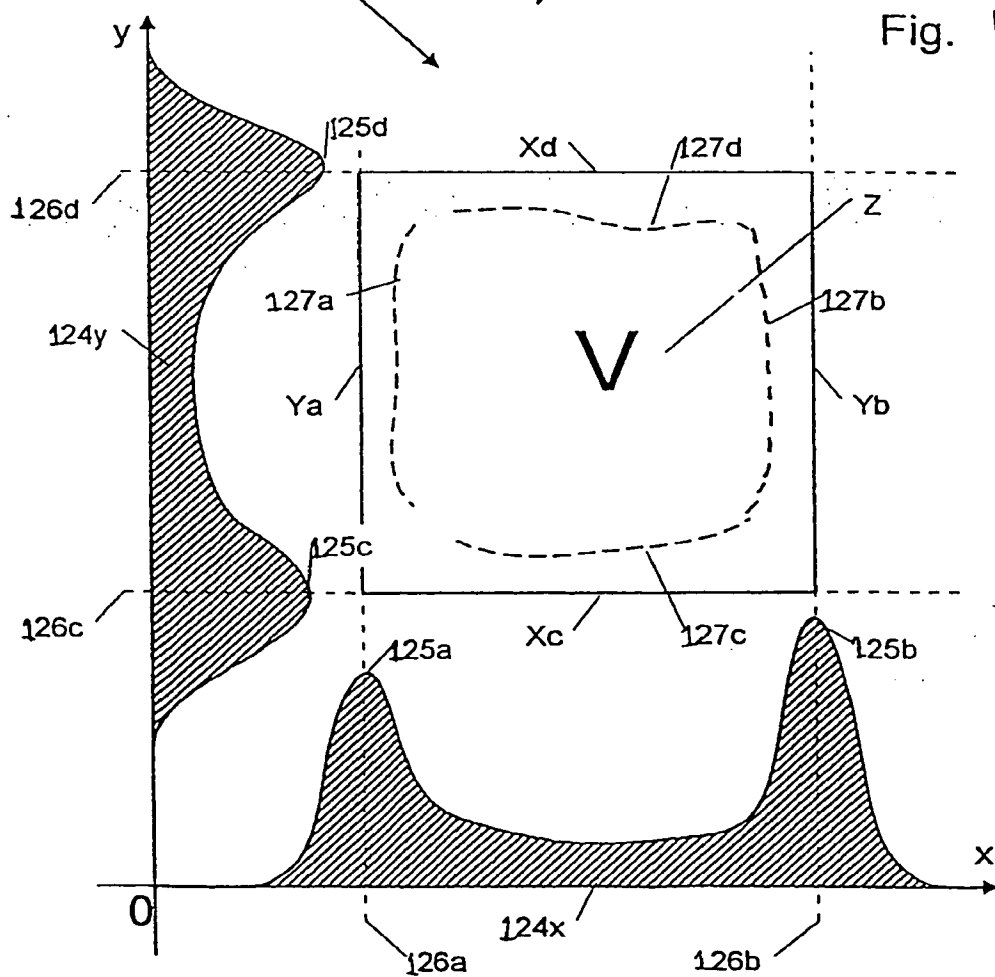
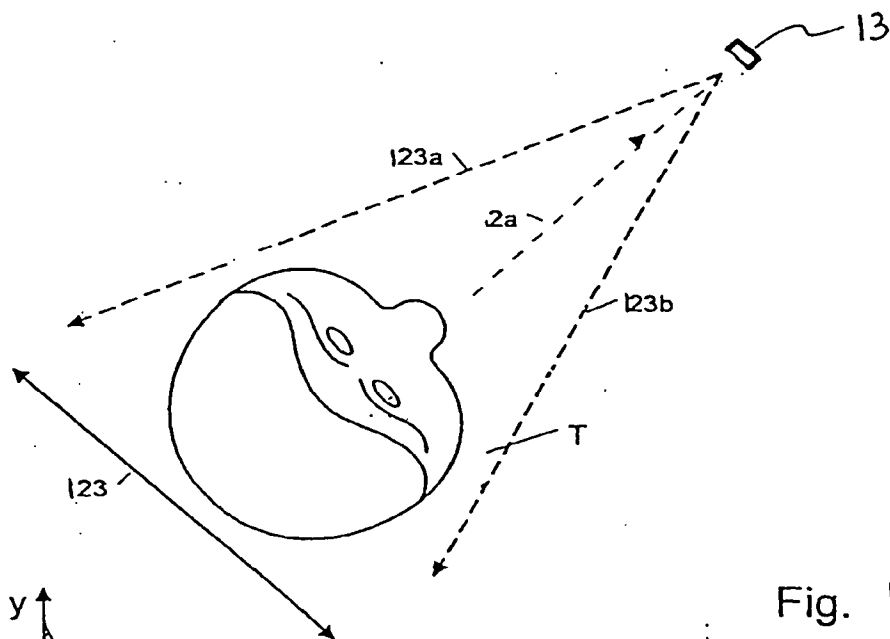


