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- (71) Applicant: **EAGLE VIEW TECHNOLOGIES, INC**
[US/US]; 17401 Northeast 138th Street, Redmond, Wash-
ington 98052 (US).
- (72) Inventor: **PERSHING, Chris**; 17401 Northeast 138th
Street, Redmond, Washington 98052 (US).
- (74) Agents: **BLAIR, Steven, R.** et al.; Seed Intellectual Prop-
erty Law Group PLLC, Suite 5400, 701 Fifth Avenue,
Seattle, Washington 98104-7064 (US).

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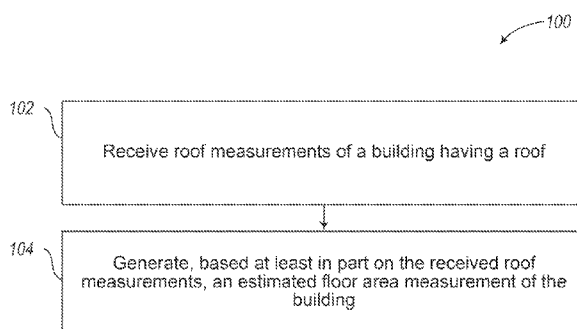


Fig. 1A

(57) Abstract: A system generates an estimated floor area measurement of a building based on the calculated estimated total roof area of the roof of the building. This is based on a correlation between the size of the building roof and the size of the building. Typically, the floor area of a single full floor of the building is roughly the size of the roof of the building if the roof were flat with no slope. This in effect is turning the roof into a floor to generate estimated floor area. With additional adjustments to area measurements to account for multiple floors, roof overhang, wall width, internal building features such as walls and staircases, and/or obstructed views of the building in the aerial image(s), etc., an even more accurate floor area estimation may be generated.

SYSTEMS AND METHODS FOR ESTIMATION OF BUILDING FLOOR AREA

BACKGROUND

Technical Field

This invention is in the field of building size estimation, and in particular, building floor area estimation.

Description of the Related Art

Building floor area is used throughout the construction, real estate, insurance and finance industries. For example, the square footage measurement of a building is used as a main factor in quickly determining the market value of real estate, estimating costs of materials to repair or replace flooring and make other improvements or modifications to the entire building. Thus, accurate floor area measurements are instrumental in these calculations. Current methods of measuring floor area often involve a person having to visit the building and manually measure particular dimensions within the building, or by referring to original plans or blueprints of the building. Manually measuring the dimensions for verification of building floor area is costly and original plans for the building may be unavailable or out of date. Therefore, accurate methods for estimating and verifying floor area, and for using such floor area estimation and verification in the construction, real estate, insurance and finance industries, which avoid these drawbacks are desirable.

SUMMARY OF THE INVENTION

A subset of building floor area, referred to as total living area (TLA) is used by insurance underwriters (Underwriters) as one component of assessing whether to insure a property, what kind of insurance to provide and at what premium rate. Underwriters also factor in overall condition of the property to be insured which includes, among other things, a visual assessment

of the number of buildings such as detached garages and barns on the property; building features such as roofs, chimneys, siding, skylights, windows and doors; items on the property such as recreational vehicles, abandoned cars, and animal pens; and distances from the property to features such as steep ground slopes, water hazards, greenbelt areas, and fire hydrants. In addition, Underwriters may also factor in data from government records pertaining to the property and buildings on it. Current methods of acquiring this information often involve a person having to visit the property and manually measure and inspect the property, or having to visit a location to view original plans or blueprints of the building. Manually measuring total living area (TLA) and manually evaluating property condition is costly, particularly given the high demand for underwriting new policies or reassessing old policies. Therefore accurate methods for estimating TLA and evaluating property conditions that avoid these drawbacks are desirable.

15 In one embodiment, a floor area measurement system receives a first and a second aerial image of the building, each of the aerial images providing a different view of the roof of the building. The system correlates the first aerial image with the second aerial image to generate a three-dimensional model of the roof that includes a plurality of planar roof sections that each have a corresponding slope, area, and edges. An adjusted roof model is generated by adjusting a slope of the planar roof sections in the three dimensional model of the roof to substantially zero. This may be performed in a variety of manners, including, in one embodiment, removing particular roof features from the model that would not be present in a flat roof, namely a roof with zero slope.

20 For example, one step is to remove ridge lines or other features distinguishing individual planar roof sections resulting in a virtual fusing of the individual roof sections in the model into one flat roof. This may be performed instead of or in addition to adjusting a slope parameter or variable of each roof section within the roof model to zero. In other embodiments, this step may be performed with just one initial aerial image of the building showing a substantially orthogonal

view of the building since roof pitch need not be determined and can be assumed to be zero.

The system generates the estimated floor area measurement of the building based on the calculated estimated total roof area of the roof after the roof model has been adjusted. This is based on a correlation between the size of the building roof and the size of the building. Typically, the floor area of a single full floor of the building is roughly the size of the roof of the building if the roof were assumed to be flat, namely a slope of zero. This will turn the roof into another floor in the virtual space. With additional adjustments to the roof area measurements to account for multiple floors, roof overhang, wall width, internal building features such as walls and staircases, and/or obstructed views of the building in the aerial image(s), etc., an even more accurate floor area estimation is generated.

In one embodiment, a floor area measurement estimation system may be a system integrated with a roof estimation system or other system that provides roof measurements. In other embodiments, the roof area measurements may be provided by an external source, system or entity, or may be input manually by an operator of the floor area measurement estimation system. Various received roof measurements may often correspond closely to external dimensions of the building such as the width and length of the building and/or lengths of exterior walls or sections of exterior walls of the building.

In another embodiment, the output of the floor area measurement may take the form of an electronic or printed report that includes, but is not limited to geocoding information of the property, images of the property from one or more views, diagrams showing the area and dimensions of living area on different floors.

One embodiment is a computing system for generating an estimated floor area measurement, the computing system comprising: a memory; a floor area measurement estimation module that is stored on the memory and that is configured, when executed, to: receive one or more aerial images of a roof of a building including a substantially top-down image of the

roof; and generate, based at least in part on the received aerial images, an estimated floor area measurement of the building.

One embodiment is a computer-implemented method for generating an estimated floor area measurement, the method comprising:

- 5 receiving one or more aerial images of a roof of a building including a substantially top-down image of the roof; using the substantially top-down image of the roof to calculate an estimated total roof area of the roof assuming each section of the roof has no slope; and generating the estimated floor area measurement of the building based on the calculated estimate total roof area of
- 10 the roof.

- One embodiment is a computer-readable medium whose contents enable a computing system to generate an estimated floor area measurement, by performing a method comprising: receiving one or more aerial images of a roof of a building including a substantially top-down image; using the
- 15 substantially top-down image to calculate an estimated total roof area of the roof assuming each section of the roof has no slope; using the one or more aerial images of the roof to determine the number of floors of the building that are under the roof; and generating, based at least in part on the estimated total roof area measurement and the number of floors that are under the roof, an
 - 20 estimated floor area measurement of the building.

- One embodiment is a computing system for generating a risk management report, the computer system comprising: a memory; a risk management report module that is stored on the memory and that is configured, when executed, to: receive features and conditions data about a
- 25 property; receive risk management criteria for the property; and generate, based at least in part on the received features and conditions data and risk management criteria, a risk management report for the property.

- One embodiment is a computer-implemented method for generating a risk management report, the method comprising: receiving
- 30 features and conditions data about a property; receiving risk management criteria for the property; and generating, based at least in part on the received

features and conditions data and risk management criteria, a risk management report for the property.

One embodiment is a computer-readable medium whose contents enable a computing system to generate an estimated floor area measurement, by performing a method comprising: receiving features and conditions data about a property; receiving risk management criteria for the property; and generating, based at least in part on the received features and conditions data and risk management criteria, a risk management report for the property.

One embodiment is a computing system for generating a risk management report, the computing system comprising: a memory; a risk management report module that is stored on the memory and that is configured, when executed, to: receive features and conditions data about a property; receive risk management criteria for the property; receive one or more aerial images of a roof of a building on the property including a substantially top-down image of the roof; generate, based at least in part on the received aerial images, an estimated floor area measurement of the building; and generate, based at least in part on the received features and conditions data, estimated floor area measurement of the building and risk management criteria, a risk management report for the property.

One embodiment is a computer-implemented method for generating a risk management report, the method comprising: receiving features and conditions data about a property; receiving risk management criteria for the property; receiving one or more aerial images of a roof of a building on the property including a substantially top-down image; using the substantially top-down image of the roof to calculate an estimated total roof area of the roof assuming each section of the roof has no slope; using the one or more aerial images of the roof to determine the number of floors of the building that are under the roof; generating, based at least in part on the estimated total roof area measurement and the number of floors that are under the roof, an estimated floor area measurement of the building; and generating, based at least in part on the received features and conditions data, estimated

floor area measurement of the building and risk management criteria, a risk management report for the property.

A computer-readable medium whose contents enable a computing system to generate an estimated floor area measurement, by

5 performing a method comprising: receiving features and conditions data about a property; receiving risk management criteria for the property; receiving one or more aerial images of a roof of a building on the property including a substantially top-down image; using the substantially top-down image of the roof to calculate an estimated total roof area of the roof assuming each section

10 of the roof has no slope; using the one or more aerial images of the roof to determine the number of floors of the building that are under the roof; and generating, based at least in part on the received features and conditions data, estimated floor area measurement of the building and risk management criteria, a risk management report for the property.

15 In another embodiment, the output of the floor area measurement may take the form of an electronic or printed report that includes, but is not limited to geocoding information of the property, images of the property from one or more views, diagrams showing the area and dimensions of living area on different floors, number of stories.

20 The output of the overall property condition evaluation includes structural observations such as type of structure, corners, estimated roof pitch, roof shape, structure footprint, basement area and basement type; and property observations, such as whether there is building permit, roof or wall report available, distances to commercial exposures or natural hazards, and/or other

25 property observations.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

The patent or application file contains at least one drawing executed in color. Copies of this patent or patent application publication with color drawing(s) will be provided by the Office upon request and payment of the

30 necessary fee.

