


IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re <i>Inter Partes</i> Review of:	:	I hereby certify that this
U.S. Patent No. 8,078,436	:	correspondence is being
	:	electronically filed per 37 CFR
Issued: December 13, 2011	:	§ 42.6(b)(1) with the U.S. Patent and
	:	Trademark Office via EFS-Web on
Named Inventor: Pershing et al.	:	<u>4/8/2016</u>
	:	
Patentee: Eagle View Technologies, Inc.	:	Typed or printed name of person
	:	signing this certificate
Filed: October 16, 2008	:	
	:	<u>Mark E. Nikolsky</u>
Title: AERIAL ROOF ESTIMATION	:	
SYSTEMS AND METHODS	:	Signature
	:	

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Alexandria, VA 22313-1450

SECOND CORRECTED PETITION FOR *INTER PARTES* REVIEW OF
U.S. PATENT NO. 8,078,436

Dear Commissioner:

Pursuant to 35 U.S.C. §§ 311-319 as amended by the Leahy-Smith America Invents Act, Xactware Solutions, Inc. (“Xactware”) respectfully petitions for *Inter Partes* Review of United States Patent No. 8,078,436, which issued December 13, 2011, to Pershing et al., from an application filed on October 16, 2008 (the “‘436 Patent”). A copy of the ‘436 Patent is attached hereto and made a part hereof as XACTWARE EXHIBIT 1001.

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LIST OF EXHIBITS

- XACTWARE EXHIBIT 1001: U.S. Patent No. 8,078,436 to Pershing et al., issued Dec. 13, 2011
- XACTWARE EXHIBIT 1002: Ex Parte Reexamination Certificate No. 8,078,436 C1 to Pershing et al., issued Aug. 27, 2014
- XACTWARE EXHIBIT 1003: Power of Attorney
- XACTWARE EXHIBIT 1004: Publication by Hsieh, entitled “Design and Evaluation of a Semi-Automated Site Modeling System,” Carnegie Mellon, November 1995 (“Hsieh”).
- XACTWARE EXHIBIT 1005: Publication by Applicad, entitled “Product Bulletin – November 2002: Key features of our Roofing Software,” November 2002 (“Applicad”).
- XACTWARE EXHIBIT 1006: Selected Portions of File History of Supplemental Examination No. 96/000,004
- XACTWARE EXHIBIT 1007: Declaration of Harold Schuch (“Schuch Decl.”)

I. INTRODUCTION

Xactware Solutions, Inc. (“Xactware” or “Petitioner”) respectfully petitions for *inter partes* review of Claims 1-5, 7-13, 15-23, 25-31, 33-40, 42, 46-52, 54-56 of U.S. Patent No. 8,078,436 to Pershing et al., which issued December 13, 2011 (the “‘436 patent”), and which is attached as Xactware Exhibit 1001.

It is noted that the ‘436 Patent underwent Supplemental Examination (Control No. 96/000,004), which resulted in an Ex Parte Reexamination Certificate that issued on August 27, 2014 (amending the claims of the ‘436 Patent and adding new claims). A copy of the Ex Parte Reexamination Certificate is attached hereto and made a part hereof as Xactware Exhibit 1002. Selected portions of the file history of the Supplemental Examination are also attached hereto and made a part hereof as Xactware Exhibit 1006.

II. REAL PARTY-IN-INTEREST

The real party-in-interest is Xactware Solutions, Inc., which is wholly owned by Insurance Services Offices, Inc., which itself is wholly owned by Verisk Analytics, Inc.

III. RELATED MATTERS

Petitioner notes that a lawsuit is pending in the United States District Court for the District of New Jersey, and is captioned *Eagle View Technologies, Inc., and Pictometry International Corp. v. Xactware Solutions, Inc., and Verisk Analytics,*

Inc., Civil Action No. 2:15-cv-07025 (hereinafter “the Lawsuit”). The Lawsuit was filed on September 23, 2015, wherein Eagle View Technologies, Inc. (“Eagleview”) and Pictometry International Corp. (“Pictometry”) allege infringement of nine (9) patents including the ‘436 patent. Specifically, the Lawsuit alleges infringement of U.S. Patent Nos. 8,818,770, 8,825,454, 8,823,732, 8,542,880, 8,209,152, 8,170,840, 8,078,436, 9,129,376, and 9,135,737. Petitions for *inter partes* review of the asserted claims of each of these patents are also being filed on even date herewith.

IV. GROUNDS FOR STANDING AND ELIGIBILITY

Xactware certifies that the ‘436 patent is eligible for *inter partes* review, and that Xactware is not barred or estopped from requesting an *inter partes* review challenging the patent claims on the grounds identified herein. The Complaint in the Lawsuit was served on October 8, 2015 for all patents-in-suit except U.S. Patent Nos. 9,129,376, and 9,135,737, which were served on November 30, 2015. Xactware thus certifies that this *inter partes* review petition is not being filed more than one year after being served with a complaint alleging infringement of the ‘436 patent. Xactware further certifies that it has not filed a civil action challenging the validity of any claim of the ‘436 patent. Xactware certifies that estoppel does not prohibit this review.

V. LEAD AND BACK-UP COUNSEL

Xactware designates lead counsel and back-up counsel as follows:

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VI. SERVICE INFORMATION

Please address all correspondence to Lead Counsel at the address provided in Section V above. Xactware consents to e-mail service of all papers in this proceeding.

VII. FEE INFORMATION

The Commissioner is authorized to charge all fees due to Deposit Account No. 503571, including but not limited to \$14,400 (\$9,000 plus \$5,400 in excess claim fees) upon the filing of this petition, and if institution is ordered, an additional \$26,800 (\$14,000 plus \$12,800 in excess claim fees) upon institution. If any additional and/or other fees are due from Xactware, or if any credit is due, the Commissioner is authorized to charge/credit Deposit Account No. 503571.

VIII. POWER OF ATTORNEY

A suitable Power of Attorney is attached hereto at Xactware Exhibit 1003.

IX. SPECIFIC IDENTIFICATION OF THE CHALLENGES TO THE CLAIMS OF THE ‘436 PATENT

Xactware respectfully petitions for *inter partes* review of Claims 1-5, 7-13, 15-23, 25-31, 33-40, 42, 46-52, 54-56 of the ‘436 patent, and respectfully requests that the Board find same invalid. Xactware identifies the specific statutory grounds under 35 U.S.C. §§ 102 and/or 103 on which each of the challenged claims is based, and the patents and/or printed publications relied upon for each ground, as follows:

Claims 1-5, 7-13, 15-23, 25-31, 33-40, 42, 46-52, and 54-56 of the ‘436 patent are unpatentable as obvious under 35 U.S.C. § 103 over Publication by Hsieh, entitled “Design and Evaluation of a Semi-Automated Site Modeling System,” Carnegie Mellon, November 1995 (“Hsieh”) (Xactware Exhibit 1004) in view of Publication by Applicad, entitled “Product Bulletin – November 2002: Key features of our Roofing Software,” November 2002 (“Applicad”) (Xactware Exhibit 1005).

The earliest claimed priority date for the ‘436 Patent is Provisional Application No. 60/925,072, filed on Apr. 17, 2007, and the foregoing references relied upon for the grounds of rejection were published or otherwise publicly available more than one year before the earliest claimed priority date.

X. OVERVIEW OF THE ‘436 PATENT

The ‘436 Patent generally describes systems and methods for determining roof measurement information based on aerial images of a roof of a building. *See, e.g., ‘436 Patent, 1:16-20, 3:51-56; see also Schuch Decl. (Xactware Exhibit 1007); see also Schuch Decl., ¶¶ 33-34.* FIG. 8 of the ‘436 Patent, in particular, discloses steps for performing a roof estimation for a building. According to FIG. 8 of the ‘436 Patent, the steps include receiving a first and a second aerial image of a 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, generating (based at least in part on the correlation between the first and the second aerial images) a three-dimensional model of the roof, and preparing and transmitting a roof estimate report that includes one or more annotated, top-down views of the three dimensional model. *See, e.g., ‘436 Patent, FIG. 8; see also Schuch Decl., ¶ 34.*

The ‘436 Patent discloses that the three-dimensional model is constructed using photogrammetric algorithms. *See, e.g., ‘436 Patent, 6:50-67* (“The service's 70 measurement software then uses these reference points and any acceptable algorithm to co-register the images and reconstruct the three-dimensional geometry of the object identified by the reference points. There are a variety of photo-grammetric algorithms that can be utilized to perform this

reconstruction. One such algorithm used by the service 70 uses photographs taken from two or more view points to ‘triangulate’ points of interest on the object in three-dimensional (‘3D’) space.’”). Independent Claim 1 of the ‘436 Patent, as well as other claims, recites that the first and second aerial images are “top plan” and “oblique perspective” views, and that the first and second aerial images are not a stereoscopic pair. *See, e.g.*, ‘436 Patent, Claim 1; *see also* Schuch Decl., ¶¶ 35, 38, 41, 45.

XI. CLAIM CONSTRUCTION

In an *inter partes* review proceeding, “[a] claim in an unexpired patent shall be given its broadest reasonable construction in light of the specification of the patent in which it appears.” 37 CFR § 42.100(b). Hence, all claim terms should be construed in accordance with the broadest reasonable interpretation (“BRI”) in view of the specification from the perspective of one of ordinary skill in the art. BRI furthers the Office’s role of safeguarding the public from enforcement of a claim that may be “interpreted more broadly than is justified.” M.P.E.P. § 2111. Further, the claim terms are presumed to take on their ordinary and customary meaning.

