

Xactware Solutions, Inc.

EXHIBIT 1002



US008078436C1

(12) **EX PARTE REEXAMINATION CERTIFICATE** (11th)
Ex Parte Reexamination Ordered under 35 U.S.C. 257

United States Patent
Pershing et al.

(10) **Number:** **US 8,078,436 C1**
(45) **Certificate Issued:** **Aug. 27, 2014**

(54) **AERIAL ROOF ESTIMATION SYSTEMS AND METHODS**

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Supplemental Examination Request:
No. 96/000,004, Dec. 28, 2012

Reexamination Certificate for:

Patent No.: **8,078,436**
Issued: **Dec. 13, 2011**
Appl. No.: **12/253,092**
Filed: **Oct. 16, 2008**

Related U.S. Application Data

(63) Continuation-in-part of application No. 12/148,439,
filed on Apr. 17, 2008, now Pat. No. 8,145,578.

(60) Provisional application No. 60/925,072, filed on Apr.
17, 2007.

(51) **Int. Cl.**
G06F 7/60 (2006.01)
G06F 17/10 (2006.01)
G06Q 30/02 (2012.01)
G06T 17/20 (2006.01)

(52) **U.S. Cl.**
CPC **G06Q 30/02** (2013.01); **G06T 17/20**
(2013.01); **G06Q 30/0283** (2013.01); **G06T**
2200/08 (2013.01)

USPC **703/2**

(58) **Field of Classification Search**

None

See application file for complete search history.

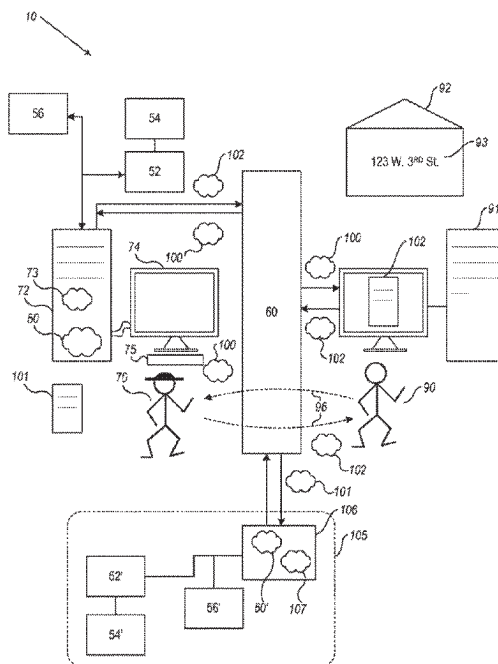
(56) **References Cited**

To view the complete listing of prior art documents cited during the supplemental examination proceeding and the resulting reexamination proceeding for Control Number 96/000,004, please refer to the USPTO's public Patent Application Information Retrieval (PAIR) system under the Display References tab.

Primary Examiner — Jason Proctor

(57) **ABSTRACT**

Methods and systems for roof estimation are described. Example embodiments include a roof estimation system, which generates and provides roof estimate reports annotated with indications of the size, geometry, pitch and/or orientation of the roof sections of a building. Generating a roof estimate report may be based on one or more aerial images of a building. *The slope and orientation images are typically oblique perspective views and top plan views of the buildings in the area.* In some embodiments, generating a roof estimate report of a specified building roof may include generating a three-dimensional model of the roof, and generating a report that includes one or more views of the three-dimensional model, the views annotated with indications of the dimensions, area, and/or slope of sections of the roof. This abstract is provided to comply with rules requiring an abstract, and it is submitted with the intention that it will not be used to interpret or limit the scope or meaning of the claims.



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EX PARTE
REEXAMINATION CERTIFICATE
ISSUED UNDER 35 U.S.C. 307

THE PATENT IS HEREBY AMENDED AS
INDICATED BELOW.