FIG. 19

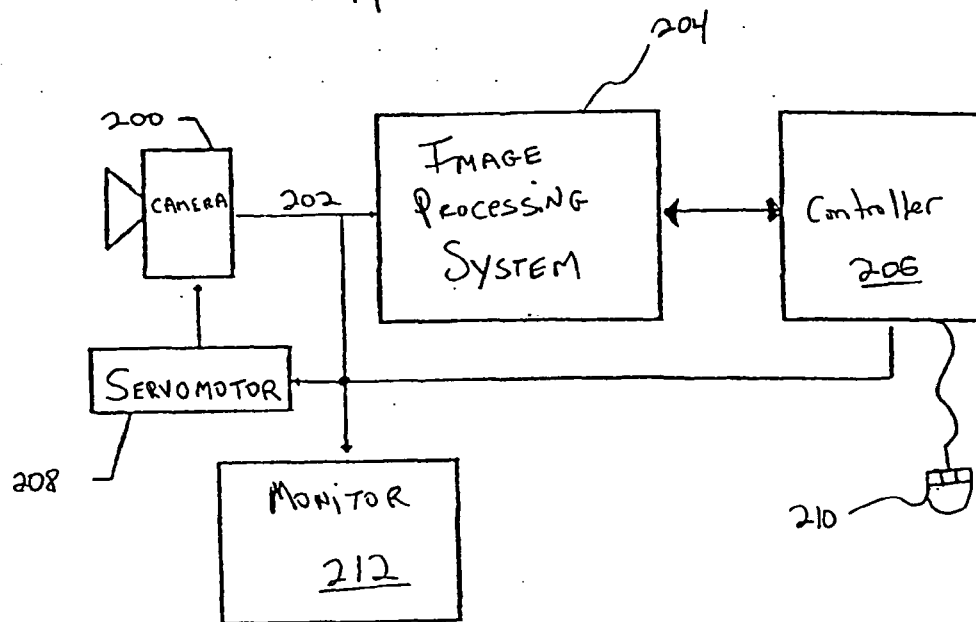
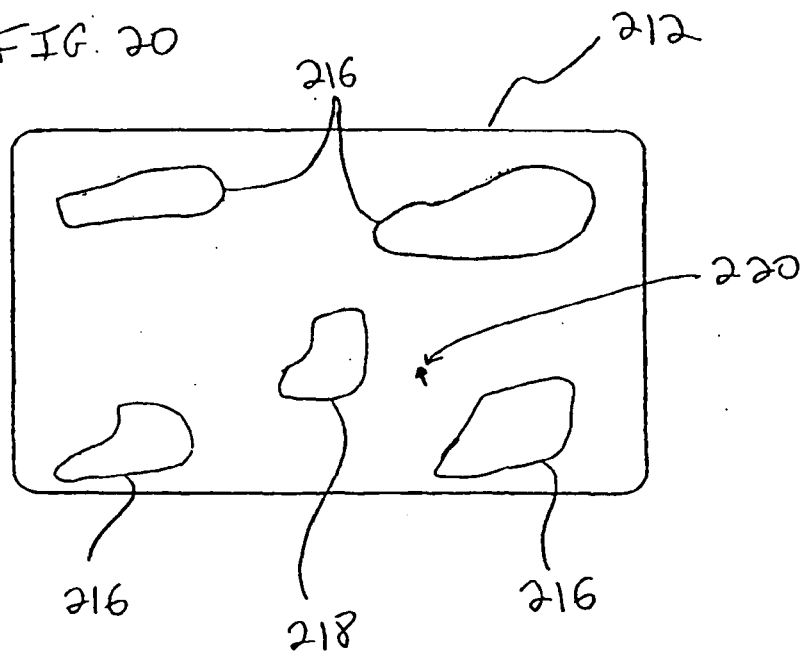
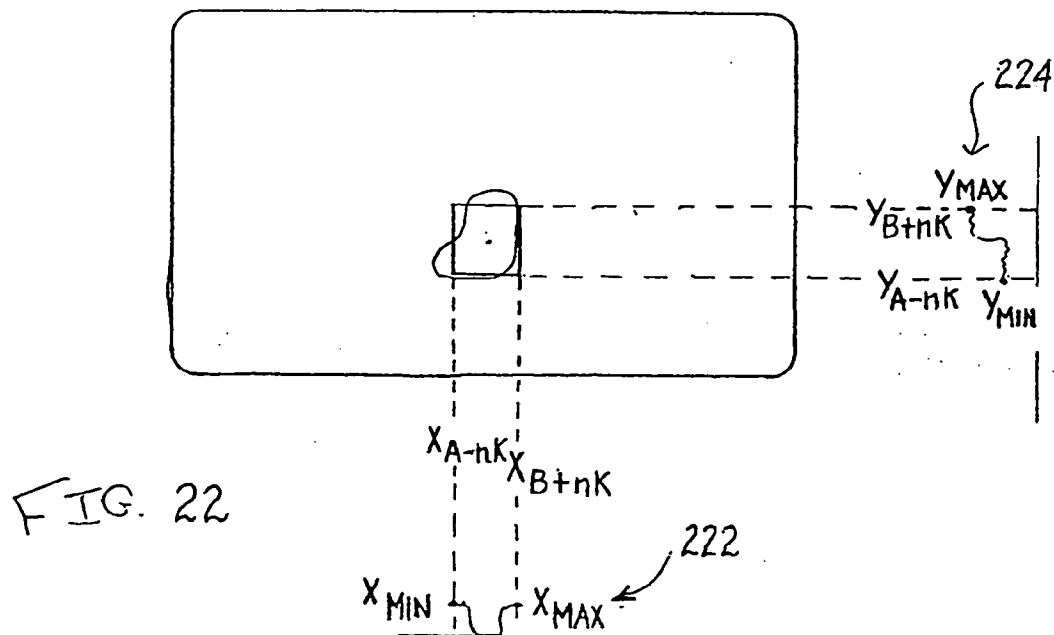