A. “top plan view”

Petitioner submits that a BRI of the term “top plan view” as used by the ‘436 Patent refers to an aerial view of an object that is taken from a position vertically

or nearly vertically above the object. This is consistent with the specification of the '436 Patent. *See, e.g.,* '436 Patent, 4:8-10, FIG. 3 (“As shown in FIG. 3, the image files 54 typically include at least one a top plan view 65 and a perspective view 66 of the building 92.”); *see also* '436 Patent, 14:65-66 (“In step 901, the routine receives a **substantially** top-down aerial image of a building having a roof.” (emphasis added)). Further, the patentee specifically discussed top plan views during the Supplemental Examination as meaning the same thing as “orthogonal” views. *See, e.g.,* Office Action Response of October 25, 2013, Supplemental Examination 96/000,004, p. 9 (“The term used in the Application as filed was ‘top plan view,’ which was discussed at the interview as having the same meaning as orthogonal view within the context of the ' 436 Patent. The Examiner requested that the claims use the term from the '436 Patent, ‘top plan view,’ to cover images of the type of views shown rather than the more widely used term, ‘orthogonal view,’ with the understanding that they mean the same thing in the context of the ' 436 Patent and in the industry.”); Office Action Response of October 25, 2013, Supplemental Examination 96/000,004, Attachment 2, Pershing Declaration, pp. 2-3 (“More specifically, I studied the possibility of using image files containing oblique viewpoints (such as the Microsoft's ‘Bird's Eye’ images) in combination with images containing a top-down viewpoint (such as the **near vertical viewpoints** commonly found in orthographic image maps).” (emphasis

added)). Additionally, a top plan view would be understood by one of ordinary skill in the art to mean a view of an object (such as a building) that is taken approximately above the object, such that the camera taking the image of the object is positioned approximately vertically above the object, looking down on the object. *See, e.g.,* Schuch Decl., ¶¶ 28, 36.

B. “oblique perspective view”

Petitioner submits that under a BRI, the term “oblique perspective view” as used by the ‘436 Patent is an aerial view of an object that is neither vertically nor near vertically above the object. This is consistent with the specification of the ‘436 Patent. *See, e.g.,* ‘436 Patent, 4:8-10, FIG. 3 (“As shown in FIG. 3, the image files 54 typically include at least one a top plan view 65 and a perspective view 66 of the building 92.”). Further, the patentee specifically discussed oblique perspective views during the Supplemental Examination as meaning something other than a top plan view. *See, e.g.,* Office Action Response of October 25, 2013, Supplemental Examination 96/000,004, p. 10 (“This issue was discussed during the interview and the Examiner stated that it was preferred to use the terms from the specification. One suggestion during the interview was to refer to them as a view that is ‘other than a top plan view’ if they were being claimed in the independent claims and then in a dependent claim, and to be more specific in calling them oblique perspective views or perspective views. Thus, the term perspective view of

the patent is used in some places and the term ‘oblique perspective view’ is used in other places as having generally the same meaning as an oblique view as used in the industry.”); Office Action Response of October 25, 2013, Supplemental Examination 96/000,004, P. 11 (“As will be explained later herein, the claims are amended to specific [sic] that one image is a top plan view and the other image is a view other than a top plan view as discussed during the interview. Some of the claims specify that this other view is an oblique perspective view. Accordingly, this will be shown to be patentably distinct from the EP '966 and the all [sic] other prior art.”). Additionally, one of ordinary skill in the art understands “oblique perspective view” to mean an aerial view of an object (such as a building) that is taken from a position (perspective) that is not directly above (not vertically above) the object. *See, e.g.,* Schuch Decl., ¶¶ 28, 37.

C. “not a stereoscopic pair”

Petitioner submits that a BRI of the term “not a stereoscopic pair” as used by the ‘436 Patent is a pair of images of the same object that does not provide an appearance of depth when viewed together (i.e., such that stereoscopic vision is not possible). For example, one image may show the object from above (a top plan view), and the other image may show it from the side (an oblique view). This is consistent with the supplemental examination of the ‘436 Patent. *See, e.g.,* Office Action Response, Supplemental Examination 96/000,004, p. 11, October 25, 2013

(“As both Mr. Pershing and Dr. Curless explained in the interview, and Dr. Curless sets forth in his declaration, a stereoscopic pair of images are obtained from two orthographic images.”); *see also, e.g.*, Office Action Response, Supplemental Examination 96/000,004, Attachment 3, Curless Declaration, p. 14-15, October 25, 2013 (“As explained in the interview, stereoscopic aerial pairs of images are obtained using two top-plan view images, not from a top plan view image and an oblique image.”); *see also, e.g.*, Office Action Response of October 25, 2013, Supplemental Examination 96/000,004, Attachment 4, Jones Declaration, p. 8-9 (“Stereoscopy requires two clean images, has a specific set of constraints that must be met and uses associated stereoscopic data regarding camera position and angle. For example, stereoscopy as described in the 966 Patent requires two images taken at the same camera angle with respect to the image plane. Thus, they cannot be two images, one having a top plan view and one having another view, such as an oblique view. For example, when using aerial images of roofs, the stereoscopic pair of images of the roof may be two images both showing top plan views of the roof, each taken at a known distance between the respective camera positions. Also, the general 1/30th rule of thumb in stereoscopy requires the distance between the camera positions taking each stereoscopic image to be substantially 1/30th of the distance from the object being photographed.”). Additionally, one of ordinary skill in the art understands that a top plan view and an oblique perspective view of

the same object are not a stereoscopic pair of images if the pair of images do not give the appearance of depth when viewed together. *See, e.g.*, Schuch Decl., ¶¶ 38-41.

XII. THE PATENT CLAIMS ARE INVALID UNDER 35 U.S.C. § 103

Xactware respectfully submits that Claims 1-5, 7-13, 15-23, 25-31, 33-40, 42, 46-52, 54-56 of the '436 patent are unpatentable under 35 U.S.C. § 103 as specifically demonstrated in the following claim chart (claim elements are labeled for cross-referenced claims using the following notation: 1.P (preamble of Claim 1), 1.5 (element 5 of Claim 1), etc.):

A. Claim Chart 1: Claims 1-5, 7-13, 15-23, 25-31, 33-40, 42, 46-52, 54-56 of the Pershing '436 Patent are Unpatentable as Obvious under 35 U.S.C. § 103 over Hsieh (Xactware Exhibit 1004) in view of Applicad (Xactware Exhibit 1005)

Photogrammetry is the science of making measurements from photographs including, among other things, measuring distances between objects and determining shapes. *See, e.g.*, Schuch Decl., ¶ 17. Many of the techniques of photogrammetry are notoriously well-known, and have been for decades. *See, e.g.*, Schuch Decl., ¶ 22. In particular, it has been well-known that the shape and dimensions of an object can be determined using relative points of the object across two or more images (whether stereoscopic or non-stereoscopic). *See, e.g.*, Schuch Decl., ¶ 22. For example, triangulation is a well-known technique, the

results of which can be used to determine the relative position and distance between points using two or more images. *See, e.g.*, Schuch Decl., ¶ 22.

These principles were applied in the past (e.g., initially with the help of optical-mechanical solutions, as early as during the First World War), and can still be applied, by hand using nothing more than paper and a pencil. *See, e.g.*, Schuch Decl., ¶ 23. Since the advent of computers, computer technology has been used in the field of photogrammetry to increase accuracy and efficiency in processing photogrammetric calculations and to facilitate generation of models based thereon. *See, e.g.*, Schuch Decl., ¶ 23. Eventually, semi-automatic and automatic computer programs were developed to further improve the processing efficiency of the user and the computer in conducting photogrammetric calculations and generating models. *See, e.g.*, Schuch Decl., ¶ 23. Additionally, photogrammetric techniques have been used, prior to the filing of the '436 Patent, to measure features visible in photographs, such as roofs and roof detail of buildings. *See, e.g.*, Schuch Decl., ¶ 24.

Hsieh discloses an automated and semi-automated site modeling system that can model roofs having a plurality of planar roof sections using one or more aerial images. *See, e.g.*, Publication by Hsieh, entitled "Design and Evaluation of a Semi-Automated Site Modeling System," Carnegie Mellon, November 1995 ("Hsieh") (Xactware Exhibit 1004); *see also* Hsieh, Abstract; *see also* Schuch

Decl., ¶¶ 43-46. One of ordinary skill in the art understands that aerial images are typically taken from an aircraft or satellite. The system provides the ability to construct and manipulate three-dimensional building models using multiple images. *See, e.g., Hsieh*, Abstract and p. 1. The semi-automated site modeling system can require user input to supply the automated processes. *See, e.g., Hsieh*, p. 1. In *Hsieh*, the system can detect peak roof building models, which require at least two roof planes. *See, e.g., Hsieh*, p. 6. To model roofs in *Hsieh* the user measures the roof of a building in one aerial image by outlining the roof in that aerial image. *See also Hsieh*, p. 20. The system then detects peaks, edges, and other roof features in the image, and generates a full three-dimensional (3D) model of the building (including the roof). *See also Hsieh*, p. 20. The system also projects the 3D model onto other aerial images of the building. *See, e.g., Hsieh*, pp. 6, 29; *see also* Schuch Decl., ¶ 48.

In *Hsieh*, the building measurement process is broken down into a verification component, an object matching component, and an edge estimation component. *See, e.g., Hsieh*, p. 10; *see also* Schuch Decl., ¶ 49. The verification component verifies the existence of an object in an image. *See, e.g., Hsieh*, p. 10. The object matching component generates a set of hypotheses for the location of the object in the image. *See, e.g., Hsieh*, p. 10. The edge estimation component generates a set of possible edge hypotheses for the model edge. *See, e.g., Hsieh*, p.

10. Multi-image roof matching could be used to generate a set of roof hypotheses by triangulating building hypotheses from at least two images. *See, e.g.*, p. 20. Hsieh discloses using an automated process to determine the height of the building and to correct the location of the building in other images (related to multi-image matching processes). *See, e.g.*, Hsieh, pp. 6-7; *see also* Schuch Decl., ¶ 50. More specifically, Hsieh discloses estimating the peak edge of a peak roof building and building height. *See, e.g.*, Hsieh, p. 14. Further, Hsieh discloses achieving good three-dimensional measurements by locating a projected object in several images. *See, e.g.*, Hsieh, p. 16.