Matter enclosed in heavy brackets [] appeared in the patent, but has been deleted and is no longer a part of the patent; matter printed in italics indicates additions made to the patent.

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

Claims **43-45** are cancelled.

Claims **1, 18, 36, 37** and **41** are determined to be patentable as amended.

Claims **2-17, 19-35, 38-40, 42** and **46-56**, dependent on an amended claim, are determined to be patentable.

New claims **57-66** are added and determined to be patentable.

1. A computing system for generating a roof estimate report, the computing system comprising:

a memory;

a roof estimation module that is stored on the memory and that is configured, when executed, to:

receive a first and a second aerial image of a building having a roof, each of the aerial images providing a different view of the roof of the building, *wherein the first aerial image provides a top plan view of the roof and the second aerial image provides an oblique perspective view of the roof, and are not a stereoscopic pair;*

correlate the first aerial image with the second aerial image;

generate, based at least in part on the correlation between the first and second aerial images, a three-dimensional model of the roof that includes a plurality of planar roof sections that each have a corresponding slope, area, and edges; and

generate and transmit a roof estimate report that includes one or more top plan views of the three-dimensional model annotated with numerical values that indicate the corresponding slope, area, and length of edges of at least some of the plurality of planar roof sections using at least two different indicia for different types of roof properties.

18. A computer-implemented method for generating a roof estimate, the method comprising:

receiving a first and a second aerial image of a building having a roof, each of the aerial images providing a different view of the roof of the building *wherein the first aerial image provides a top plan view of the roof and the second aerial image provides a view of the roof that is other than a top plan view and neither of the two images are part of a stereoscopic pair;*

correlating the first aerial image with the second aerial image;

generating, based at least in part on the correlation between the first and second aerial images, a three-dimensional model of the roof that includes a plurality of planar roof sections that each have a corresponding slope, area, and edges; and

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transmitting a roof estimate report that includes one or more top plan views of the three-dimensional model annotated with numerical indications of at least one of the slope, area, and lengths of the edges of the plurality of planar roof sections, wherein the roof estimate report includes at least two different indicia for different types of roof properties.

36. A non-transitory computer-readable storage medium whose contents, *which are computer executable instructions stored on the non-transitory computer-readable storage medium, when executed by a computer processor of a computing system, enable [a] the computing system to generate a roof estimate report for a building having a roof, by [performing] causing, when executed by the computer processor of the computing system, the computing system to perform a method comprising:*

receiving [one] two or more images of the building, *wherein at least one of the two or more images provides an oblique perspective view of the roof and one of the images provides a top plan view of the roof;*

receiving an indication of pairs of points on the two or more images, each pair of points corresponding to substantially the same point on the roof depicted in each of the two or more images;

generating, based on the [one] two or more images of the building, a three-dimensional model of the roof that includes a plurality of planar roof sections that each have a corresponding area and edges, *wherein the generating, based on the two or more images of the building, the model of the roof includes generating the model of the roof based on the receiving the indication of the pairs of points on the two or more images of the building;* and

transmitting a roof estimate report that includes one or more views of the model, the report being annotated with numerical indications of the area and lengths of the edges of at least some of the plurality of planar roof sections, wherein the roof estimate report includes at least two different indicia for different types of roof properties.

37. The non-transitory computer-readable storage medium of claim **36** wherein generating the model *of the roof based on the receiving the indication of the pairs of points on the two or more images* includes:

correlating two of the two or more images by registering the pairs of points; and

generating [a] the three-dimensional model based on [a] the correlation between the two of the [one] two or more images.