Figure 1A is a flow diagram showing an example method of generating an estimated floor area measurement, according to one non-limiting illustrated embodiment.

Figure 1B is a flow diagram showing a method that may be included as part of the generating floor area measurement step of the method shown in Figure 1A, according to one non-limiting illustrated embodiment.

Figure 1C is a flow diagram showing a method that may be included as part of the generating total roof area step of the method shown in Figure 1B, according to one non-limiting illustrated embodiment.

Figure 1D is a flow diagram showing an example method of generating a risk management report and determining insurance product offers, which in some instances may use the floor area measurements or methods for generating the floor area measurements described herein, according to one non-limiting illustrated embodiment.

Figure 1E is a flow diagram showing a method that may be included as a part of the receive risk management criteria step of the method shown in Figure 1D, according to one non-limiting illustrated embodiment.

Figure 1F is a flow diagram showing a method that may be included as a part of the receive additional data from one or more sources step of the method shown in Figure 1D, according to one non-limiting illustrated embodiment.

Figure 1G is a flow diagram showing a method that may be included as a part of the evaluate the aerial views and received additional data in light of the risk management criteria step of the method shown in Figure 1D, according to one non-limiting illustrated embodiment.

Figure 1H is a flow diagram showing a method that may be included as a part of the provide additions, updates, and/or corrections to the data step of the method shown in Figure 1D, according to one non-limiting illustrated embodiment.

Figure 1I is a flow diagram showing a method that may be included as a part of the receive underwriting criteria step of the method shown in Figure 1D, according to one non-limiting illustrated embodiment.

Figure 2 is an example screenshot of a user interface of a system
5 for generating floor area measurements, which may be used independently of, as part of, or integrated with the systems and methods for generating a risk management report described herein, showing roof sections annotated on an aerial image of the roof, according to one non-limiting illustrated embodiment.

Figure 3 is an example screenshot of a user interface of the
10 system of Figure 2 for generating floor area measurements with area measurements of roof sections annotated on an aerial image of the roof, according to one non-limiting illustrated embodiment.

Figure 4 is an example screenshot of a user interface of the system of Figure 2 for generating floor area measurements showing the roof
15 annotated with an estimated total roof area on which to base an estimated floor area measurement, such as that estimated in the method of Figures 1A-1C, according to one non-limiting illustrated embodiment.

Figure 5 is an example screenshot of a user interface of the system of Figure 2 for generating floor area measurements showing the
20 building annotated with an adjusted estimated floor area measurement, such as that estimated in the method of Figures 1A-1C, according to one non-limiting illustrated embodiment.

Figure 6 is an example screenshot of a user interface of the system of Figure 2 for generating floor area measurements showing the
25 building annotated with adjusted estimated first and second floor area measurements, such as that estimated in the method of Figures 1A-1C, according to one non-limiting illustrated embodiment.

Figure 7 is an example screenshot of a user interface of the system of Figure 2 for generating floor area measurements showing a line
30 drawing of a top plan view of each the first and second floor of the building annotated with corresponding floor area measurements, such as that estimated

in the method of Figures 1A-1C, according to one non-limiting illustrated embodiment.

Figure 8 is an example screenshot of a user interface of the system of Figure 2 for generating floor area measurements showing a line
5 drawing of a top perspective view of the first and second floor of the building annotated with corresponding floor area measurements, such as that estimated in the method of Figures 1A-1C, according to one non-limiting illustrated embodiment.

Figure 9 is a schematic diagram of a computing environment in
10 which systems and methods for estimation of building floor area and generating a risk management report may be implemented or of which they may be a part.

Figure 10 is an example screenshot of a user interface of a system for generating floor area measurements which may be used independently of, as part of, or integrated with the systems and methods for
15 generating a risk management report described herein, showing roof sections annotated on an aerial image of the roof, according to one non-limiting illustrated embodiment.

Figure 11 is an example screenshot of a user interface of the system of Figure 10 for generating floor area measurements showing an aerial
20 view used to identify floors and the roof section areas, dimensions, and levels annotated on which to base an estimated floor area measurement or a risk management report, such as that estimated in the method of Figures 1A-1I, according to one non-limiting illustrated embodiment.

Figure 12 is an example screenshot of a user interface of the system of Figure 10 for generating floor area measurements showing an aerial
25 view used to identify floors and the roof section areas, dimensions, and levels annotated on which to base an estimated floor area measurement or a risk management report, such as that estimated in the methods of Figures 1A-1I, according to one non-limiting illustrated embodiment.

30 Figure 13 is an example screenshot of a user interface of the system of Figure 10 for generating floor area measurements showing an aerial

view used to identify floors and the roof section areas, dimensions, and levels annotated on which to base an estimated floor area measurement or a risk management report, such as that estimated in the methods of Figures 1A-1I, according to one non-limiting illustrated embodiment.

5 Figure 14 is an example screenshot of a user interface of the system of Figure 10 for generating floor area measurements showing an aerial view used to identify floors and the roof section areas, dimensions, and levels annotated on which to base an estimated floor area measurement or a risk management report, such as that estimated in the methods of Figures 1A-1I,
10 according to one non-limiting illustrated embodiment.

 Figure 15 is an example screenshot of a user interface of the system of Figure 10 for generating floor area measurements showing an aerial view used to identify floors and the roof section areas, dimensions, and levels annotated on which to base an estimated floor area measurement or a risk
15 management report, such as that estimated in the method of Figures 1A-1I, according to one non-limiting illustrated embodiment.

 Figure 16 is an example screenshot of a user interface of a system for gathering property risk assessment data using one or more aerial images of the property, which may be used independently of, as part of, or
20 integrated with the systems and methods for generating a risk management report described herein, according to one non-limiting illustrated embodiment.

 Figure 17 is an example screenshot of a user interface of the system of Figure 16 for gathering property risk assessment data, such as that described in the method of Figures 1A-1I, according to one non-limiting
25 illustrated embodiment.

 Figure 18 is an example screenshot of a user interface of the system of Figure 16 for gathering property assessment data, using measurement tools to estimate distance, such as that described in the method of Figures 1A-1I, according to one non-limiting illustrated embodiment.

30 Figure 19 is an example screenshot of a user interface of the system of Figure 16 for gathering property risk assessment data, showing data

entered from other sources, such as that described in the method of Figures 1A-1I, according to one non-limiting illustrated embodiment.

Figure 20 is an example screenshot of a user interface of the system of Figure 16 for gathering property risk assessment data, including roof characteristics, such as that estimated in the method of Figures 1A-1I, according to one non-limiting illustrated embodiment.

Figure 21 is an example screenshot of a user interface of the system of Figure 16 for gathering property risk assessment data including property ground characteristics, such as that described in the method of Figures 1A-1I, according to one non-limiting illustrated embodiment.

Figure 22 is an example page of a report that provides floor area and property assessment data, such as that estimated in the method of Figures 1A-1I, according to one non-limiting illustrated embodiment.

Figure 23 is an example page of a report to provide floor area and property risk assessment data, including report details and building summary, such as that estimated in the method of Figures 1A-1I, according to one non-limiting illustrated embodiment.

Figure 24 is an example page of a report to provide floor area and property risk assessment data, including report images, such as that described in the method of Figures 1A-1I, according to one non-limiting illustrated embodiment.

Figure 25 is an example page of a report to provide floor area and property risk assessment data, including multiple aerial angles of the property, such as that described in the method of Figures 1A-1I, according to one non-limiting illustrated embodiment.

Figure 26 is an example page of a report to provide floor area and property risk assessment data, including multiple aerial angle images, such as that described in the method of Figures 1A-1I, according to one non-limiting illustrated embodiment.

Figure 27 is an example page of a report to provide floor area and property risk assessment data, including the dimensions and the area for

different sections of a floor of a building, such as that estimated in the method of Figures 1A-1I, according to one non-limiting illustrated embodiment.

Figure 28 is an example page of a report to provide floor area and property risk assessment data, including dimensions and area by sections for a particular floor of a building, such as that estimated in the method of Figures 1A-1F, according to one non-limiting illustrated embodiment.

Figure 29 is an example page of a report to provide floor area and property assessment data, including structural observations, property observations, and confidence rating of the floor area and property assessment data, such as that described in the method of Figures 1A-1I, according to one non-limiting illustrated embodiment.

DETAILED DESCRIPTION

Figure 1A is a flow diagram showing an example method 100 of generating an estimated floor area measurement, according to one non-limiting illustrated embodiment.

While each of the steps shown in Figure 1A contributes to the overall solution, each can be used independently or in various combinations to yield improvements in estimating floor area measurements as discussed below. Below is an overview of each step in the process, which will be followed by a more detailed discussion of each step.

At 102, the process receives roof measurements of a building having a roof. These measurements may be estimated or actual dimensional and/or area measurements of the roof such as one or more of: roof edge lengths, ridge lengths, gable lengths, hip lengths, valley lengths, roof section pitch, roof area measurements, planar roof section area measurements, planar roof section dimension measurements, etc. These roof measurements may be generated internally by a component of a system that estimates floor area measurements (i.e., a floor area measurement estimation system) and received from such an internal component, or may be generated and received from an

external component or entity separate from the floor area measurement estimation system. In some embodiments, the external component is located remotely from the floor area measurement estimation system.

For example, in some embodiments, the floor area measurement
5 estimation system may be a system integrated with a roof estimation system or other system that provides roof measurements. In other embodiments, the roof area measurements may be provided by an external source, system or entity, or may be input manually by an operator of the floor area measurement estimation system. Various received roof measurements may often correspond
10 closely to external dimensions of the building such as the width and length of the building and/or lengths of exterior walls or sections of exterior walls of the building.