Applicad discloses a system for generating three-dimensional roof models and reports thereof. *See, e.g.*, Publication by Applicad, entitled “Product Bulletin – November 2002: Key features of our Roofing Software,” November 2002 (“Applicad”) (Xactware Exhibit 1005); *see also* Applicad, p. 18; *see also* Schuch Decl., ¶ 53. The system uses a computer aided design system to draw or import a roof or wall outline in three dimensions. *See, e.g.*, Applicad, pp. 2, 4. Roof models can be imported using various file formats (e.g., drawing exchange format (.dxf)) or from a scanned image or bitmap. *See, e.g.*, Applicad, pp. 4, 6; *see also* Schuch Decl., ¶ 57.

The system of Applicad allows for generating and modifying of a three-dimensional roof model, including the change of pitch of roof planes. *See, e.g.*,

Applicad, pp. 7-14; *see also* Schuch Decl., ¶ 54. The software updates areas and lengths as new features are inserted and/or modified. *See, e.g.,* Applicad, p. 13; *see also* Schuch Decl., ¶ 54. From the 3D drawing, the software automatically calculates the necessary roofing material to generate a detailed quote. *See, e.g.,* Applicad, p. 2; *see also* Schuch Decl., ¶ 55. Further, users can generate user-defined forms (e.g., custom forms) which could include quotations and drawings, and extract desired information. *See, e.g.,* Applicad, pp. 2, 39-40, 42; *see also* Schuch Decl., ¶ 55. Accordingly, the system of Applicad can be used to generate a report, including a top plan view of a three-dimensional model, measurement information of the roof (e.g., roof pitch, height, etc.), among various other types of information. *See, e.g.,* Applicad, p. 40; *see also* Schuch Decl., ¶ 55.

A person of ordinary skill in the art would have found it obvious to combine the roof reporting functionality of Applicad with the three-dimensional roof generation of Hsieh. *See, e.g.,* Schuch Decl., ¶ 56. In fact, Applicad discloses the ability to import roof models from other systems. *See, e.g.,* Applicad, p. 4 (“Importing Roof or Building outlines from another CAD system . . . CAD drawings can be saved in various different file formats, and our software supports most of these, but the most common form is the .dxf format (drawing exchange format).”) Accordingly, a person of ordinary skill in the art would have found it

obvious to import the three-dimensional roof as generated by the Hsieh system into the Applicad system to generate a roof report. *See, e.g.*, Schuch Decl., ¶ 57.

Regarding claim elements 1.P and 18.P, discussed below, the system of Hsieh generates roof models and measures roof features. *See, e.g.*, Hsieh, p. 2. Regarding claim elements 1.1 and 36.P, discussed below, Hsieh discloses use of computer programs, which includes a memory. *See, e.g.*, Hsieh, p. 4. Regarding claim elements 1.2, discussed below, SiteCity is a roof estimation computer program (module), and it is stored in a memory of a computer on which it executes. *See, e.g.*, Hsieh, Abstract. Regarding claim elements 1.3, 18.1, 36.P, and 36.1, discussed below, Hsieh discloses a system which processes aerial images that can be taken from various views (including top plan and oblique views) to generate three-dimensional models of roofs of buildings. For example, as shown in FIG. 1, the system processes three aerial images (fhrad1, fhrad3, fhrad4) that are aerial images of the same set of buildings taken from different views. *See, e.g.*, Hsieh, FIG. 1. Hsieh discloses processing non-stereoscopic aerial images. *See, e.g.*, Schuch Decl., ¶ 45 (“Hsieh discloses processing multiple aerial images that are not stereoscopic pairs, including top-down plan views as well as oblique perspective views of the same building. Such top-down and oblique perspective views are not stereoscopic pairs because, when viewed together, they do not give the impression of depth.” (citations omitted)). Regarding claim elements 1.4, 18.2,

and 36.2, discussed below, Hsieh discloses correlating the first aerial image with the second aerial image and even correcting potential inaccuracies using the images. *See, e.g., Hsieh*, FIGS. 4 and 13, and pp. 7, 16, 20, 52. Regarding claim elements 1.5, 18.3, and 36.3, discussed below, Hsieh discloses building a 3D model that includes features in the aerial images that have been correlated, and projecting the 3D model on various aerial views for illustration and refinement (correction) of the model with reference to the images. *See, e.g., Hsieh*, Title, pp. 2, 6, 14, and 30, FIG. 8 on p. 15, and FIG. 17 on p. 32. It can be seen in FIG. 17 that the generated 3D model includes planar roof sections which each have their own slopes, areas, and edges. *See, e.g., Hsieh*, FIG. 17 on p. 32.

Regarding claim elements 1.6, 5.1, 7, 18.4, 25, 36.4, 38, 42, and 46, discussed below, Applicad discloses that the reports can include any type of drawings (e.g., line drawings), including a top plan view annotated with numerical values. *See, e.g., Applicad*, pp. 25, 28, 40. The system of Applicad calculates roof area, length, and slope, and allows the user to include such information and relevant drawings (e.g., annotated drawings) in a roof estimate report. *See, e.g., Applicad*, p. 42 (“You can also customize the reports to suit your business, so you can . . . **tailor the quote to extract certain information as required.**” (emphasis added)).

Regarding claim elements 2.1 and 20, discussed below, Hsieh discloses receiving an indication of one or more corresponding points between images by projecting an object between multiple images and correcting the projected buildings for potential inaccuracies. *See, e.g., Hsieh*, pp. 7, 16, 20, 52.

Regarding Claim 4, discussed below, Hsieh discloses receiving aerial images from a computer system (e.g., an image source computing system). *See, e.g., Hsieh*, p. 31. The RADIUS program of Hsieh is an image source for digital based (computer) aerial images.

Regarding Claim 8, discussed below, Applicad discloses positioning a length next to a line segment, indicating pitch through the orientation of stripes of each of the planar surfaces, and positioning measurements within their relevant areas. *See, e.g., Applicad*, p. 28 (illustrating a roof annotated with lengths of 5000 and 10000, having horizontal and vertical oriented stripes to indicate direction of pitch, and having measurements within the relevant area); *see also Applicad*, p. 25 (illustrating a roof annotated with lengths of ridges and edges, and having horizontal and vertical oriented stripes to indicate direction of pitch).

Regarding Claim 21, discussed below, Hsieh discloses projecting an object between multiple images, and having the user correct (e.g., receive an indication of a corresponding point from a user) the projected buildings for potential

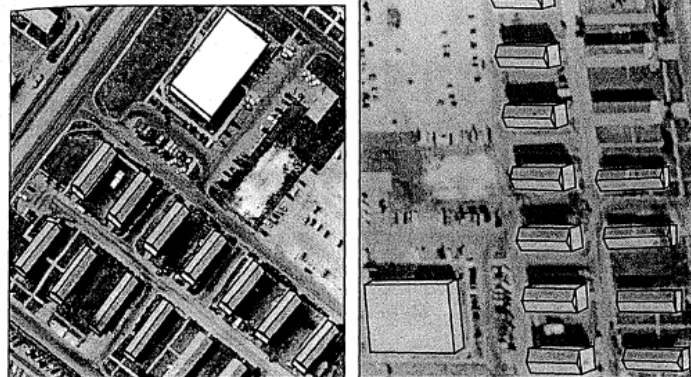
inaccuracies. In doing so, the user provides indications of the corresponding points in the images. *See, e.g., Hsieh*, Abstract, pp. 2, 7.

Regarding claim element 37.1, discussed below, *Hsieh* discloses projecting an object between multiple images (registering pairs of points between images to correlate them), and even correcting the projected buildings for potential inaccuracies. *See, e.g., Hsieh*, pp. 7, 16, 20, and 52. Regarding claim element 37.2, discussed below, *Hsieh* discloses generating a three-dimensional model based on the correlation between the two images, the three-dimensional model including a peaked-roof with a plurality of planar roof sections that each have a slope, area, and edges. *Hsieh* does this by building a 3D model that includes features in the aerial images that have been correlated, and projects the 3D model on various aerial views for illustration and refinement (correction) of the model with reference to the images. *See, e.g., Hsieh*, Title, pp. 6, 14, and 30, FIG. 8 on p. 15, and FIG. 17 on p. 32. It can be seen that the generated 3D model includes planar roof sections which each have their own slopes, areas, and edges.

Claims 1-5, 7-13, 15-23, 25-31, 33-40, 42, 46-52, 54-56	Hsieh [Block Type] in view of <i>Applicad</i> [Italics Type]
1. [1.P] A computing system for generating a roof estimate report, the computing system comprising:	<i>Hsieh</i> discloses a system/method for generating a three-dimensional model of a building (including a roof) from a plurality of photographic aerial images. <i>See, e.g.,</i> Abstract (“This paper describes the design and evaluation of SiteCity, a semi-automated building extraction system integrating

	photogrammetry, geometric constraints, image understanding and user interfaces. . . . SiteCity gives human operators the ability to construct and manipulate three dimensional building objects using multiple images.); <u>see also</u> p. 2 (“Each image window has an identical graphical user interface in which a variety of menus provide support for measurement and modification of image features. Image features are triangulated to form 3D objects which are displayed in the site window for verification and visualization.”).
[1.1] a memory;	<i>See, e.g., Hsieh</i> , p. 4 (“It will be difficult to directly compare these two drawing programs because the cost of measuring a point's location might be different than the cost of specifying a parameter such as orientation. Therefore, to readily compare the performance of a semi-automated system with a fully manual system, the two systems must decompose the problems in similar fashion.”).
[1.2] a roof estimation module that is stored on the memory and that is configured, when executed, to:	<i>See, e.g., Hsieh</i> , Abstract (“This paper describes the design and evaluation of SiteCity, a semi-automated building extraction system integrating photogrammetry, geometric constraints, image understanding and user interfaces.”).
[1.3] 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	<u>Hsieh</u> discloses that top down (vertical) and oblique images can also be used. <i>See, e.g., Hsieh</i> , FIG. 1 (showing a vertical view (image (a)) and an oblique view (image (c))); p. 31 (“This scene is part of the Fort Hood aerial images distributed under the RADIUS program. It consists of two near-vertical and two oblique shots.”); p. 57 (“Building shadows can be a useful clue in vertical images [28], where walls and floors are not visible.”); FIG. 18 (showing vertical images (a) and (c) and oblique image (d)).

stereoscopic pair;

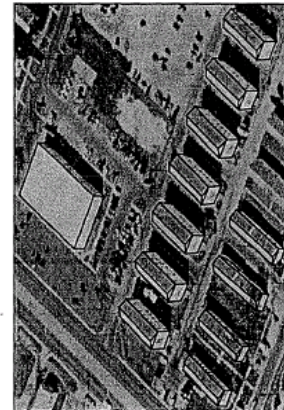


(a) Radt5

(b) Radt5ob



(c) Radt5a



(d) Radt5wob

Figure 18: Scene 2 : Radt5

Further, the images processed by Hsieh include images that are not stereoscopic pairs. *See, e.g., Hsieh*, p. 7 (“This task involves correcting the location of the building in other images (See Figure 4(c) and 4(d)), and is related to many stereo **or multi-image matching processes** in which image features were matched along the epipolar line.” (emphasis added)); FIG. 17 on p. 32.