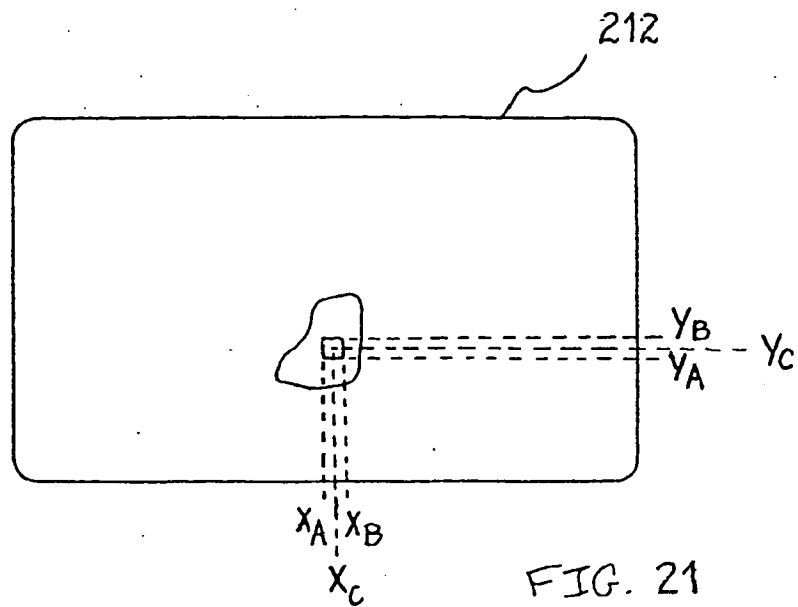
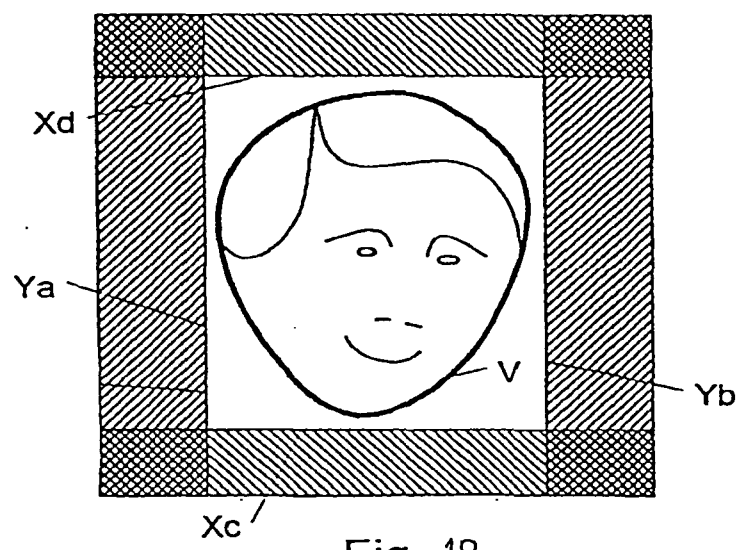
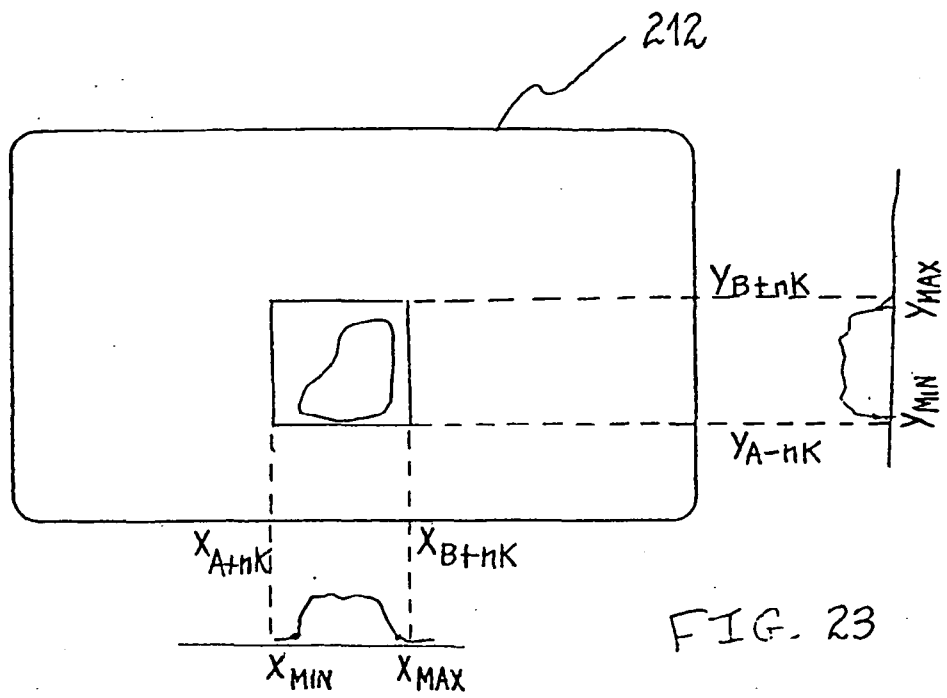