At 104, the process generates, based at least in part on the received roof measurements, an estimated floor area measurement of the
15 building. For example, the received roof measurements may include roof edge measurements of the roof. In such an embodiment, a floor area measurement estimation module of the floor area measurement estimation system is configured to generate, based at least in part on the received roof measurements, an estimated floor area measurement. In some embodiments,
20 the received roof measurements may include roof area measurements. In some embodiments, the floor area measurement estimation module of the floor area measurement estimation system is configured to generate, based at least in part on the received roof area measurements, an estimated floor area measurement. For example, the roof measurements may be generated by the
25 roof estimation system described in U.S. Patent No. 8,078,436 issued December 13, 2011, and entitled AERIAL ROOF ESTIMATION SYSTEMS AND METHODS, U.S. Patent No. 8,209,152 issued June 26, 2012, and entitled CONCURRENT DISPLAY SYSTEMS AND METHODS FOR AERIAL ROOF ESTIMATION, which are each incorporated herein by reference in their
30 entireties and such a roof estimation system may be integrated with the floor area measurement estimation system, or various components of the floor area

measurement estimation system described herein. Also, features of
embodiments described herein may be combined with one or more other
features of estimating measurements of structures, including those systems
and methods described in U.S. Patent Application No. _____, filed

5 _____ entitled SYSTEMS AND METHODS FOR
ESTIMATION OF BUILDING WALL AREA (Attorney Docket No.
290115.41001), which is incorporated herein by reference in its entirety.

In many such embodiments, one or more of the roof
10 measurements are based on aerial photographs of the building via manual or
automated analysis of roof features, such as by using the roof estimation
system or modules described in one or more of U.S. Patent Application Serial
No. 12/148,439 filed on April 17, 2008 and entitled AERIAL ROOF
ESTIMATION SYSTEM AND METHOD, U.S. Patent No. 8,078,436 issued
15 December 13, 2011, and entitled AERIAL ROOF ESTIMATION SYSTEMS
AND METHODS, U.S. Patent Application Serial No. 12/467,244 filed May 15,
2009 and entitled PITCH DETERMINATION SYSTEMS AND METHODS FOR
AERIAL ROOF ESTIMATION, U.S. Patent Application Serial No. 12/467,250
filed May 15, 2009 and entitled CONCURRENT DISPLAY SYSTEMS AND
20 METHODS FOR AERIAL ROOF ESTIMATION, U.S. Patent Application Serial
No. 13/019,228 filed February 1, 2011 and entitled GEOMETRIC
CORRECTION OF ROUGH WIREFRAME MODELS DERIVED FROM
PHOTOGRAPHS and U.S. Provisional Patent Application Serial No.
61/594,956 filed February 3, 2012 and entitled SYSTEMS AND METHODS
25 FOR ESTIMATION OF BUILDING WALL AREA. In some alternative
embodiments, such measurements may be made by an operator or an
automated system actually or virtually outlining, drawing and/or otherwise
detecting the perimeter of the roof on, or based on, an aerial image of the roof
to indicate an initial estimated floor shape or foot print, and providing such data
30 as input used by the system for estimating floor area described herein which
would otherwise use the roof edge measurements from a two or three

dimensional model of the roof. For example, such outlining or drawing the perimeter on the roof may be performed within a graphical user interface displaying the image of the roof such as that shown in Figures 10-15 below.

Thus, utilizing some embodiments described herein, one may estimate floor
5 area measurements of a building merely using one or more aerial photographs of the building, with little or no additional information initially needed.

Figure 1B is a flow diagram showing a method 110 that may be included as part of the generating floor area measurement step of the method shown in Figure 1A, according to one non-limiting illustrated embodiment.

10 While each of the steps shown in Figure 1B contributes to the overall solution, each can be used independently or in various combinations to yield improvements in estimating floor area measurements as discussed below.

At 112, the process generates roof edge measurements based on initial roof edge measurements included in the received roof measurements,
15 assuming each section of the roof has no slope regardless of an actual slope of each section of the roof. For example, if the two edges of the gable of a pitched roof are 20 feet and the gable has a pitch angle of 90 degrees, then instead of two edges of 20 feet, the process generates a single roof edge of $\sqrt{800} \sim 28.3$ feet. The process generates roof edge measurements as if the entire roof
20 was flat.

At 114, the process uses the roof edge measurements to calculate an estimated total roof area of the roof assuming each section of the roof has no slope. Thus, the process generates roof area measurements as if the entire roof was flat.

25 In embodiments in which a roof estimation system is integrated with the floor area measurement system, the floor area measurement system first receives a first and a second aerial image of the building, each of the aerial images providing a different view of the roof of the building. The system correlates the first aerial image with the second aerial image to generate a
30 three-dimensional model of the roof that includes a plurality of planar roof sections that each have a corresponding slope, area, and edges. In this

embodiment, an adjusted roof model is generated by adjusting a slope of the planar roof sections in the three dimensional model of the roof to substantially zero. This may be performed in a variety of manners, including, for example, removing particular roof features from the model that would not be present in a
5 roof with a slope of zero. The planar roof sections in the model become one large flat roof section. For example, the system will remove ridge lines, valleys or other features distinguishing individual planar roof sections. This creates the effect of having fused all roof sections together which can be termed as fusing them in a virtual software computer sense. This may be also performed instead
10 of or in addition to by just adjusting a slope parameter or variable of each roof section within the roof model to zero. In other embodiments, this step may be performed with just one initial aerial image of the building showing a substantially orthogonal view of the building since roof pitch need not be determined and can be assumed to be zero.

15 At 116, the process generates the estimated floor area measurement based on the calculated estimated total roof area of the roof. This is based on a correlation between the size of the building roof and the size of the building. Typically, the floor area of a single full floor of the building is roughly the size of the roof of the building if the roof were flat with no slope (i.e.,
20 virtually turning the roof into another floor). With additional adjustments to the roof area measurements described below (e.g., with respect to Figure 1C) to account for multiple floors, roof overhang, wall width, internal building features such as walls and staircases, and/or obstructed views of the building in the aerial image(s), etc., an even more accurate floor area estimation is generated.

25 In other embodiments, the received roof measurements may instead or additionally include at least one of: a plurality of dimensional measurements of a two-dimensional outline of the roof from a top plan view of the roof and an area of the two-dimensional outline of the roof from the top plan view of the roof. In such instances, the dimensions of the two-dimensional
30 outline of the roof from a top plan view of the roof may be used as the roof edge measurements on which to base the estimated floor area. However, these

dimensional measurements of a two-dimensional outline of the roof need not be referred to as “roof edge measurements” or “roof measurements” to fall within the scope of the embodiments described herein.

Figure 1C is a flow diagram showing a method 120 that may be included as part of the generating total roof area step of the method shown in Figure 1B, according to one non-limiting illustrated embodiment. While each of the steps shown in Figure 1C contributes to the overall solution, each can be used independently or in various combinations to yield improvements in estimating floor area measurements as discussed herein.

At 122, the process subtracts an amount from one or more of the roof edge measurements corresponding to an estimated roof overhang over one or more walls of the building to obtain adjusted roof edge measurements. For example, each roof edge measurement may be reduced by 6 inches to 18 inches corresponding to an estimated roof overhang, which is selectable by a user of the floor area measurement estimation system. This can be considered to be eroding the length in a virtual sense by some amount. However, any variety of other lengths or ranges of lengths may be used including, for example a zero length or those of standard or typical roof overhang lengths.

At 124 the process subtracts an amount from one or more of the adjusted roof edge measurements corresponding to an estimated wall width to obtain adjusted roof edge measurements. For example, each roof edge measurement may be reduced by 6 inches to 18 inches corresponding to an estimated wall width, which is selectable by a user of the floor area measurement estimation system. However, other lengths or ranges of lengths may be used (e.g., those of standard or typical wall widths).

At 126 the process receives information regarding floor area spaces of the building that are not to be included in the estimated floor area measurement of the building. For example, these areas may be areas of the building that are not used for living inside the building or areas outside the building including, but not limited to: garages; attics; unfinished rooms above the garage or other locations; covered balconies; patios, decks or porches,

unfinished basements; crawl spaces; etc. This information may be received from an external system, source or entity; input by a user (e.g., identified or marked by a user on an image or drawing of the building displayed within a graphical user interface of the system); and/or identified by the system via
5 analysis of an image of the building.

At 128 the process generates an initial estimated floor area measurement based on an area corresponding to an extent to which the spaces that are not to be included in the estimated floor area measurement extend under the roof and based on the adjusted roof edge measurements. For
10 example, the roof edge measurements may be used to calculate an estimated roof area with assumed slope of zero. Then, areas corresponding to an extent to which such spaces extend under the roof may be subtracted from the estimated roof area. This also may be performed in response to a user marking or otherwise identifying such areas on an image or drawing of the building
15 displayed within a graphical user interface of the system. In some embodiments, the entire process of generating an initial estimated floor area is automated by the system recognizing these particular features in one or more images of the building through image analysis that utilizes typical characteristics of such features as viewed from the various angles of those in
20 the one or more images of the building.

At 130, the process generates the estimated floor area measurement based on information received regarding a number of stories or floors of the building. For example, the floor area measurement estimation system may receive information regarding how many stories the building has
25 and regarding one or more sections of the roof below which one or more of the stories extends. The system may then generate the estimated floor area measurement based on a total area of the one or more sections of the roof under which each of the stories extends and based on the generated estimated total roof area of the roof. This total area of the one or more sections of the roof
30 under which each of the stories extends may be calculated using the adjusted roof edge measurements and then adjusted according to various other features

of the building identified in the an image of the building or otherwise received by the system. These various other features of the building indicate one or more sections of the roof below which one or more of the stories extends. Such features identify split level homes, homes with lofts, vaulted ceilings, etc.

5 The system may determine how many stories the building has using a second aerial image of the building representing a view from a different angle than the substantially orthogonal view of the top of the building such that the building height and other features related to how many stories the building has may at least be partially seen. This determination may be performed in
10 response to a user inputting a value representing the number of stories or by the user marking or otherwise identifying such areas corresponding to the different stories on an image or drawing of the building displayed within the graphical user interface of the system. The shape and perimeter of each building story may be annotated on a drawing or image of the building
15 displayed in the graphical user interface and manipulated by a user of the system collectively and/or individually to make the adjustments described herein. The adjustments will indicate one or more sections of the roof below which one or more of the stories laterally extends. The estimated total floor area of the building is then calculated by adding the areas of each identified
20 floor together to get the total area. The resulting changes in estimated total floor area are generated by the floor area estimation system and displayed on the drawing or image of the building displayed in the graphical user interface.