[1.4] correlate the first aerial image with the second aerial image;

Hsieh discloses correlating the first aerial image with the second aerial image. *See, e.g., Hsieh*, FIG. 4 (reproduced below) and p. 7 (“The final task is to correct the location of the building in other images (See Figures 4(c) and 4(d)). When an object is projected from one image to the next, the projected buildings usually do not agree with the

image due to inaccuracies in the DEM and the camera parameters. This step is essential for achieving accurate 3D building models.”).

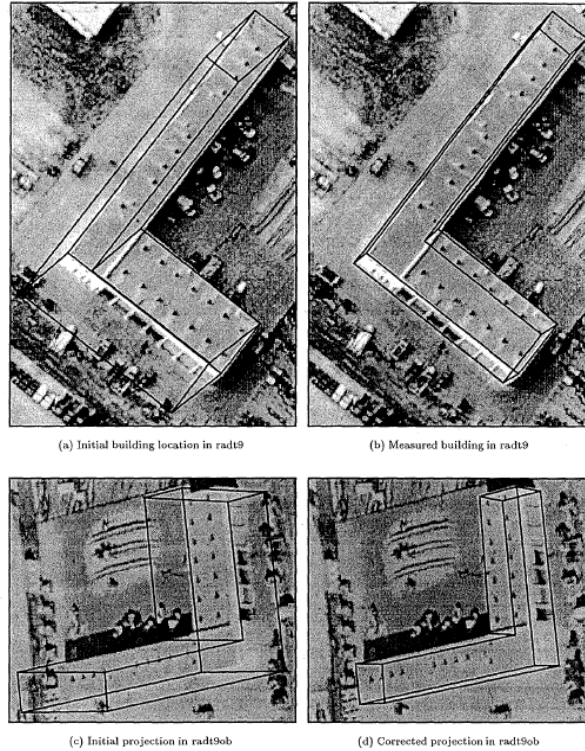
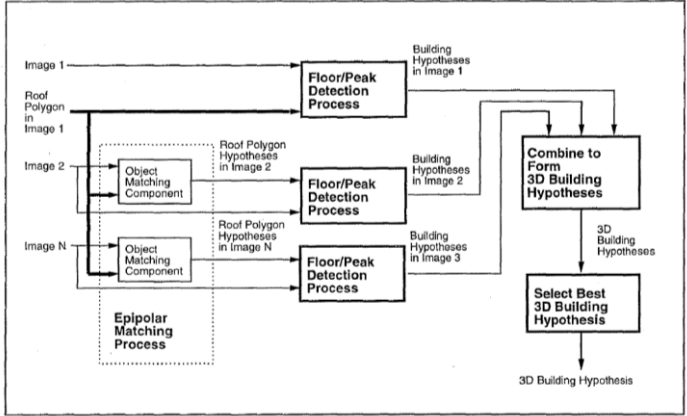


Figure 4: Correcting building delineations

See also Hsieh, p. 16 (“To achieve a good 3D measurement, it is often necessary to locate the projected object in several images.”); p. 20 (“**After the user measures a roof outline, this method takes the roof outline and performs the epipolar matching of the roof on other images and generates a set of roof hypotheses in each of the images. . . . Three-dimensional building hypotheses are generated by triangulating building hypotheses from at least two images.**”) (emphasis added); p. 52 (“The evaluation of the epipolar matching process uses the same metrics. To evaluate the epipolar matching process, manually measured buildings in one image are projected to other images and the epipolar matching process is performed to locate the object

	<p>position in those images. The position estimated by the automated process is not manually corrected, to evaluate the performance of the automated process.”); <i>see also</i> <u>Hsieh</u>, FIG. 13 (reproduced below).</p>  <p>Figure 13: Process flow for multi-image roof matching (MIRM)</p>
<p>[1.5] 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</p>	<p><u>Hsieh</u> discloses generating a three-dimensional model based on the correlation between the two images, the three-dimensional model including a peaked-roof with a plurality of planar roof sections that each have a slope, area, and edges. <i>See, e.g., Hsieh</i>, Title (“Design and Evaluation of a Semi-Automated Site Modeling System”); p. 2 (“Three windows (Figure 1(a), 1(b), 1(c)) are used for the image measurements and are called image windows. The fourth window(Figure 1(d)) displays the 3D position of the measured object and is the site window. . . . Image features are triangulated to form 3D objects which are displayed in the site window for verification and visualization.” (emphasis added)); p. 6 (“Peak Roof Building Model: The peak roof model is shown in Figure 2(c). The bottom half of the peak roof model is a rectilinear flat roof building model with a rectangular roof and floor. The roof is a triangular prism. . . . To create a 3D building object, the outline of the roof is measured and SiteCity estimates the dimensions of the building.”); p. 14</p>

(“Figure 8 (a) shows the user delineated building roof. The search bound for the peak and the vertical vanishing lines based on the roof are shown in Figure 8(b).”); FIG. 8 on p. 15.

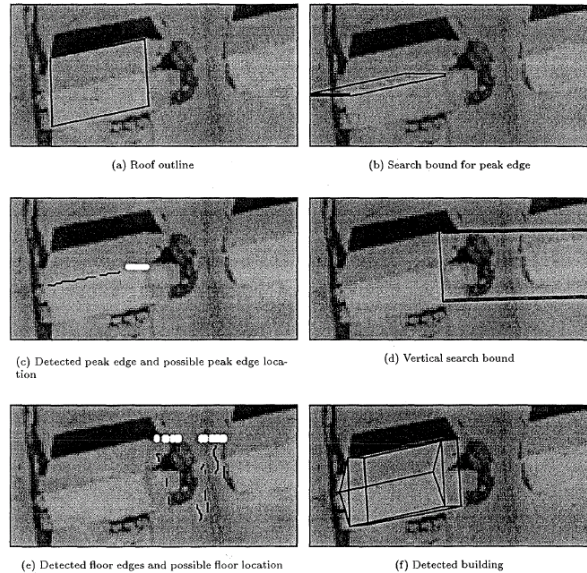
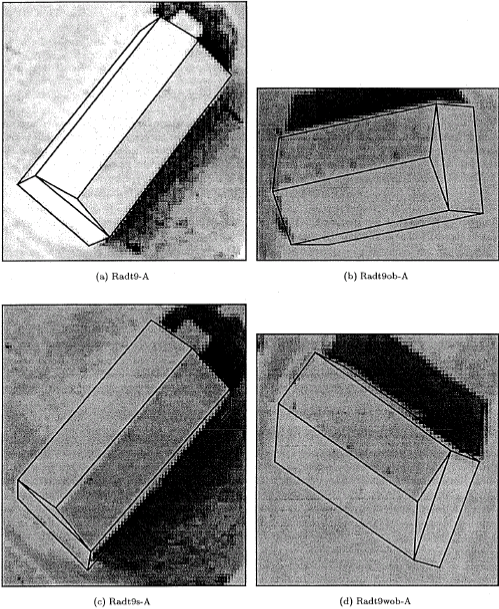


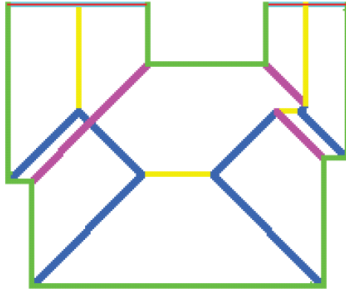
Figure 8: Example of building height estimation

p. 30 (“The dimensional method described in [50] concerns the delineation of the detected building objects in object space. A 3D ground truth building is matched to an automatically generated 3D building hypothesis based on shape, dimension and overlap. If a hypothesized building cannot be matched to a ground truth building, it is considered to be an error. Once a building hypothesis is matched to a ground truth building, **the dimensions of the building object, such as length, width and height**, and the position and orientation of the building are compared between the ground truth building and the hypothesized building.” (emphasis added)); See, e.g., Hsieh, FIG. 17 on p. 32.