FIG. 20







Electronic Patent Application Fee Transmittal

Application Number:				
Filing Date:				
Title of Invention:	IMAGE PROCESSING METHOD			
First Named Inventor/Applicant Name:	PATRICK PIRIM			
Filer:	Gregory A. Nelson/TJ FATUM			
Attorney Docket Number:	8042-2-2			
Filed as Small Entity				
Utility under 35 USC 111(a) Filing Fees				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Utility filing Fee (Electronic filing)	4011	1	82	82
Utility Search Fee	2111	1	270	270
Utility Examination Fee	2311	1	110	110
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				462

Electronic Acknowledgement Receipt

EFS ID:	6469811
Application Number:	12620092
International Application Number:	
Confirmation Number:	9882
Title of Invention:	IMAGE PROCESSING METHOD
First Named Inventor/Applicant Name:	PATRICK PIRIM
Customer Number:	86002
Filer:	Gregory A. Nelson/TJ FATUM
Filer Authorized By:	Gregory A. Nelson
Attorney Docket Number:	8042-2-2
Receipt Date:	17-NOV-2009
Filing Date:	
Time Stamp:	15:29:31
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	\$462
RAM confirmation Number	2248
Deposit Account	141437
Authorized User	LEFKOWITZ,GREGORY

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Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)

SAMSUNG EXHIBIT 1004

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		8042-2-2_TRANS_111709.pdf	1795054 90ed8b78dfb946d33c3d2fa1d02ec04878b1e86d	yes	12

Multipart Description/PDF files in .zip description

Document Description	Start	End
Transmittal of New Application	1	1
Application Data Sheet	2	2
Oath or Declaration filed	3	3
Preliminary Amendment	4	4
Specification	5	5
Claims	6	6
Applicant Arguments/Remarks Made in an Amendment	7	7
Transmittal Letter	8	9
Information Disclosure Statement (IDS) Filed (SB/08)	10	12

Warnings:

Information:

2		8042-2-2_APPLN_111709.pdf	8091330 73576e510739e165c202ae49c48eda1989604a36	yes	51
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Multipart Description/PDF files in .zip description

Document Description	Start	End
Specification	1	38
Claims	39	50
Abstract	51	51

Warnings:					
Information:					
3	Drawings-other than black and white line drawings	8042-2-2_FIGS_111709.pdf	1099345 afe05053150c89cd71c63dd0d658f68e78cc0aed	no	13
Warnings:					
Information:					
4	Fee Worksheet (PTO-875)	fee-info.pdf	32755 d95e013bd0218a5feaeabc4d10da46083a127b547	no	2
Warnings:					
Information:					
Total Files Size (in bytes):			11018484		
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SCORE Placeholder Sheet for IFW Content

Application Number: 12620092

Document Date: 11/17/09

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Date: 11/17/09

Approved for use through 7/31/2006. OMB 0651-0032

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number

12/620,092**APPLICATION AS FILED – PART I**

(Column 1)

(Column 2)

FOR	NUMBER FILED	NUMBER EXTRA
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A
TOTAL CLAIMS (37 CFR 1.16(i))	4 minus 20 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1 minus 3 =	*
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$260 (\$130 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR	
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))		

SMALL ENTITY

OR

OTHER THAN SMALL ENTITY

RATE (\$)	FEE (\$)
N/A	82
N/A	270
N/A	110
x\$26	
x\$110	
195	
TOTAL	462

OR

RATE (\$)	FEE (\$)
N/A	
N/A	
N/A	
x\$52	
x\$220	
390	
TOTAL	

* If the difference in column 1 is less than zero, enter "0" in column 2.

APPLICATION AS AMENDED – PART II

(Column 1)

(Column 2)

(Column 3)

AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total (37 CFR 1.16(i))	*	Minus **	=
Independent (37 CFR 1.16(h))	*	Minus ***	=
Application Size Fee (37 CFR 1.16(s))			
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))			

SMALL ENTITY

OR

OTHER THAN SMALL ENTITY

RATE (\$)	ADDITIONAL FEE (\$)
X =	
X =	
N/A	
TOTAL ADD'T FEE	

OR

RATE (\$)	ADDITIONAL FEE (\$)
X =	
X =	
N/A	
TOTAL ADD'T FEE	

(Column 1)

(Column 2)

(Column 3)

AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total (37 CFR 1.16(i))	*	Minus **	=
Independent (37 CFR 1.16(h))	*	Minus ***	=
Application Size Fee (37 CFR 1.16(s))			
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))			

RATE (\$)	ADDITIONAL FEE (\$)
X =	
X =	
N/A	
TOTAL ADD'T FEE	

OR

RATE (\$)	ADDITIONAL FEE (\$)
X =	
X =	
N/A	
TOTAL ADD'T FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875					Application or Docket Number 12/620,092		Filing Date 11/17/2009		<input type="checkbox"/> To be Mailed	
APPLICATION AS FILED – PART I										
(Column 1)			(Column 2)		SMALL ENTITY <input checked="" type="checkbox"/>		OR		OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE (\$)	FEE (\$)	RATE (\$)	FEE (\$)				
<input type="checkbox"/> BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A		N/A					
<input type="checkbox"/> SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A		N/A					
<input type="checkbox"/> EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A		N/A					
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X \$	=	OR	X \$	=			
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X \$	=		X \$	=			
<input type="checkbox"/> APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$250 (\$125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).									
<input type="checkbox"/> MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))										
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL				
APPLICATION AS AMENDED – PART II										
(Column 1)			(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY	
AMENDMENT	11/17/2009	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)	RATE (\$)	ADDITIONAL FEE (\$)		
Total (37 CFR 1.16(i))	* 4	Minus	** 20	= 0	X \$26 =	0	OR	X \$ =		
Independent (37 CFR 1.16(h))	* 1	Minus	*** 3	= 0	X \$110 =	0	OR	X \$ =		
<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))										
<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR			
					TOTAL ADD'L FEE	0	OR	TOTAL ADD'L FEE		
(Column 1)			(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY	
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)	RATE (\$)	ADDITIONAL FEE (\$)		
Total (37 CFR 1.16(i))	*	Minus	**	=	X \$ =		OR	X \$ =		
Independent (37 CFR 1.16(h))	*	Minus	***	=	X \$ =		OR	X \$ =		
<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))										
<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR			
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE		
<p>* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.</p> <p>** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".</p> <p>*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".</p> <p>The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.</p>										

Legal Instrument Examiner:
/DIANE JOHNSON/

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