In some embodiments, the entire process of generating an initial estimated floor area is automated by the system recognizing these particular
25 building features (e.g., building stories, floors, etc.) in one or more images of the building through image analysis that utilizes typical characteristics of such features as viewed from the various angles of those in the one or more images.

Examples of using the estimated floor area of a structure (e.g., a building) and/or the processes and systems to generate estimated floor area
30 described herein include using such estimated floor area, processes and/or systems as part of generating estimates for and/or data for generating

estimates or assessments regarding insurance coverage for the structure or real estate including the structure, property risk assessment, and/or construction and repair of the structure. For example these estimates and/or assessments include, but not limited to, estimates and/or assessments

5 regarding: the overall value of a structure; the overall value of real estate including the structure; cost of replacing or repairing the structure; insurance rates or premiums for insuring the structure; determining, predicting and/or calculating costs of replacing or repairing the structure pursuant to processing or paying insurance claims regarding the structure; processing insurance claims

10 regarding the structure; managing risk with respect to the structure becoming or being damaged and/or risk with respect to insuring and/or paying existing or potential insurance claims on the structure; etc.

For example, Figure 1D is a flow diagram showing method 135 of generating a risk management report, which in some instances may use the

15 floor area measurements or methods for generating the floor area measurements described herein, according to one non-limiting illustrated embodiment.

While each of the steps shown in figure 1D contributes to the overall solution, each can be used independently or in various combinations to

20 also yield improvements in producing a risk management report as discussed below. Below is an overview of each step in the process, which will be followed by a more detailed discussion of each step.

At 135a, the process receives risk management criteria from an entity, wherein the risk management criteria are used to create a risk

25 management profile of a particular property. For example, an insurance company may have risk management criteria that it uses to evaluate a property to create a risk management profile of the property. This permits an insurance company to manage the risk with respect to the structure on the property or other features of the property becoming or being damaged and/or risk with

30 respect to insuring and/or paying existing or potential insurance claims on the property. This profile can be used, for example, to determine which insurance

products and at what premiums it will offer the owner. The risk management criteria may include but is not limited to conditions of aspects of buildings on the property, density and size of vegetation on the property, property terrain features such as steepness of slope or water features, and nearness to

5 commercial areas or fire stations.

At 135c, the process receives one or more aerial views of the property and surrounding area. In some embodiments, these aerial views may include top-down, substantially orthogonal views, or oblique views showing the property and buildings at an angle. In some embodiments these aerial views

10 may be used to evaluate the features and conditions of the property.

At 135e, the process receives additional data from one or more sources. These sources may include, but are not limited to, insurance companies, government entities, contractors, and the like. The sources may also include systems that have generated roof estimations, wall estimations, or

15 floor estimations.

At 135g, the process evaluates the received aerial views and received additional data using the risk management criteria to determine the risk management profile of the property. In some embodiments, this evaluation involves a human operator viewing the aerial images and the additional data to

20 answer questions about the property that correspond to risk management criteria used to assess the risk management profile of the property. In other embodiments, this evaluation involves graphical image processing, data management, and/or statistical methods to answer the questions.

At 135i, the process generates a risk management profile report

25 for the property based on the evaluation completed in the previous step.

At 135k, the process stores the risk management profile information. In some embodiments, this information is stored along with profiles of other properties to be used for various purposes such as property risk history.

At 135m, the process distributes the risk management profile report. In some embodiments, the report is sent to the insurance company, the

30

insurance agent, the property owner, or other entity that uses the risk profile to make decisions concerning the property.

At 135o, the process provides additions, updates, and/or corrections to the data received. In some embodiments, the evaluation process
5 which uses property data from many sources may uncover errors or other problems which the source of the data may wish to know about and correct. For example, a building's total living area as determined by an operator using current aerial views may not match the total living area documented in county tax records. The county may wish to update their records to determine a fair tax
10 valuation for the property. In some embodiments, discrepancies discovered in data that exceed a tolerance threshold may generate an automatic notification to the source of the data. In another embodiment, the data may be directly updated by the process.

At 135q, the process receives underwriting criteria from insurance
15 companies that describes the insurance products and premium amounts the company offers based on the features and risk management profile of a property. In one embodiment, the criteria determines the features or combination of features on the property that will cause it to be insurable, and provides the formulas that use the conditions of features on the property to
20 determine insurance premium cost.

At 135r, the process determines the insurance products to offer and the pricing of the products for the property. In one embodiment, certain features and conditions of the property will be associated with certain insurance products. For example, if a residential property also has one or more
25 commercial buildings on it, then a commercial insurance product may be appropriate. In another example, if the residential property has an RV parked in the yard, offering an auto insurance product that covers the RV may be appropriate. In another embodiment, criteria involving conditions of features on the property may determine the premium amounts offered for a particular
30 policy. For example, if the condition of the roof of a residential building appears

excessively worn or damaged, the premiums for ensuring that building will be higher than if the roof was not damaged.

Figure 1E is a flow diagram showing an example method 140 of receiving risk management criteria used to create a risk management profile of a property step of the method shown in Figure 1D, according to one non-limiting illustrated embodiment. While each of the steps shown in Figure 1E contributes to the overall solution, each can be used independently or in various combinations to yield improvements in receiving risk management criteria from an entity as discussed below.

At 140a, the process receives risk management criteria from an entity used to create a risk management profile of a property. In one embodiment, the criteria are used to evaluate features of the property to create a risk management profile of the property. Features of the property may include but are not limited to buildings, vegetation, terrain, distance to water, distance to commercial areas, and distance to a fire station. Features of a building may include but are not limited to year built, number of stories, style of roof, floor area, and number of windows. In addition, the criteria may also describe various conditions of the features of a property. In one or more embodiments, the criteria may be received as a data file that may be imported into an evaluation system.

At 140c, the process stores the risk management criteria received from each company. In one embodiment, the criteria from each company are stored in a database and used during the evaluation process, described below, when the property risk assessment profile is being created.

At 140e, the process determines the criteria elements that are common among companies. In one embodiment, elements are reviewed by an operator to determine the common elements. In another embodiment elements are compared electronically.

At 140g, the process uses the common criteria elements to allow risk management profile evaluation comparison among companies. In one

embodiment, this allows the evaluation process, described below, to efficiently produce risk management profile reports for a number of insurance companies.

Figure 1F is a flow diagram showing an example method 150 of receiving additional data from one or more sources to used to determine a risk management profile step of the method shown in figure 1D, according to one non-limiting illustrated embodiment. While each of the steps shown in Figure 1F contributes to the overall solution, each can be used independently or in various combinations to yield improvements in receiving additional data from one or more sources as discussed below.

At 150a, the process receives one or more aerial views of the property. In one or more embodiments, these aerial views may include a top-down, or substantially orthogonal view of the property, and/or oblique views of the property taken at angles from different directions. For example, an oblique aerial view of the property may be taken at a 45° angle from the north, and another taken at a 50° angle from the west. In one embodiment, these aerial views are provided in a digital format.

At 150c, the process receives floorplan estimates and total living area estimates for buildings on the property. In one embodiment, these estimates are received from the roof estimation system or a floor area measurement system described herein. In another embodiment the estimates may come from county records.

At 150e, the process receives data generated from modeling or estimation software for buildings. In one or more embodiments, this data may be generated by a roof estimation systems, wall estimation systems, 3D modeling systems, CAD systems, or the like.

At 150g, the process receives data on file for similar houses in the community. In one or more embodiments, this data may include the date the neighborhood was developed, the average age of houses, typical improvements done to property, and the like.

At 150i, the process receives government records on the property. In one or more embodiments, these records may include but are not limited to

information received from county or city building departments, which include building plans, building permit information, as-built information and the like. The records may also include government tax records that include estimated total living area of buildings on the property.

5 At 150K, the process receives data from contractor or construction firms. In one or more embodiments, this may include but is not limited to blueprints, as-built information, landscape elevations, and repair information.

 At 150m, the process receives data from scans of the property. In
10 one or more embodiments, these scans may include but are not limited to infrared scans, thermal imaging scans, and the like.

 At 150o, the process receives property data collected on-site. In one or more embodiments, this data includes but is not limited to visual information on property features, for example external and internal property
15 features of buildings. Examples of external features are the condition of walls, roofs, chimneys, skylights, porches, patio, decks, garages, and other exterior features. Example of internal features are the conditions of walls, ceilings, floors, carpeting, windows, fixtures, skylights, and other interior features.

 Conditions of other property features may include but are not
20 limited to terrain, vegetation, water hazards, trampolines, hot tubs, swimming pools, outbuildings, automobiles, or other outside features relevant to determine a risk management profile.

 In some embodiments, this visual information may be captured using an image or video recording device by the property owner or one or more
25 other individuals evaluating the property. In some embodiments, the data collected may include but is not limited to interviews with property owners, tenants, or one or more neighbors.

 In other embodiments, data collected may include data from chemical samples, odor detectors, radiation detectors, radon detectors,
30 moisture detectors, RFI detectors and the like.

In one or more embodiments, additional data required during the evaluation process, described below, may be requested from one or more individuals who are evaluating the property.

At 150q, the process receives data collected from insurance
5 companies. In one or more embodiments, this data may include but is not limited to existing photographs of the property, descriptions and measurements of features on the property, insurance claims history of the property and the like. In addition this data may include insurance data available for buildings or property near the property being evaluated.

10 Figure 1G is a flow diagram showing a method 155 that may be included as a part of the evaluate the aerial views and received data in light of risk management criteria step of the method shown in figure 1D, according to one non-limiting illustrated embodiment. While each of the steps shown in Figure 1G contributes to the overall solution, each can be used independently
15 or in various combinations to yield improvements in evaluating the aerial views and received data as discussed below.

At 155a, the process generates questions for assessing the individual elements of the risk management criteria for the property. In one embodiment, a question is created for each criteria element. For example, if an
20 element is the age of a building, a generated question may be “what year was the building built?”