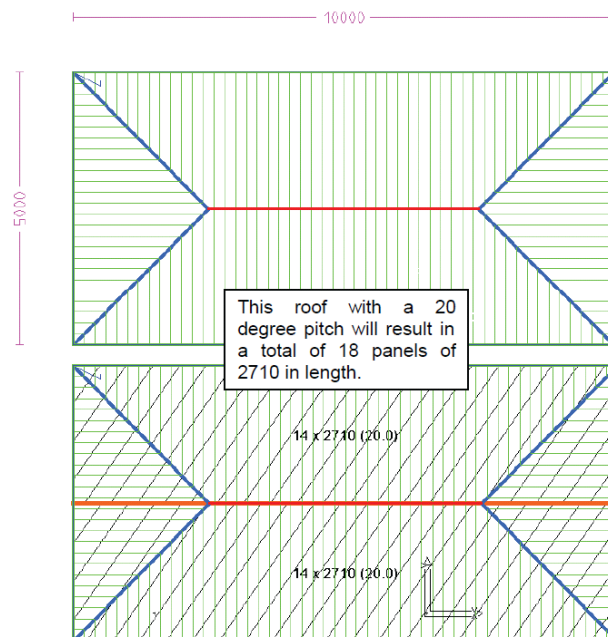
	 <p style="text-align: center;">Figure 17: Scene 1 : Radt9-A</p>
<p>[1.6] generate and transmit a roof estimate report that includes one or more top plan views of the three-dimensional model annotated with numerical values that indicate the corresponding slope, area, and length of edges of at least some of the plurality of planar roof sections using at least two different indicia for different types of roof properties.</p>	<p><u>Hsieh</u> discloses that the three-dimensional models include measurement information (e.g., height measurements). <i>See, e.g., Hsieh</i>, p. 6 (“To create a 3D building object, the outline of the roof is measured and SiteCity estimates the dimensions of the building.”); p. 19 (“The length of the vertical edges in the image are converted to meters in object space. Since the roof position differs from the ground only in elevation, the height measurement allows us to construct the building structure in the local coordinate system,”); p. 30 (“Once a building hypothesis is matched to a ground truth building, the dimensions of the building object, such as length, width and height, and the position and orientation of the building are compared between the ground truth building and the hypothesized building.” (emphasis added)).</p> <p><i>The Applicad system calculates slope, area, and lengths of edges of the plurality of planar roof sections. See, e.g., Applicad</i>, p. 4 (“By using the command Digitise Outline we can then move the cursor to the extremities of the wall outline, by</p>

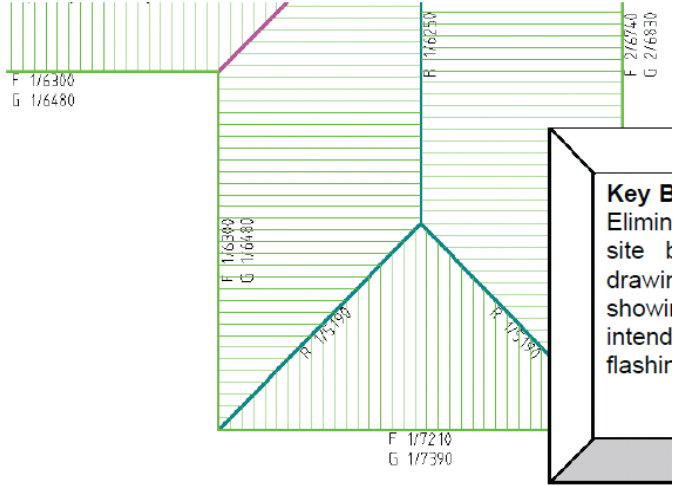
	<p><i>“snapping” to those points, and after entering the pitch or slope of the roof and the eave offset from the wall, the roof is generated automatically, resulting in an accurate and fast method of working out the areas and lengths.”); p. 10 (“Often, with multi-hipped roofs, it is quite a time consuming process to work out the necessary areas and lengths. With our software this can be achieved in seconds.”); p. 13 (“The important thing to remember here is the fact that the software is constantly updating the areas and lengths when inserting new features, so there is no need to manually have to add a length of new ridge everytime a new dormer is inserted for instance.”).</i></p> <p><i><u>Applicad</u> discloses generating a roof estimate report with drawings. See, e.g., <u>Applicad</u>, p. 1 (“All of our products utilise a CAD (computer aided design) system . . . to draw up the roof or wall outline accurately in 3 dimensions, and then, from that 3D drawing, the software automatically calculates the amount of material to cover the roof or wall, along with all the necessary flashings. The result of this is the production of a detailed quotation breakdown, and the ability to generate your own user-defined forms These forms include quotations, labour pay summaries, order forms for your suppliers, invoices and drawings.”).</i></p> <p><i><u>Applicad</u> discloses processing models generated by other software packages. See, e.g., <u>Applicad</u>, p. 4 (“Importing Roof or Building outlines from another CAD system . . . CAD drawings can be saved in various different file formats, and our software supports most of these, but the most common form is the .dxf format (drawing exchange format).”).</i></p> <p><i><u>Applicad</u> discloses that the reports can include a top plan view annotated with numerical values.</i></p>
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See, e.g., *Applicad*, p. 40 (the report includes a top plan view of the model with the numerical value of the roof pitch).

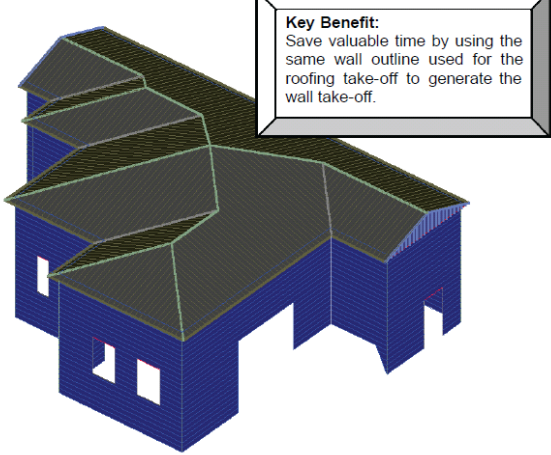
Applicad Roofing 123 Church St Hawthorn 03 9819 3100 03 9819 3200 Home 2 A/C N: Home 1		Date: November 2002 Job No:
Customer	Address	Site address
Phone		
Fax		
		Builder name Phone
		Roof Pitch 20.0 Height 5.300 Rafter CTS 600 Eaves 0 Gable Finish For the supply and installation of Roof KS 1000 LP Steel, Galvanised - Paint Ridge BWP Ridge capping, Mountain Blue Fascia Metal fascia, Tones Blue Gutter O Gee Gutter, Ebony Valley Not Included Barge Rake flashing, Off white Balcon Not Included Insulation Not Included Downpipes Not Included Curved Roof Not Included

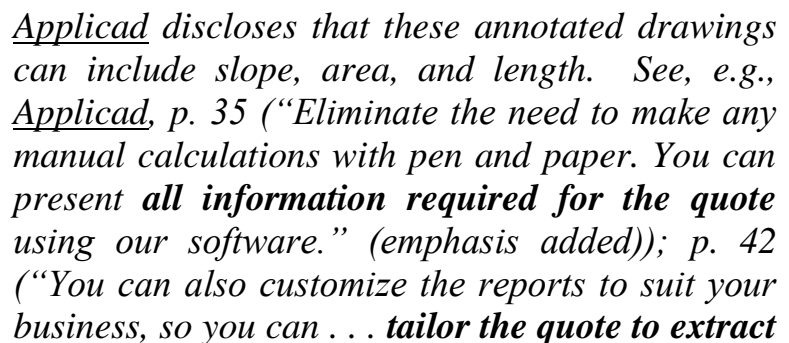
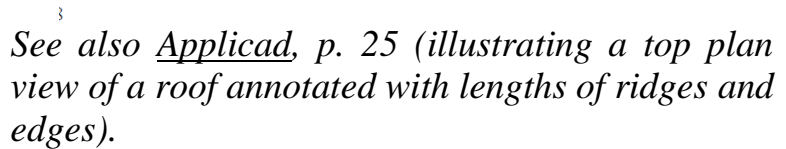
See, e.g., *Applicad*, p. 28 (illustrating a top plan view of a roof annotated with lengths of 5000 and 10000 and a pitch of 20).



	<p>See also <u>Applicad</u>, p. 25 (illustrating a top plan view of a roof annotated with lengths of ridges and edges).</p>  <p><u>Applicad</u> discloses that these annotated drawings can include slope, area, and length. See, e.g., <u>Applicad</u>, p. 35 (“Eliminate the need to make any manual calculations with pen and paper. You can present all information required for the quote using our software.” (emphasis added)); P. 42 (“You can also customize the reports to suit your business, so you can . . . tailor the quote to extract certain information as required.” (emphasis added)). Further, as shown in the figures above, <u>Applicad</u> discloses that these drawings can include two more types of indicia for different types of roof properties (e.g., one color for roof edges, another color for ridges, numbers for lengths, parentheses for pitch, etc.).</p>
<p>2. [2.1] The computing system of claim 1 wherein the roof estimation module is further configured to correlate the first and second aerial images by receiving an indication of one or more corresponding points on the building</p>	<p><u>Hsieh</u> discloses receiving an indication of one or more corresponding points between images. See, e.g., <u>Hsieh</u>, p. 7 (“The final task is to correct the location of the building in other images (See Figures 4(c) and 4(d)).”); p. 16 (“To achieve a good 3D measurement, it is often necessary to locate the projected object in several images.”); p. 20 (“After the user measures a roof outline, this method takes the roof outline and performs the</p>


<p>shown in each of the first and second aerial images.</p>	<p>epipolar matching of the roof on other images and generates a set of roof hypotheses in each of the images. . . . Three-dimensional building hypotheses are generated by triangulating building hypotheses from at least two images.” (emphasis added); p. 52 (“The evaluation of the epipolar matching process uses the same metrics. To evaluate the epipolar matching process, manually measured buildings in one image are projected to other images and the epipolar matching process is performed to locate the object position in those images.”).</p>
<p>3. [3.1] The computing system of claim 1 wherein the roof estimation module is further configured to generate the three-dimensional model by receiving an indication of at least one of a ridgeline of the roof, a valley of the roof, an edge of the roof, a hip of the roof, and a gable of the roof.</p>	<p><u>Hsieh</u> discloses identifying a peak (e.g., ridgeline) of a roof as part of the process for generating the three-dimensional model of the roof. <i>See, e.g., Hsieh</i>, p. 14 (“For a peak roof building model, once the user measures the rectangular outline for the roof, the first task is to estimate the position of the peak edge.”); <i>see also</i> FIG. 8 (images (b) and (c) on P. 15, reproduced below:</p> <div data-bbox="669 1106 1250 1673" data-label="Image"> <p>Figure 8 consists of six sub-images arranged in a 3x2 grid, labeled (a) through (f). Each sub-image shows an aerial photograph of a building with various graphical overlays. (a) 'Roof outline' shows a white rectangular box on the roof. (b) 'Search bound for peak edge' shows a white line segment on the roof. (c) 'Detected peak edge and possible peak edge location' shows a white dashed line and a white dot. (d) 'Vertical search bound' shows a white rectangular box on the roof. (e) 'Detected floor edges and possible floor location' shows white dashed lines and white dots. (f) 'Detected building' shows a white wireframe of the building.</p> </div> <p>Figure 8: Example of building height estimation</p>
<p>4. The computing system of claim 1 wherein the roof estimation module is further configured to receive the</p>	<p><u>Hsieh</u> discloses receiving aerial images from a computer system. <i>See, e.g., Hsieh</i>, p. 31 (“Figure 17 shows a lone peak roof building model in four images. This scene is part of the Fort Hood aerial</p>