41. The non-transitory computer-readable storage medium of claim **36** wherein the contents are instructions that when executed cause the computing system to perform *the receiving two or more images step of the method by causing, when executed by the computer processor of the computing system, the computing system to provide access to a repository of aerial images of one or more buildings.*

57. The method according to 18 wherein the second aerial image provides an oblique perspective view of the roof.

58. A computer-implemented method for generating a roof estimate, the method comprising:

receiving a first aerial image of a building having a type of view of the roof that is a top plan view of the roof;

receiving a second aerial image of the building having a type of view of the roof that is a perspective oblique view of the roof;

receiving a third aerial image having a type of view of the roof that is an oblique perspective from a different direc-

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tion than the second aerial image, each of the aerial images providing a different view of the roof of the building;

correlating the first aerial image with the second aerial image and third aerial images;

generating, based at least in part on the correlation between the first, second and third aerial images, a three-dimensional model of the roof that includes a plurality of planar roof sections that each have a corresponding slope, area, and edges; and

transmitting a roof estimate report that includes one or more top plan views of the three-dimensional model annotated with numerical indications of at least one of the slope, area, and lengths of the edges of the plurality of planar roof sections, wherein the roof estimate report includes at least two different indicia for different types of roof properties.

59. The method of claim 58 wherein the different types of roof properties include a ridge line and a valley line and the at least two different indicia include one color of a line conveying the meaning of a roof ridge and a different color of a line conveying the meaning of roof valley.

60. A computer-implemented method for generating a roof estimate, the method comprising:

receiving a first aerial image of a building;

receiving a second aerial image of the building having the roof;

receiving a third aerial image of the building, each of the aerial images providing a different view of the roof of the building;

correlating the first aerial image with the second aerial image and third aerial image;

generating, based at least in part on the correlation between the first, second and third aerial images, a three-dimensional model of the roof that includes a plurality of planar roof sections that each have a corresponding slope, area, and edges; and

generating and transmitting a roof estimate report that includes one or more top plan views of the three-dimensional model annotated with numerical indications of at least one of the slope, area, and lengths of the edges of the plurality of planar roof sections, wherein the roof estimate report includes at least two different indicia for different types of roof properties.

61. The method of claim 60 wherein the correlating the first aerial image with the second and third aerial image includes receiving an indication of pairs of points on each of the images corresponding to substantially the same point on the roof depicted in each of the images.

62. The method of claim 61 wherein the correlating the first aerial image with the second and third aerial image further includes registering the pairs of points and the generating the

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three-dimensional model includes generating the three-dimensional model based on the registering of the pairs of points.

63. A computer-implemented method for generating a roof estimate, the method comprising:

receiving a request for a roof estimate report for the roof of the building;

receiving location information regarding the building;

receiving a first aerial image of the building having the roof;

receiving a second aerial image of the building having the roof, the first and second images of the roof being independent of each in the views provided of the roof, each of the aerial images providing a different view of the roof of the building;

correlating the first aerial image with the second aerial image;

generating, based at least in part on the correlation between the first and second aerial images, a three-dimensional model of the roof that includes a plurality of planar roof sections that each have a corresponding pitch, area, and edges;

determining a pitch of a plurality of sections of the roof;

determining a direction of the pitch for each of the plurality of sections of the roof for which a pitch was determined;

generating a roof estimate report that includes a top plan views of the three-dimensional model annotated with numerical indications of the determined pitch and the direction of the pitch;

displaying on at least one top plan view a graphical indication of the pitch value of the respective roof sections that conveys the pitch value;

determining a ridge line and a valley line of the roof;

displaying on at least one top plan view a ridge line in which the property of it being a ridge line is conveyed by it being displayed in a first color and a valley line in which the property of it being a valley line is conveyed by it being in a second color, different from the first color; and transmitting the generated roof report.

64. The method of claim 63 further comprising:

displaying on at least one top plan view of the roof a graphical indication of the pitch direction of the respective roof sections that conveys the direction of the pitch.

65. The method of claim 63 wherein the top plan view showing the pitch value is a different top plan view than the one showing the ridge line and the valley line.

66. The method of claim 65 wherein the correlating the first aerial image with the second aerial image further includes registering pairs of points and the generating the three-dimensional model includes generating the three-dimensional model based on the registering of the pairs of points.

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