At 155c, the process uses the aerial views and received data to provide answers to the generated questions. In one or more embodiments, the answers to the questions may be but are not limited to being provided by an
25 operator at a workstation viewing the images and the data, an automated system analyzing the aerial views and received data, and one or more individuals viewing the aerial views and receive data according to a crowd sourcing model.

At 155e, the process receives questions to answer. In one non-
30 limiting embodiment, an individual at a workstation is viewing the aerial images

and the received data. However, in some embodiments, this process may be automated.

At 155g, the process evaluates data and aerial images to answer the received questions. In this embodiment, an operator at a workstation is
5 viewing the aerial images, the received data and the received questions, and is answering the questions based on the operator's evaluation of the images and data.

At 155i, the process provides a confidence rating for answers to the questions. In one embodiment, the operator enters a confidence rating for
10 each individual question answered. In another embodiment, the operator enters an overall confidence rating once all questions are answered.

At 155k, the process receives questions to answer. In one non-limiting embodiment, the aerial images and received data are analyzed by an automated system to determine the answers.

15 At 155m, the process uses graphical processing to analyze received aerial views to identify features of the property. In one non-limiting embodiment, a feature of the property may be a building, terrain, water feature, vegetation, or other characteristic of the property relevant to a risk management assessment.

20 At 155n, the process uses visual recognition, graphical analysis, and the like to identify features and conditions of the property to determine answers to the questions. For example, to identify roof wear or prior patch made to the roof by analyzing the pattern or color differences identified on the roof or to identify the condition of the skylight or window by using optical density
25 analysis. In another example, to use visual analysis to determine the distance to the nearest water feature or to determine the style of a building, or to identify if a trampoline or swimming pool is located on the property.

At 155o, the process uses graphical processing to compare similar aerial views of the property taken at different times to determine
30 answers to the questions. Examples include but are not limited to identifying the rate of deterioration of an outbuilding roof, the rate of growth of vegetation,

whether any structures have been newly built or modified, whether damage to a structure has been sustained but unrepaired over time such as hailstorm damage, and the like.

At 155p, the process uses data processing to analyze data about
5 neighboring properties to estimate answers to the questions. Examples include but are not limited to the age of surrounding buildings, the age of the neighborhood, the condition of surrounding property, and the like.

At 155q, the process uses statistical techniques to determine the confidence rating for answers to the questions. These techniques include but
10 are not limited to analyzing the resolution of aerial views, any obstruction by trees of views to the buildings, age of data received indicating it may be out of date, and the like.

At 155r, the process receives questions to answer. In one non-limiting embodiment, the evaluation is performed using a crowd sourcing model,
15 in which, for example a number of individuals view the aerial views and additional data, and answer the questions.

At 155s, the process identifies the evaluators that will receive the questions, the additional data, and aerial images. In one or more embodiments the evaluators may be but are not limited to volunteers, paid contractors, the
20 property owner, to the property tenant, to neighbors of the property, and the like.

At 155t, the process sends the questions, data, and aerial images to the evaluators. In one or more non-limiting embodiments, this may be done electronically via email, a Smartphone application, on paper, or the like.

25 At 155u, the process evaluates the data and aerial images to answer the questions. In one or more non-limiting embodiments, this may be done by an individual operator at a workstation, by an automated process, or by a combination of both.

At 155v, the process provides a confidence rating for answers to
30 the questions. In one or more embodiments, the operator may enter either a confidence rating for each individual question answered, or an overall

confidence rating once all questions are answered. Or, if using an automated process, statistical techniques may be used to determine the confidence rating.

At 155W, the process receives the answers from the evaluators. In one or more non-limiting embodiments, this may be done electronically, via email, a Smartphone application, on paper, or the like.

At 155X, the process assesses the accuracy of each evaluator for use in selecting future evaluators. In one or more embodiments, the assessment may take the form of, but not limited to, several techniques. In one non-limiting example, statistical techniques may be used to generate the most likely correct answer for each question answered by the evaluator and compare that answer to the evaluator's answer. In another non-limiting example, individuals may review the evaluations done by each evaluator and vote on the accuracy of the each evaluation.

Figure 1H is a flow diagram showing a method 160 that may be included as part of providing additions, updates, and/or corrections to the data received step of the method shown in Figure 1D, according to one non-limiting illustrated embodiment. While each of the steps shown in figure 1H contributes to the overall solution, each can be used independently or in various combinations to yield improvements in providing additions, updates, and/or corrections to the data received as discussed below.

At 160c, the process identifies data that has been found during the evaluation process to be incorrect. In one or more embodiments, examples of this data include but are not limited to images that are out of date, area estimates of buildings that are incorrect, number of listed outbuildings that is not correct, and the like. In one or more embodiments, the term "correct" may include a deviation within a certain tolerance level.

At 160e, the process reports to the source of the data that the data is not correct. In one or more embodiments, this may include but is not limited to notifying the source of the data (e.g. an insurance company) that the data is not correct, sending the source the correct data, updating the source with the correct data, and the like.

Figure 1I is a flow diagram showing a method 165 that may be included as part of the receiving underwriting criteria for insurance product offers and pricing for the property step of the method shown in figure 1D, according to one non-limiting illustrated embodiment. While each of the steps
5 shown in Figure 1I contributes to the overall solution, each can be used independently or in various combinations to yield improvements in estimating floor area measurements as discussed below.

At 165a, the process receives underwriting criteria to determine the insurance products and premiums available based on a property's risk
10 assessment profile. Examples of this underwriting criteria include but are not limited to a list of the features of a property that corresponds to a particular insurance products offered by the company and the various conditions of the features of the property that affect premium cost of each insurance product.

At 165c, the process receives the property risk management
15 profile. In one non-limiting embodiment, the property risk management profile is retrieved from a database containing property risk management profiles.

At 165e, the process determines the insurance products and pricing for the property. In one non-limiting embodiment, the process compares the features and conditions of the property found in the property risk
20 management profile to the received underwriting criteria to determine what insurance products are available for the property and the premium cost of each insurance product.

At 165g, the process determines if the confidence rating for the property risk management profile is high enough to not send a person to the
25 property for an on-site inspection. In one non-limiting embodiment, the confidence rating that is part of the properties risk management profile is compared with other factors including but not limited to the features of the property, the condition of the features of the property, the dollar cost of the insurance products being quoted, cost to send someone for an on-site
30 inspection, and the like. A company may, based on the comparison, either

choose to not send a person on-site and instead “desk underwrite” the insurance products.

Figure 2 is an example screenshot of a user interface of a system for generating floor area measurements with roof sections annotated on an aerial image of the roof, according to one non-limiting illustrated embodiment. For example, the screenshots of Figures 2-8 are screenshots of the graphical user interface of the floor area measurement system which performs the processes described in Figures 1A-1C above.

Shown is a graphical user interface including two panels, one with an image of a building showing a top substantially orthogonal view 202 of the building and the other with an image of the building showing a top oblique view 204 of the same building. Also shown is an annotation 212, which is a line drawing of a three dimensional model of the roof. The annotation 212 is an adjustable graphical user interface element overlaid on the roof of the building in each image corresponding to the angle of view 202 and view 204 of the roof in each image. The annotation 212 also shows various planar sections of the roof as delineated by the roof features and roof lines, such as the ridge line, valley lines and roof eaves, etc. This annotation 212 is an interactive graphical user interface feature and may be manipulated by a user of the system to make various adjustments to roof features and characteristics for the purpose of generating roof measurements, such as those used in the processes shown in Figures 1A-1C and other embodiment described herein. These may be performed by user interaction with the annotation itself and/or various selectable controls 206.

Also shown are image selection bars 208 and 210 which display thumbnail or reduced-size images of various other images showing the building from other perspectives and view angles. Selection bar 208 is located above view 202. When a particular thumbnail image in selection bar 208 is selected, the image showing the current view 202 is replaced with that of the selected image. Similarly, selection bar 210 is located above view 204. When a

particular thumbnail image in selection bar 210 is selected, the image showing the current view 204 is replaced with that of the selected image.

Figure 3 is an example screenshot 300 of a user interface of the system of Figure 2 for generating floor area measurements with area measurements 302, 304 and 306 of roof sections annotated on an aerial image of the roof, according to one non-limiting illustrated embodiment. For example, when the user selects the “next button” 214 shown in Figure 2, the floor area measurement estimation system calculates the areas 302, 304 and 306 of each roof section according to the roof annotation 212, as adjusted by the user, and displays these area values 302, 304 and 306 on the corresponding sections of the roof in the displayed image. Also shown is a “Fuse” button 308, the selection of which causes results to be displayed as shown in Figure 4.

Figure 4 is an example screenshot 400 of a user interface of the system of Figure 2 for generating floor area measurements showing the roof annotated with an estimated total roof area 402 on which to base an estimated floor area measurement, such as that estimated in the method of Figures 1A-1C, according to one non-limiting illustrated embodiment. For example, when the user selects the “Fuse” button 308 shown in Figure 3, the floor area measurement estimation system may perform the acts 112 and 114 of the process shown in Figure 1B to calculate an estimated total roof area of the roof by setting each section of the roof to a zero slope.

In this embodiment, the floor area measurement estimation system generates an adjusted roof model by adjusting the slope to substantially zero of the planar roof sections having areas 302, 304 and 306 shown in Figure 3 in the three dimensional model of the roof represented by annotation 212. This may be performed in a variety of manners, including, for example, by removing particular roof features from the model represented by annotation 212 in Figure 3 that would not be present in a flat roof with no slope. This could be considered “fusing” individual planar roof sections in the model into one flat roof section, such as by removing ridge lines or other features distinguishing individual planar roof sections instead of, or in addition to, adjusting a slope

parameter or variable within the model to zero. This process results in the adjusted annotation 212 displayed by the system as shown in Figure 4 without lines indicating roof features such as ridge lines associated the pitched roof. Thus, the system generates and provides roof edge measurements using the
5 roof model as if the entire roof was flat with no slope, as shown by the annotation 212 representing the roof model in Figure 4.