<p>first and second aerial image from an image source computing system.</p>	<p>images distributed under the RADIUS program.”).</p>
<p>5. [5.1] The computing system of claim 1 wherein the roof estimation module is further configured to generate the roof estimate report by generating an electronic file that includes an image of the building along with line drawings of the one or more top plan views of the three-dimensional model.</p>	<p>See discussion of element 1.6 of Claim 1.</p> <p><i>As discussed above, <u>Applicad</u> shows a report with line drawings and a top plan view of the model (e.g., a line drawing of a top plan view of the three-dimensional model). See, e.g., <u>Applicad</u>, pp. Cover Page, 40, and 42. Further, <u>Applicad</u> discloses an image of a three-dimensional model of the building (e.g., an image of the building). See, e.g., <u>Applicad</u>, p. 41 (showing a three-dimensional model of the building).</i></p>  <p><i><u>Applicad</u> also discloses exporting data (e.g., an electronic file). See, e.g., <u>Applicad</u>, p. 38.</i></p>
<p>7. The computing system of claim 1 wherein the different types of roof properties include different roof measurements, and the at least two different indicia include at least one of: length, slope, and area.</p>	<p>See discussion of element 1.6 of Claim 1.</p> <p><i><u>Applicad</u> discloses that the reports can include a top plan view annotated with numerical values. See, e.g., <u>Applicad</u>, p. 40 (the report includes a top plan view of the model with the numerical value of the roof pitch); p. 28 (illustrating a top plan view of a roof annotated with lengths of 5000 and 10000 and a pitch of 20).</i></p>



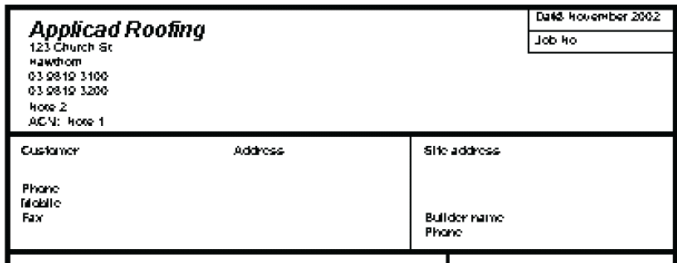
	<i>certain information as required.” (emphasis added)). Further, as shown in the figures above, <u>Applicad</u> discloses that these drawings can include two more types of indicia for different types of roof properties (e.g., one color for roof edges, another color for ridges, numbers for lengths, parentheses for pitch, etc.).</i>
8. [8.1] The computing system of claim 7 wherein the length is located adjacent to a line representing a segment, the slope is located next to an arrow indicating direction of the slope and the area is located within a section having the area.	<i><u>Applicad</u> discloses positioning a length next to a line segment and positioning measurements within their relevant areas. See, e.g., <u>Applicad</u>, p. 28 (illustrating a roof annotated with lengths of 5000 and 10000 and having measurements within the relevant area). See also <u>Applicad</u>, p. 25 (illustrating a roof annotated with lengths of ridges and edges).</i>
9. [9.1] The computing system of claim 1 wherein the different types of roof properties include different roof features, and the at least two different indicia include different graphical representations of the different roof features.	<i><u>Applicad</u> discloses using two different indicia with different graphical representations of different roof features: a first color for ridges, and a second color for valleys. See, e.g., <u>Applicad</u>, p. 11 (illustrating red lines used for valleys, and blue lines used for ridges).</i>
10. [10.1] The computing system of claim 1 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 associated with a ridge and a different color of a line associated with a valley.	<i>See discussion of element 9.1 of Claim 9.</i>

<p>11. [11.1] The computing system of claim 1 wherein the different types of roof properties include at least one of: a roof section, a roof segment, a roof valley, a ridge, a roof size, a roof geometry, a roof measurement, a roof dimension, slope, length and area.</p>	<p>See discussion of element 9.1 of Claim 9.</p>
<p>12. The computing system of claim 1 wherein the at least two different indicia include at least one of: different line color, different line weight, different visual characteristics of a line, different characters, different color of characters, different visual characteristics of characters, different measurements, different visual characteristics of measurements, different placement of measurements with respect to lines, different symbols, different visual characteristics of symbols and different placement of measurements with respect to symbols.</p>	<p>See discussion of element 9.1 of Claim 9.</p>
<p>13. [13.1] The computing system of claim 1 wherein the different types of roof properties include a ridge length and a valley length</p>	<p><i>Applicad</i> calculates the lengths of ridges and valleys. See, e.g., <i>Applicad</i>, p. 14 (“Because the roof is drawn up in 3 dimensions, any changes to the pitch will accurately change the length of the associated hips, valleys and ridges.”); p. 26.</p>

<p>and the at least two different indicia include one color of a line associated with a ridge and a different color of a line associated with a valley.</p>	 <p><i>Applicad</i> annotates drawings with ridge lengths. See, e.g., <i>Applicad</i>, p. 25 (illustrating a top plan view of a roof annotated with lengths of ridges and edges).</p> <p><i>Applicad</i> discloses that these annotated drawings can include valley length as well. See, e.g., <i>Applicad</i>, p. 35 (“Eliminate the need to make any manual calculations with pen and paper. You can present all information required for the quote using our software.” (emphasis added)); p. 42 (“You can also customize the reports to suit your business, so you can . . . tailor the quote to extract certain information as required.” (emphasis added)).</p> <p>Further, <i>Applicad</i> discloses using a first color for ridges, and a second color for valleys. See, e.g., <i>Applicad</i>, p. 11 (illustrating red lines used for valleys, and blue lines used for ridges).</p>
<p>15. [15.1] The computing system of claim 1 wherein the different types of roof properties include a ridge and the at least two different indicia include a ridge length indicia, wherein the ridge length indicia is a ridge line with a numerical value adjacent thereto.</p>	<p><i>Applicad</i> calculates the lengths of ridges and valleys. See, e.g., <i>Applicad</i>, p. 14 (“Because the roof is drawn up in 3 dimensions, any changes to the pitch will accurately change the length of the associated hips, valleys and ridges.”). Further, <i>Applicad</i> annotates drawings with the indication of ridges both by color and an “R,” with a numerical value adjacent to the ridge. See, e.g., <i>Applicad</i>, p. 25 (illustrating a top plan view of a roof annotated with lengths of ridges and edges).</p>
<p>16. [16.1] The computing system of claim 1 wherein the different types of roof properties include a valley and the at least two different</p>	<p><i>Applicad</i> calculates the lengths of ridges and valleys. See, e.g., <i>Applicad</i>, p. 14 (“Because the roof is drawn up in 3 dimensions, any changes to the pitch will accurately change the length of the associated hips, valleys and ridges.”). Further,</p>

<p>indicia include a valley length indicia, wherein the valley length indicia is a valley line with a numerical value adjacent thereto.</p>	<p><i>Applicad</i> annotates drawings with the indication of ridges both by color and an “R,” with a numerical value adjacent to the ridge. See, e.g., <i>Applicad</i>, p. 25 (illustrating a top plan view of a roof annotated with lengths of ridges and edges). <i>Applicad</i> discloses graphically distinguishing ridges and valleys, and can include similar annotations for valleys as those for ridges. See, e.g., <i>Applicad</i>, p. 11 (illustrating red lines used for valleys, and blue lines used for ridges).</p>
<p>17. The computing system of claim 1 wherein the different types of roof properties include a slope and the at least two different indicia include a slope indicia, wherein the slope indicia is an arrow in a direction of the slope with a numerical value adjacent thereto.</p>	<p>See discussion of element 8.1 of Claim 8.</p>
<p>18. [18.P] A computer-implemented method for generating a roof estimate, the method comprising:</p>	<p>See discussion of element 1.P of Claim 1.</p>
<p>[18.1] 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</p>	<p>See discussion of element 1.3 of Claim 1.</p>

images are part of a stereoscopic pair;	
[18.2] correlating the first aerial image with the second aerial image;	See discussion of element 1.4 of Claim 1.
[18.3] 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	See discussion of element 1.5 of Claim 1.
[18.4] 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.	See discussion of element 1.6 of Claim 1.
19. [19.1] The method of claim 18 wherein identifying the building includes receiving a street address of the building.	<i>Applicad</i> discloses identifying a building by a street address of the building. See, e.g., <i>Applicad</i> , p. 40.

	
20. The method of claim 18 wherein correlating the first and second aerial images includes receiving an indication of one or more corresponding points shown in each of the first and second aerial images.	<i>See</i> discussion of element 2.1 of Claim 2.
21. The method of claim 20 wherein receiving the indication of the corresponding point includes receiving the indication from a user.	<i>See, e.g., Hsieh</i> , Abstract (“SiteCity gives human operators the ability to construct and manipulate three dimensional building objects using multiple images.”); p. 2 (“A set of graphical user interface tools are provided for users to modify and create arbitrary objects and to supply other cues, such as area of interest, to assist the automated processes.”); p. 7 (“The final task is to correct the location of the building in other images (See Figures 4(c) and 4(d)). When an object is projected from one image to the next, the projected buildings usually do not agree with the image due to inaccuracies in the DEM and the camera parameters. This step is essential for achieving accurate 3D building models.”).
22. The method of claim 18 wherein generating the three-dimensional model includes receiving an indication of at least one of a ridgeline of the roof, a valley of the roof, an edge of the roof, a hip of the roof,	<i>See</i> discussion of element 3.1 of Claim 3.

and a gable of the roof.	
23. The method of claim 18, further comprising generating the roof estimate report, the roof estimate report being a data file that includes an image of the building along with line drawings of the one or more top plan views of the three-dimensional model.	See discussion of element 5.1 of Claim 5.
25. The method of claim 18 wherein the different types of roof properties include different roof measurements, and the at least two different indicia include at least one of: length, slope, and area.	<p>See discussion of element 1.6 of Claim 1.</p> <p><i>Applicad</i> discloses that the reports can include a top plan view annotated with numerical values. See, e.g., <i>Applicad</i>, p. 40 (the report includes a top plan view of the model with the numerical value of the roof pitch); p. 28 (illustrating a top plan view of a roof annotated with lengths of 5000 and 10000 and a pitch of 20). See also <i>Applicad</i>, p. 25 (illustrating a top plan view of a roof annotated with lengths of ridges and edges).</p> <p><i>Applicad</i> discloses that these annotated drawings can include slope, area, and length. See, e.g., <i>Applicad</i>, p. 35 (“Eliminate the need to make any manual calculations with pen and paper. You can present all information required for the quote using our software.” (emphasis added)); p. 42 (“You can also customize the reports to suit your business, so you can . . . tailor the quote to extract certain information as required.” (emphasis added)). Further, as shown in the figures above, <i>Applicad</i> discloses that these drawings can include two more types of indicia for different types of roof properties (e.g., one color for roof edges, another color for ridges, numbers for lengths, parentheses for pitch, etc.).</p>

<p>26. The method of claim 25 wherein the length is located adjacent to a line representing a segment, the slope is located next to an arrow indicating direction of the slope and the area is located within a section having the area.</p>	<p><i>See discussion of element 8.1 of Claim 8.</i></p>
<p>27. The method of claim 18 wherein the different types of roof properties include different roof features, and the at least two different indicia include different graphical representations of the different roof features.</p>	<p><i>See discussion of element 9.1 of Claim 9.</i></p>
<p>28. The method of claim 18 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 associated with a ridge and a different color of a line associated with a valley.</p>	<p><i>See discussion of element 9.1 of Claim 9.</i></p>
<p>29. The method of claim 18 wherein the different types of roof properties include at least one of: a roof section, a roof segment, a roof valley, a ridge, a roof size, a roof geometry, a roof measurement, a roof dimension, slope, length and area.</p>	<p><i>See discussion of element 9.1 of Claim 9.</i></p>

<p>30. The method of claim 18 wherein the at least two different indicia include at least one of: different line color, different line weight, different visual characteristics of a line, different characters, different color of characters, different visual characteristics of characters, different measurements, different visual characteristics of measurements, different placement of measurements with respect to lines, different symbols, different visual characteristics of symbols and different placement of measurements with respect to symbols.</p>	<p><i>See discussion of element 9.1 of Claim 9.</i></p>
<p>31. The method of claim 18 wherein the different types of roof properties include a ridge length and a valley length and the at least two different indicia include one color of a line associated with a ridge and a different color of a line associated with a valley.</p>	<p><i>See discussion of element 13.1 of Claim 13.</i></p>
<p>33. The method of claim 18 wherein the different types of roof properties include a ridge and the at least two different indicia include a ridge length</p>	<p><i>See discussion of element 15.1 of Claim 15.</i></p>

indicia, wherein the ridge length indicia is a ridge line with a numerical value adjacent thereto.	
34. The method of claim 18 wherein the different types of roof properties include a valley and the at least two different indicia include a valley length indicia, wherein the valley length indicia is a valley line with a numerical value adjacent thereto.	<i>See</i> discussion of element 16.1 of Claim 16.
35. The method of claim 18 wherein the different types of roof properties include a slope and the at least two different indicia include a slope indicia, wherein the slope indicia is an arrow in a direction of the slope with a numerical value adjacent thereto.	<i>See</i> discussion of element 8.1 of Claim 8.
36. [36.P] 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 the computing system to generate a roof estimate report for a building having a roof, by causing, when	<i>See</i> discussion of elements 1.1-1.3 of Claim 1.

executed by the computer processor of the computing system, the computing system to perform a method comprising:	
[36.1] receiving 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;	<i>See discussion of element 1.3 of Claim 1.</i>
[36.2] 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;	<i>See discussion of element 1.4 of Claim 1.</i>
[36.3] generating, based on the 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	<i>See discussion of element 1.5 of Claim 1.</i>

building; and	
[36.4] 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.	<i>See</i> discussion of element 1.6 of Claim 1.
37. [37.1] 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	<i>See, e.g., Hsieh</i> , p. 7 (“The final task is to correct the location of the building in other images (See Figures 4(c) and 4(d)). When an object is projected from one image to the next, the projected buildings usually do not agree with the image due to inaccuracies in the DEM and the camera parameters. This step is essential for achieving accurate 3D building models.”); p. 16 (“To achieve a good 3D measurement, it is often necessary to locate the projected object in several images.”); p. 20 (“After the user measures a roof outline, this method takes the roof outline and performs the epipolar matching of the roof on other images and generates a set of roof hypotheses in each of the images. . . . Three-dimensional building hypotheses are generated by triangulating building hypotheses from at least two images.”); p. 52 (“The evaluation of the epipolar matching process uses the same metrics. To evaluate the epipolar matching process, manually measured buildings in one image are projected to other images and the epipolar matching process is performed to locate the object position in those

	images. The position estimated by the automated process is not manually corrected, to evaluate the performance of the automated process.”).
[37.2] generating the three-dimensional model based on the correlation between the two of the two or more images.	<u>Hsieh</u> discloses generating a three-dimensional model based on the correlation between the two images, the three-dimensional model including a peaked-roof with a plurality of planar roof sections that each have a slope, area, and edges. <i>See, e.g., Hsieh</i> , Title (“Design and Evaluation of a Semi-Automated Site Modeling System”); p. 6 (“Peak Roof Building Model: The peak roof model is shown in Figure 2(c). The bottom half of the peak roof model is a rectilinear flat roof building model with a rectangular roof and floor. The roof is a triangular prism.”); p. 14 (“Figure 8 (a) shows the user delineated building roof. The search bound for the peak and the vertical vanishing lines based on the roof are shown in Figure 8(b).”); FIG. 8 on p. 15; p. 30 (“The dimensional method described in [50] concerns the delineation of the detected building objects in object space. A 3D ground truth building is matched to an automatically generated 3D building hypothesis based on shape, dimension and overlap. If a hypothesized building cannot be matched to a ground truth building, it is considered to be an error. Once a building hypothesis is matched to a ground truth building, the dimensions of the building object, such as length, width and height , and the position and orientation of the building are compared between the ground truth building and the hypothesized building.” (emphasis added)); <i>See, e.g., Hsieh</i> , FIG. 17 on p. 32.
38. The non-transitory computer-readable storage medium of claim 36 wherein the method further comprises generating the	<i>See</i> discussion of element 1.6 of Claim 5. <i>See</i> discussion of element 5.1 of Claim 5.

roof estimate report, the roof estimate report including annotated line drawings of each of the one or more views of the model.	
39. The non-transitory computer-readable storage medium of claim 36 wherein the one or more images of the building are images obtained from at least one of an aircraft, satellite, and ground-based platform, and	<u>Hsieh</u> discloses using aerial imagery. <i>See, e.g., Hsieh</i> , p. 1 (“Efficient and accurate delineation of man made features from digital aerial imagery has been a shared goal of the photogrammetry and computer vision communities for a number of years.”); p. 31 (“Figure 17 shows a lone peak roof building model in four images. This scene is part of the Fort Hood aerial images distributed under the RADIUS program. It consists of two near-vertical and two oblique shots. The two oblique shots are designated with <i>ob</i> and <i>wob</i> (wide oblique) suffix. The primary use of this scene is to familiarize the subjects with SiteCity.”).
wherein the one or more views of the model are top-down line drawing views of the model.	<i>See</i> discussion of element 5.1 of Claim 5.
40. The non-transitory computer-readable storage medium of claim 36 wherein generating the model of the roof includes automatically identifying at least some features of the roof for inclusion in the model.	<u>Hsieh</u> discloses automatically identifying peak edges of a peak roof building. <i>See, e.g., Hsieh</i> , p. 14 (“3.2 Automated processes in SiteCity” and “3.2.1 Estimate Peak Edge of a Peak Roof Building”).
42. The non-transitory computer-readable storage medium of claim 36 wherein the method further comprises transmitting to a remote computing system a computer-readable data file	<i>See</i> discussion of element 1.6 of Claim 1. <i>See</i> discussion of element 5.1 of Claim 1. <u>Applicad</u> discloses saving and exporting files. <i>See, e.g., Applicad</i> , p. 38 (“[W]e have built in the ability to either Export CSV (comma separated