Although the screenshot of the graphical user interface 300 shows both the orthogonal view 202 and oblique view 204, in other embodiments, this action may be performed with just one initial aerial image of the building using
10 and/or showing only the substantially orthogonal view 202 of the building since roof pitch need not be determined and can be assumed to be zero.

Also shown is an “Erode” button 402, the selection of which causes results to be displayed as shown in Figure 5, as will be explained in conjunction with Figure 5 below.

15 Figure 5 is an example screenshot 500 of a user interface of the system of Figure 2 for generating floor area measurements showing the building annotated with an adjusted estimated floor area measurement, such as that estimated in the method of Figures 1A-1C, according to one non-limiting illustrated embodiment. For example, when the user selects the “Erode” button
20 402 shown in Figure 4, the floor area measurement estimation system will perform the acts 122 and 124 of the process shown in Figure 1C to calculate an adjusted estimated total roof area of the roof by subtracting an amount from each section of the roof to account for an eave overhang distance.

In this embodiment, the floor area measurement estimation
25 system subtracts an amount from one or more of the roof edge measurements in the roof model represented by annotation 212 corresponding to an estimated roof overhang over one or more walls of the building to obtain adjusted roof edge measurements. For example, each roof edge measurement may be reduced (i.e., “eroded”) by 6 inches to 18 inches corresponding to an estimated
30 roof overhang, which is selectable by a user of the floor area measurement estimation system. However, other lengths or ranges of lengths may be used.

The floor area measurement estimation system may also subtract an amount from one or more of the adjusted roof edge measurements in the roof model represented by annotation 212 corresponding to an estimated wall width to obtain adjusted roof edge measurements. For example, each roof

5 edge measurement may be reduced (i.e., “eroded”) by 6 inches to 18 inches corresponding to an estimated wall width, which is selectable by a user of the floor area measurement estimation system. However, other lengths or ranges of lengths may be used.

The amount of length subtracted from a line to obtain a more

10 accurate measure of the internal footprint of the home will vary depending on the factor being subtracted for. If the factor being subtracted for is an eave, the value may be 2 feet, 3 feet, or another selected amount which may be a default value, such as 2 feet, or a value selected by an operator from seeing a second image of the home, which provides an oblique view of the overhang difference,

15 which in some homes might be 4 feet. On the other hand, if the subtraction is for a wall thickness, the amount will usually be 6 inches or at most 10 inches. For a porch or deck, the amount might be 10 feet, 12 feet or some other value, based on an estimate of the true distance from an operator viewing one or more oblique images.

20 In some embodiments, each time a user selects the “erode” button 402, an additional adjustment shortening the lengths of the roof edges will be performed by the system. Note that the annotation 212 in Figure 5 is now adjusted corresponding to the adjusted roof edge lengths such that the actual edges of the roof in the image shown in both the orthogonal view 202

25 and oblique view 204 extend beyond the borders of the annotation 212. The corresponding roof area measurement 502 is also therefore adjusted accordingly by the floor area measurement estimation system (e.g., from 2144 square feet down to 1855 square feet as shown in Figures 4 and 5, respectively).

30 Figure 6 is an example screenshot 600 of a user interface of the system of Figure 2 for generating floor area measurements showing the

building annotated with adjusted estimated first floor and second floor area measurements, such as that estimated in the method of Figures 1A-1C, according to one non-limiting illustrated embodiment. For example, the user may manipulate or otherwise adjust the annotation 212, or add additional

5 annotations to represent multiple floors of the building as identified in the oblique view 204 of the building. Based on these adjustments, the floor area measurement estimation system may perform act 130 of the process shown in Figure 1C to generate the estimated floor area measurement based on information received regarding a number of stories of the building. For

10 example, the floor area measurement estimation system may receive information regarding how many stories the building has and regarding one or more sections of the roof below which one or more of the stories laterally extends. The system may then generate the estimated floor area measurement based on a total area of the one or more sections of the roof under which each

15 of the stories extends and based on the generated estimated total roof area of the roof.

In the example embodiment shown in Figure 6, shown is a first floor annotation 602 and a second floor annotation 604 that combined form annotation 212. The relationship between the first floor, second floor and roof

20 can be seen from a different perspective in the oblique view 204 as the second floor annotation 604 shows that the second floor laterally extends substantially the entire length of the roof. However, the first floor annotation 602 shows that the first floor laterally extends about half way the length of the roof and the second floor due to the garage. The first floor annotation 602 and a second

25 floor annotation 604 may be directly or indirectly manipulated and adjusted resulting in different area measurements of the floor represented by these annotations.

Also, first floor annotation 602 and second floor annotation 604 may be directly or indirectly manipulated and adjusted to account for spaces

30 that are not to be included in the estimated floor area measurement. For example, these areas may be areas of the building that are not used for living

inside the building or areas outside the building, including but not limited to: garages; attics; unfinished rooms above the garage or other unfinished spaces; covered balconies; patios, decks or porches, basements; crawl spaces; etc.

This also may be performed in response to a user marking or otherwise

- 5 identifying such areas on the first floor annotation 602 and second floor annotation 604, or otherwise adjusting the dimensions of the sides of the first floor annotation 602 and second floor annotation 604 to “notch” out or “cut” out such areas. In some embodiments, selectable graphical user interface items are provided representing such spaces. When selected and placed on the first
10 floor annotation 602 and second floor annotation 604, an area corresponding to a standard size and/or shape of such a space will be removed from the first floor annotation 602 and second floor annotation 604, and the floor area measurements will be adjusted accordingly.

For example, a selectable graphical user interface item

- 15 representing a standard two-car garage may be selected by a user and placed in a position on the first floor annotation 604 overlaid on the image of the building corresponding to where a garage of the building is located. The floor area measurement estimation system will then subtract an area corresponding to the area of the standard two-car garage from the area of the first floor
20 according to the position of the graphical user interface item representing the standard two-car garage on the first floor annotation 604.

- Figure 7 is an example screenshot 700 of a user interface of the system of Figure 2 for generating floor area measurements showing a line drawing of a top plan view of each the first and second floor of the building
25 annotated with corresponding floor area measurements of the building shown in Figure 6, such as that estimated in the method of Figures 1A-1C, according to one non-limiting illustrated embodiment. The line drawing represents the first floor annotation 602 and the second floor annotation 604 shown in Figure 6. Note that the corresponding estimated floor areas are displayed on each
30 annotation. These are adjusted by the floor area measurement estimation

system upon manipulation of the corresponding first floor annotation 602 or second floor annotation 604 by the user.

Figure 8 is an example screenshot 800 of a user interface of the system of Figure 2 for generating floor area measurements showing a line drawing of a top perspective view of the first and second floor of the building shown in Figure 6 annotated with corresponding floor area measurements, such as that estimated in the method of Figures 1A-1C, according to one non-limiting illustrated embodiment. Shown in this manner in the graphical user interface of the floor area measurement estimation system, a user may manipulate the corresponding first floor annotation 602 and/or second floor annotation 604 and see the visual effects of the changes according to the positional relationships between the first and second floors corresponding to the oblique view 204 shown in Figure 6.

Provided the example in Figure 8, the total estimated floor area of the building is 2866 square feet (1076 square feet as noted on the first floor annotation 602 plus 1790 square feet as noted on the second floor annotation 604). Various reports may be generated showing the estimated areas of the various floor and/or the estimated total floor area of the building. For example, a report may be generated by the building floor area measurement estimation system or by using the data provided by the building floor area measurement estimation system that includes diagrams similar to the screenshots 700 and 800 shown in Figure 7 and 8, respectively either alone or overlaid on the corresponding images of the building shown in Figure 6.

Figure 9 is a schematic diagram of a computing environment in which systems and methods for estimation of building floor area may be implemented or of which they may be a part. For example, processes 100, 110 and 120 described above in conjunction with Figures 1A-1C may be performed or implemented by, for example, one or more software modules or components or any combination of suitable hardware, firmware or software components or devices including those that are a part of, stored in, or configure the computing environment of Figure 9. Also, the graphical user interface functions and

features may be performed or implemented by, for example, one or more software modules or components or any combination of suitable hardware, firmware or software components or devices including those that are a part of, stored in, or configure the computing environment of Figure 9.

- 5 The computing environment 900 will at times be referred to in the singular herein, but this is not intended to limit the embodiments to a single device since in typical embodiments there may be more than one computer system or device involved. Unless described otherwise, the construction and operation of the various blocks shown in Figure 9 are of conventional design.
- 10 As a result, such blocks need not be described in further detail herein, as they will be understood by those skilled in the relevant art.

- The computing environment 900 may include one or more processing units 912a, 912b (collectively 912), a system memory 914 and a system bus 916 that couples various system components including the system
- 15 memory 914 to the processing units 912. The processing units 912 may be any logic processing unit, such as one or more central processing units (CPUs) 912a, digital signal processors (DSPs) 912b, digital video or audio processing units such as coder-decoders (codecs) or compression-decompression units, application-specific integrated circuits (ASICs), field programmable gate arrays
- 20 (FPGAs), etc. The system bus 916 can employ any known bus structures or architectures, including a memory bus with memory controller, a peripheral bus, and a local bus. The system memory 914 includes read-only memory ("ROM") 918 and random access memory ("RAM") 920. A basic input/output system ("BIOS") 922, which can form part of the ROM 918, contains basic routines that
- 25 help transfer information between elements within the computing environment 900, such as during start-up.