<p>that includes a representation of the model.</p>	<p><i>values file format) or Export GRIM (a fixed format file containing only certain parts of information). . . . At various processes used in our software, wherever a result is displayed, we provide the ability to Export CSV. For instance, you can export the data relating to the nett [sic] areas and lengths of the roof or the cutting list for the sheets or the complete listing for every component required for the job.”).</i></p>
<p>46. The non-transitory computer-readable storage medium of claim 36 wherein the different types of roof properties include different roof measurements, and the at least two different indicia include at least one of: length, slope, and area.</p>	<p>See discussion of element 1.6 of Claim 1.</p> <p><i>Applicad</i> discloses that the reports can include a top plan view annotated with numerical values. See, e.g., <i>Applicad</i>, p. 40 (the report includes a top plan view of the model with the numerical value of the roof pitch); p. 28 (illustrating a top plan view of a roof annotated with lengths of 5000 and 10000 and a pitch of 20). See also <i>Applicad</i>, p. 25 (illustrating a top plan view of a roof annotated with lengths of ridges and edges).</p> <p><i>Applicad</i> discloses that these annotated drawings can include slope, area, and length. See, e.g., <i>Applicad</i>, p. 35 (“Eliminate the need to make any manual calculations with pen and paper. You can present all information required for the quote using our software.” (emphasis added)); p. 42 (“You can also customize the reports to suit your business, so you can . . . tailor the quote to extract certain information as required.” (emphasis added)). Further, as shown in the figures above, <i>Applicad</i> discloses that these drawings can include two more types of indicia for different types of roof properties (e.g., one color for roof edges, another color for ridges, numbers for lengths, parentheses for pitch, etc.).</p>
<p>47. The non-transitory computer-readable storage medium of claim 46</p>	<p>See discussion of element 8.1 of Claim 8.</p>

wherein the length is located adjacent to a line representing a segment, the slope is located next to an arrow indicating direction of the slope and the area is located within a section having the area.	
48. The non-transitory computer-readable storage medium of claim 36 wherein the different types of roof properties include different roof features, and the at least two different indicia include different graphical representations of the different roof features.	<i>See discussion of element 9.1 of Claim 9.</i>
49. The non-transitory computer-readable storage medium of claim 36 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 associated with a ridge and a different color of a line associated with a valley.	<i>See discussion of element 9.1 of Claim 9.</i>
50. The non-transitory computer-readable storage medium of claim 36 wherein the different types of roof properties include at least one of: a roof section, a roof segment, a roof valley, a ridge, a roof size, a	<i>See discussion of element 9.1 of Claim 9.</i>

roof geometry, a roof measurement, a roof dimension, slope, length and area.	
51. The non-transitory computer-readable storage medium of claim 36 wherein the at least two different indicia include at least one of: different line color, different line weight, different visual characteristics of a line, different characters, different color of characters, different visual characteristics of characters, different measurements, different visual characteristics of measurements, different placement of measurements with respect to lines, different symbols, different visual characteristics of symbols and different placement of measurements with respect to symbols.	<i>See discussion of element 9.1 of Claim 9.</i>
52. The non-transitory computer-readable storage medium of claim 36 wherein the different types of roof properties include a ridge length and a valley length and the at least two different indicia include one color of a line associated with a ridge and a different	<i>See discussion of element 13.1 of Claim 13.</i>

color of a line associated with a valley.	
54. The non-transitory computer-readable storage medium of claim 36 wherein the different types of roof properties include a ridge and the at least two different indicia include a ridge length indicia, wherein the ridge length indicia is a ridge line with a numerical value adjacent thereto.	<i>See</i> discussion of element 15.1 of Claim 15.
55. The non-transitory computer-readable storage medium of claim 36 wherein the different types of roof properties include a valley and the at least two different indicia include a valley length indicia, wherein the valley length indicia is a valley line with a numerical value adjacent thereto.	<i>See</i> discussion of element 16.1 of Claim 16.
56. The non-transitory computer-readable storage medium of claim 36 wherein the different types of roof properties include a slope and the at least two different indicia include a slope indicia, wherein the slope indicia is an arrow in a direction of the slope with a numerical value adjacent	<i>See</i> discussion of element 8.1 of Claim 8.

thereto.	
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It would have been obvious to a person of ordinary skill in the art to include an annotated roof report, as taught by Applicad, with the system of Hsieh for easy and effective communication of roof measurement results to a user. Accordingly, there is a rationale for supplementing the teachings of Hsieh by those of Applicad under each of M.P.E.P. §§ 2143(I)(A), (C), (G), as discussed in more detail below.

As discussed above, Applicad discloses “generating an electronic file that includes an image of the building along with line drawings of the one or more top plan views of the three-dimensional model,” as recited or similarly recited in Claims 5 and 23 and “transmitting to a remote computing system a computer-readable data file that includes a representation of the model,” as recited in Claim 42. It would have been obvious to a person of ordinary skill in the art to generate a roof estimate report by generating an electronic file that includes an image of the building along with line drawings of the one or more top plan views of the three-dimensional model, as taught by Applicad, with the system of Hsieh for consolidated electronic storage of relevant information. Applicant notes that generating and transmitting an electronic file was very well-known at the time of the invention of the ‘436 Patent. Accordingly there is a rationale for

supplementing the teachings of Hsieh by those of Applicad under each of M.P.E.P. §§ 2143(I)(A), (C), (G), as discussed in more detail below.

As discussed above, Applicad discloses “wherein identifying the building includes receiving a street address of the building,” as recited in Claim 19. It would have been obvious to a person of ordinary skill in the art to identify a building by a street address, as taught by Applicad, with the system of Hsieh for identification of a particular roof of interest (e.g., to model and obtain measurements thereof). Accordingly there is a rationale for supplementing the teachings of Hsieh by those of Applicad under each of M.P.E.P. §§ 2143(I)(A), (C), (G), as discussed in more detail below.

Under M.P.E.P. § 2143(I)(A), a person of ordinary skill in the art would have found it obvious to incorporate the roof reporting functionality, electronic file generation and transmission (including an image of the building and line drawings of a top plan view of the three-dimensional model), and/or identification of a building by a street address of Applicad with the three-dimensional modeling of Hsieh as doing so would be combining prior art elements according to known methods to yield predictable results. Together, Hsieh and Applicad disclose the claim elements discussed in the claim chart above. *See, e.g.*, M.P.E.P. § 2143(I)(A)(1). A person of ordinary skill in the art could have combined the elements as claimed by electronically importing the three-dimensional model of

Hsieh into the roof reporting system of Applicad, as disclosed in Applicad. *See, e.g., Applicad*, p. 4 (“Importing Roof or Building outlines from another CAD system . . . CAD drawings can be saved in various different file formats, and our software supports most of these, but the most common form is the .dxf format (drawing exchange format).”); *see also, e.g., M.P.E.P. § 2143(I)(A)(2)*. A person of ordinary skill in the art would have recognized that the results of the combination were predictable, as Applicad would function as originally intended and designed after the three-dimensional model of Hsieh was imported. *See, e.g., M.P.E.P. § 2143(I)(A)(3)*.

Under M.P.E.P. § 2143(I)(C), a person of ordinary skill in the art would have found it obvious to incorporate the roof reporting functionality, electronic file generation and transmission (including an image of the building and line drawings of a top plan view of the three-dimensional model), and/or identification of a building by a street address of Applicad with the three-dimensional modeling of Hsieh as doing so would amount to using known techniques to improve similar devices in the same way. Petitioner submits that Hsieh is the base device that was known in the art. Applicad improves the system of Hsieh by providing roof reporting functionality, electronic file generation and transmission (including an image of the building and line drawings of a top plan view of the three-dimensional model), and/or identification of a building by a street address. *See,*

e.g., Applicad, p. 3 (“Because our software sits on top of a very powerful 3 dimensional CAD package, we can utilize various tools to enable the drawing of the roof and checking the result, before submitting to a bid.”). One of ordinary skill in the art could have applied the functionality of Applicad in the base device of Hsieh with predictable results. *See, e.g.*, M.P.E.P. § 2143(I)(C).

Under M.P.E.P. § 2143(I)(G), a person of ordinary skill in the art would have found it obvious to incorporate the roof reporting functionality, electronic file generation and transmission (including an image of the building and line drawings of a top plan view of the three-dimensional model), and/or identification of a building by a street address of Applicad with the three-dimensional modeling of Hsieh, as Applicad provides a teaching, suggestion, or motivation to do so. Petitioner submits that Applicad suggests importing three dimensional models from other systems. *See, e.g.*, Applicad, p. 4; *see also, e.g.*, M.P.E.P. § 2143(I)(G)(1). Further, there was a reasonable expectation of success that Applicad would be able to provide the roof measurement functionality, electronic file generation and transmission, and/or building identification by street address using a three-dimensional model generated by the teachings of Hsieh. *See, e.g.*, M.P.E.P. § 2143(I)(G)(2).

Petitioner notes that the format of a roof report (as in Claims 1, 7-13, 15-18, 25-31, 33-36, 38, 46-52, and 54-56) and the information that is included in an

electronic file of a roof estimate report (as in Claims 5, 23, and 42) is a mere matter of design choice, and should be afforded no patentable weight. *See, e.g.*, M.P.E.P. § 2144.04(I) citing *In re Seid*, 161 F.2d 229, 73 USPQ 431 (CCPA 1947) (“The court found that matters relating to ornamentation only which have no mechanical function cannot be relied upon to patentably distinguish the claimed invention from the prior art.”). Further, Petitioner notes that Claim 19 does not require that images of a building nor a three-dimensional model of a building be identified by a street address. In fact, the limitation does not require a computer at all.

XIII. CONCLUSION AND FEE AUTHORIZATION

For the reasons discussed above, Xactware has demonstrated a likelihood of prevailing with respect to at least one claim of the '436 Patent. Accordingly, Xactware respectfully petitions that the Board institute an *inter partes* review of claims 1-5, 7-13, 15-23, 25-31, 33-40, 42, 46-52, 54-56 of the '436 patent.

The Commissioner is authorized to charge the fee as set forth in 35 U.S.C. § 312(a) and 37 CFR §§ 42.100(a), 42.103(a), and 42.15(a), e.g., \$41,200.00, to Deposit Account No. 503571. If any additional and/or other fees are due in connection with the submission of this Request, or if any credit is due, the Commissioner is hereby authorized to charge and/or credit them to Deposit Account No. 503571.

4/8/2016
Dated

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XIV. CERTIFICATE OF SERVICE

I hereby certify that true and complete copies of this Second Corrected Petition for *Inter Partes* Review of United States Patent No. 8,078,436, including this Certificate of Service, has been caused to be served on Counsel of Record by electronic mail on April 8, 2016.

4/8/2016
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