- The computing environment 900 may include a hard disk drive 924 for reading from and writing to a hard disk 926 (including a solid state memory device), an optical disk drive 928 for reading from and writing to
- 30 removable optical disks 932, and/or a magnetic disk drive 930 for reading from and writing to magnetic disks 934. The optical disk 932 can be a CD-ROM,

while the magnetic disk 934 can be a magnetic floppy disk or diskette. The hard disk drive 924, optical disk drive 928 and magnetic disk drive 930 may communicate with the processing unit 912 via the system bus 916. The hard disk drive 924, optical disk drive 928 and magnetic disk drive 930 may include
5 interfaces or controllers (not shown) coupled between such drives and the system bus 916, as is known by those skilled in the relevant art. The drives 924, 928 and 930, and their associated computer-readable storage media 926, 932, 934, may provide nonvolatile and non-transitory storage of computer readable instructions, data structures, program modules and other data for the
10 computing environment 900. Although the depicted computing environment 900 is illustrated employing a hard disk 924, optical disk 928 and magnetic disk 930, those skilled in the relevant art will appreciate that other types of computer-readable storage media that can store data accessible by a computer may be employed, such as magnetic cassettes, flash memory, solid state
15 drives, digital video disks ("DVD"), Bernoulli cartridges, RAMs, ROMs, smart cards, etc. For example, computer-readable storage media may include, but is not limited to, random access memory (RAM), read-only memory (ROM), electrically erasable programmable read-only memory (EEPROM), flash memory, compact disc ROM (CD-ROM), digital versatile disks (DVD) or other
20 optical disk storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, solid state memory or any other medium which can be used to store the desired information and which may be accessed by processing unit 912a.

Program modules can be stored in the system memory 914, such
25 as an operating system 936, one or more application programs 938, other programs or modules 940 and program data 942. Application programs 938 may include instructions that cause the processor(s) 912 to perform generating digital roof models, generating roof and floor area measurements, and store and display input images or images generated by generating digital roof models
30 and generating roof and floor area measurements, including the processes described herein. Other program modules 940 may include instructions for

handling security such as password or other access protection and communications encryption. The system memory 914 may also include communications programs, for example, a Web client or browser 944 for permitting the computing environment 900 to access and exchange data
5 including digital images, roof measurements and other building data with sources such as Web sites of the Internet, corporate intranets, extranets, or other networks and devices, as well as other server applications on server computing systems. The browser 944 in the depicted embodiment is markup language based, such as Hypertext Markup Language (HTML), Extensible
10 Markup Language (XML) or Wireless Markup Language (WML), and operates with markup languages that use syntactically delimited characters added to the data of a document to represent the structure of the document. A number of Web clients or browsers are commercially available such as those from Mozilla, Google, and Microsoft of Redmond, Washington.

15 While shown in Figure 9 as being stored in the system memory 914, the operating system 936, application programs 938, other programs/modules 940, program data 942 and browser 944 can be stored on the hard disk 926 of the hard disk drive 924, the optical disk 932 of the optical disk drive 928 and/or the magnetic disk 934 of the magnetic disk drive 930.

20 An operator can enter commands and information into the computing environment 900 through input devices such as a touch screen or keyboard 946 and/or a pointing device such as a mouse 948, and/or via a graphical user interface in order to receive, process, store and send data on which floor area measurement estimation has been or will be performed as
25 described herein. Other input devices can include a microphone, joystick, game pad, tablet, scanner, etc. These and other input devices are connected to one or more of the processing units 912 through an interface 950 such as a serial port interface that couples to the system bus 916, although other interfaces such as a parallel port, a game port or a wireless interface or a
30 universal serial bus ("USB") can be used. A monitor 952 or other display device is coupled to the system bus 916 via a video interface 954, such as a video

adapter which may be configured to display images used by or generated by floor area measurement estimation as described herein. The computing environment 900 can include other output devices, such as speakers, printers, etc.

5 The computing environment 900 can operate in a networked environment using logical connections to one or more remote computers and/or devices. For example, the computing environment 900 can operate in a networked environment using logical connections to one or more other computing systems, mobile devices and other service providers or information
10 servers that provide the digital images in various format or by other electronic delivery methods. Communications may be via a wired and/or wireless network architecture, for instance wired and wireless enterprise-wide computer networks, intranets, extranets, telecommunications networks, cellular networks, paging networks, and other mobile networks.

15 Figure 10 is an example screenshot 702 of a user interface of a floor plan editor tool for generating floor area measurements, which may be used independently of, as part of, or integrated with the systems and methods for generating a risk management report described herein. In one embodiment, the tool consists of a floor plan editor 300, a facet label editor 302, and control
20 buttons 304. The floor plan editor 300 consists of an approximately orthogonal view of the property 306 over which the software operator can draw shapes, such as rectangles, to outline the dimensions and area of different approximate floor areas of different sections of the house or building 308. The facet label editor 302 is a window that displays multiple aerial views of the property. In this
25 example, the operator is looking at a West view which is indicated in area 310. Below this area there are a series of thumbnail images 314, with the current image being viewed highlighted 312. The highlighted image 312 indicates the expanded view of the image shown below 320. The operator, when drawing the floor areas 308, uses the multiple views of the property that are referenced
30 by the thumbnail images 314 to determine the various features and facet types of the building for which the operator wants to estimate a floor area. An

example of these facet types and features are listed in the facet label editor as facet type buttons 316. These facet types include, but are not limited to, footprint 316a, outbuilding 316b, garage 316c, first floor 316d, second floor 316e, third floor 316f, deck 316g, patio 316h, and porch 316i. The operator
5 may select one of these buttons to associate one floor plan shape drawn on the building 308.

Control buttons 304 allow the operator to adjust floor plan shapes and choose different views of the property to show on the facet label editor 302. The operator can select the image 320 to display by using either the left arrow
10 318a or the right arrow 318b to move the selected thumbnail image, in this case image 312, to the desired image to be shown. Selecting different aerial images of the property taken at different angles allows the operator to better understand the structure of the building to determine the number of floors, the levels, garages, decks, patios, porches, or other features of the building. The
15 erode button 330 allows a floor plan shape that is selected from among the number of floor plan shapes 308 to have its edges slightly reduced, for example, by 16 inches to 18 inches. Conversely, the dilate button 332 will enlarge the size of the selected shape by a small amount. The erode and dilate features are used as fine-tune adjustments by the operator to adjust the
20 rectangle shape to the approximate floor plan of the building section that is being estimated. The checklist button 322 will take the user to the gathering property assessment screens described starting in Figure 16. When the operator has finished drawing all the shapes and is satisfied with the drawings of the floor plan, the operator selects the finish button 326. To reject the
25 changes and start over, the operator selects the reject button 324.

Figure 11 is an example screenshot 704 of the user interface of the system described in Figure 10. Here, the operator has zoomed in, using the floor plan editor, on the image showing the top of the building being measured 306. In one embodiment, the operator uses a mouse to move cursor
30 336 to different locations over the house to draw rectangles that represents floor areas the operator wishes to measure. For example, if the operator

wished to estimate the measurement of the deck 338, the operator would first select the deck facet types button 316g, then on the floor plan editor image 306 select the four corners that appear to the operator to be the corners of deck 338. Once the operator has completed this for all of the floor plan areas
5 desired to be captured, the operator can go to the facet label editor thumbnail images 314 and select the top view, in this example by selecting thumbnail 340, which shows the top view of the building in the facet label editor overlaid with the different facet types as identified by the operator. In this example, the facet types are differentiated by different names, such as garage, footprint, first floor,
10 second floor, deck, etc. and are also distinguished by color: magenta, beige, blue, dark blue, gray, etc. In addition, the dimensions and the areas associated with each facet type footprint also appear in the same color in the floor plan editor overlaid on the top-down image 306.

Figure 12 is an example screenshot 706 of the user interface of
15 the system from Figure 10. In this example, the user has selected thumbnail 342, which is an oblique aerial view of the property facing east. The operator may use this view to verify the operator's choices of the different facet types for the floor areas.

Figure 13 is an example screenshot 708 of the user interface of
20 the system of Figure 10. Here, the operator has selected thumbnail 344, which is a oblique aerial view of the property facing north, again to check whether the facet type selections for the floor area need any adjustment.

Figure 14 is an example screenshot 710 of a user interface of the
system of Figure 10. Here, the operator has zoomed in further on the north
25 oblique-facing image 348 to better check and review the operator's assessment of the features of the building.

Figure 15 is an example screenshot 712 of a user interface of the
system of Figure 10. Here, the operator has selected the top thumbnail 340 to
review the final floor plan selections and facet type selections for any final
30 changes. If the operator is satisfied with the floor plan, the operator selects the finish button 326.

Figure 16 is an example screenshot 714 of a user interface of a system for gathering property assessment data for a property and the buildings on the property, which may be used independently of, as part of, or integrated with the systems and methods for generating a risk management report

5 described herein, according to one non-limiting illustrated embodiment. For example, the screenshots of Figures 16-21 are screenshots of the graphical user interface of the gathering property assessment data, which performs the processes described in Figures 1A-1I above.

Shown is a graphical user interface including two panels, one with
10 an image of the property 346, and one with a series of questions pertaining to the property to be answered 348. In some embodiments, the answers may be provided by other data sources, or by the operator in viewing the pictures of the property in panel 346.

In some embodiments the panel 346 may display various images
15 of the property which can be viewed by selecting a tab 342. The available images may come from different sources, may be of different perspectives (e.g. top-down versus oblique), and may have different image manipulation methods, for example viewing an image in Bing vs. Google. The operator can select a view of 342 and use the image displayed to answer questions 348 about the
20 property. In screen 714, the questions 348 have to do with a house on the property. In this example, the operator is asked a series of questions to be answered based on the operator's visual assessment of the property from the given aerial images. For example, the number of stories in the house, the type of structure, the number of corners, and total living area information of the
25 structure, which can be either estimated or taken from the floor plan editor tool.

Figure 17 is an example screenshot 716 of a user interface of the system for Figure 16 for gathering property assessment data, according to one non-limiting illustrated embodiment. In this example, additional questions 350 regarding the house on the property have been answered by the operator.

30 Figure 18 is an example screenshot 718 of a user interface of the system of Figure 16 for gathering property assessment data according to one

non-limiting embodiment. Here, the operator is asked for data regarding exposures to the property and to the house 352, for example, the nearest nonresidential exposures, nearest steep slope, nearest water hazard, nearest natural vegetation exposure. In this example, the operator may either estimate
5 and type the number directly into the answer area 354, or the operator can use the get distance tool by clicking 356. When the operator uses the get distance tool, in one embodiment the system presents the operator an image of the property and surrounding area 346 as well as a marker indicating the location of the property that is being evaluated 358. The system displays a marker 360
10 which can be moved within the image to indicate the location that the distance should be measured to. Line 362 connects the marker showing the location of the property 358 to the floating marker that the user is able to place at the location of the exposure to which the distance needs to be determined.

Figure 19 is an example screenshot 720 of a user interface of the
15 system of Figure 16 for gathering property assessment data according to one non-limiting illustrated embodiment. Screen 720 shows the results of using the get distance tool which was selected by pressing button 356 in screen 718. In this example, the tool estimated the distance based on the top-down image scale 346, and put the result in answer box 358. In addition to measuring the
20 distance, the operator is asked to identify the type of vegetation present around the property and also if there are any recreational vehicles, boats or motorcycles on the property.

Figure 20 is an example screenshot 722 of a user interface for of the system of Figure 16 for gathering property assessment data according to
25 one non-limiting illustrated embodiment. In this example, the operator is asked about roof characteristics including how steep the roof is, the pitch of the roof (estimate), the type or style of the roof, for example, a hip or gabled roof versus a flat roof, the number of chimneys in the house, and the number of outbuildings on the property 360.

30 Figure 21 is an example screenshot 724 of a user interface of the system of Figure 16 for gathering property assessment data according to one

non-limiting illustrated embodiment. In this example, the operator is asked for additional information on the property 362. For example, ground slope beneath the main structure on the property, whether there is a trampoline on the property, and whether there is a pool or hot-tub on the property. In this
5 example, the operator is able to go back to previous screens by selecting previous button 364. Otherwise, if the operator is finished with the property assessment data, the operator selects the finish button 366.

Figure 22 is an example page of a report 726 of a property risk management report according to one non-limiting illustrated embodiment.
10 Figures 22-29 are examples of the presentation of data which is received from the processes described in Figures 1A-1F. This example shows a top-down view of the property 368, a title of the report 370, the type of report 372, in this case a custom residential report, a report date, property address, and insurance policy number related to the property, if available. Finally, the example includes
15 the name and address of the individual or company for which the report was prepared 374.

Figure 23 is an example page 728 of a property risk management report example of Figure 22, according to one non-limiting illustrated embodiment. This example page shows, the date of the report, report details
20 including a report number, an insurance policy number that is related, if any, the renewal date of the insurance policy related, if any, the date of the photo, and the geocoded location, for example, in latitude and longitude, of where the property exists. In addition, a building summary is presented which includes the year built, the number of stories, the estimated living area, whether or not
25 there is a garage, and whether the garage is attached.

Figure 24 is an example page 730 of a property risk management report of Figure 22, according to one non-limiting illustrated embodiment. This example page contains a top view or orthogonal view 380 of the property.

Figure 25, is an example page 732 of a property risk management
30 report of Figure 22, according to one non-limiting illustrated embodiment. This

example page shows two orthogonal views of the property: a north view 382, and a south view 384.

Figure 26 is an example page 734 of a property risk management report of Figure 22, according to one non-limiting illustrated embodiment. This
5 example page shows two additional aerial oblique views of the property: an east view 386, and a west view of the property 388.

Figure 27 is an example page 736 of a property risk management report, according to one non-limiting illustrated embodiment. The example page includes total estimated living area 390, number of stories 392, and an
10 indicator of the floor level 393 and the area and dimension diagram of the features for that floor in diagram form 404. A color-coded key 394 is used to identify the different features of the floor diagram 404 being shown. The example of this report has a color key 394 for each feature area, which corresponds to colors of the features shown in diagram 404, namely the living
15 area 398 in light blue, the garage area 396 in peach, the deck area 400 in maroon, etc. In addition, there is a compass rose 402 to orient the position of the buildings on the property.

Figure 28 is an example page 738 of a property risk management report of Figure 22, according to one non-limiting illustrated embodiment. This
20 example page describes the second floor and shows the dimensions and area for the living area in light blue 406 and the footprint in grey 408.

Figure 29 is an example page 740 of a property risk management report of Figure 22, according to one non-limiting illustrated embodiment. This examples page includes a confidence rating 410 that allows the operator in the
25 gathering property assessment data tool discussed above to indicate the operator's level of confidence in the ratings and estimations given for the property. Structural observations 412 include year built, number of stories, type of family structure, footprint, number of corners, estimated total living area, garage area, garage type, deck area, patio area, porch area, estimated roof
30 pitch, roof shape, number of chimneys, outbuilding count, outbuilding total area, basement area, finished basement area, basement type, basement description.

Property observations 413 include whether there is a building permit, whether an EagleView roof report was completed, whether an EagleView wall report was completed, property distance to a commercial exposure, property distance to a steep slope, property distance to a water hazard, property distance to
5 vegetation, type of vegetation, cross-sell identification, slope on property, existence of a trampoline, swimming pool/hot tub, the location of the nearest responding fire station, the type of responding fire station, property distance of the responding fire station, and whether the structure is owner occupied.

10 The various embodiments described above can be combined to provide further embodiments. All of the U.S. patents, U.S. patent application publications, U.S. patent applications, foreign patents, foreign patent applications and non-patent publications referred to in this specification and/or listed in the Application Data Sheet are incorporated herein by reference, in their
15 entirety. Aspects of the embodiments can be modified, if necessary to employ concepts of the various patents, applications and publications to provide yet further embodiments.

Also, U.S. Provisional Patent Serial No. 61/594,964 entitled
20 SYSTEMS AND METHODS FOR ESTIMATION OF BUILDING FLOOR AREA, filed February 3, 2012; U.S. Provisional Patent Serial No. 61/594,956 entitled SYSTEMS AND METHODS FOR ESTIMATION OF BUILDING WALL AREA, filed February 3, 2012; PCT Application No. PCT/US2013/023503 entitled SYSTEMS AND METHODS FOR ESTIMATION OF BUILDING FLOOR AREA,
25 filed January 28, 2013; PCT Application No. PCT/US2013/023502 entitled SYSTEMS AND METHODS FOR ESTIMATION OF BUILDING WALL AREA, filed January 28, 2013 is hereby incorporated by reference in its entirety.

These and other changes can be made to the embodiments in light of the above-detailed description. In general, in the following claims, the
30 terms used should not be construed to limit the claims to the specific embodiments disclosed in the specification and the claims, but should be

construed to include all possible embodiments along with the full scope of equivalents to which such claims are entitled. Accordingly, the claims are not limited by the disclosure.

CLAIMS

1. A computing system for generating an estimated floor area measurement, the computing system comprising:

a memory;

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

receive roof measurements of a building having a roof;

generate, based at least in part on the received roof measurements, an estimated floor area measurement of the building; and

output a floor area measurement report having floor area data thereon.

2. The computing system of claim 1 wherein the received roof measurements include roof edge measurements of the roof and the estimation module is configured to generate, based at least in part on the received roof measurements, an estimated floor area measurement based on the roof edge measurements of the roof.

3. The computing system of claim 2 wherein the generating the estimated floor area measurement based on the roof edge measurements includes:

calculating the roof edge measurements assuming each section of the roof has no slope regardless of an actual slope of each section of the roof;

using the roof edge measurements to calculate an estimated total roof area of the roof assuming each section of the roof has no slope; and

generating the estimated floor area measurement based on the calculated estimated total roof area of the roof.

4. The computing system of claim 3 wherein the generating the estimated floor area measurement based on the roof edge measurements further comprises:

subtracting an amount from one or more of the roof edge measurements corresponding to an estimated roof overhang over one or more walls of the building to obtain adjusted roof edge measurements; and

generating the estimated floor area measurement based on the adjusted roof edge measurements.

5. The computing system of claim 3 wherein the generating the estimated floor area measurement based on the roof edge measurements further comprises:

subtracting an amount from one or more of the adjusted roof edge measurements corresponding to an estimated wall width to obtain adjusted roof edge measurements; and

generating the estimated floor area measurement based on the adjusted roof edge measurements.

6. The computing system of claim 1 wherein the generating the estimated floor area measurement includes:

receiving information regarding how many stories the building has and regarding one or more sections of the roof below which one or more of the stories laterally extends;

generating an estimated total roof area of the roof assuming each section of the roof has no slope regardless of an actual slope of each of the roof sections;

generating the estimated floor area measurement based on a total area of the one or more sections of the roof under which the one or more of the stories laterally extends and the generated estimated total roof area of the roof.

7. The computing system of claim 1 wherein the received roof measurements include at least one of: a plurality of dimensional measurements of a two-dimensional outline of the roof from a top plan view of the roof and an area of the two-dimensional outline of the roof from the top plan view of the roof.

8. The computing system of claim 1 wherein the roof measurements of the building are based on at least one aerial image of the building.

9. The computing system of claim 8 wherein the at least one aerial image of the building includes a first and a second aerial image of the building on which the roof measurements are based, the first aerial image representing a substantially orthogonal view of the top of the building and the second aerial image of the building representing a view from a different angle than the substantially orthogonal view of the top of the building.

10. The computing system of claim 9 wherein the roof estimation module is configured to generate, based at least in part on the received roof measurements, an estimated floor area measurement of the building by:

determining how many stories the building has using the second aerial image of the building representing a view from a different angle than the substantially orthogonal view of the top of the building.

11. The computing system of claim 1 wherein the roof measurements include at least one of: one or more roof edge dimensions of the roof, areas of a plurality of planar roof sections of the roof, and slopes of the plurality of planar roof sections of the roof

12. The computing system of claim 1 wherein the roof estimation module is further configured to generate the roof measurements of the building.

13. The computing system of claim 12 wherein the roof estimation module is further configured to generate the roof measurements of the building based on graphical indications of roof edges of the roof made on an aerial image of the building.

14. The computing system of claim 1 wherein the roof estimation module is further configured to generate and deliver a floor area measurement estimate report that includes one or more aerial images of the building annotated with numerical values that indicate the corresponding estimated floor area measurement.

15. The computing system of claim 14 wherein the roof estimation module is further configured to generate and deliver a floor area measurement estimate report that is annotated with a floor area measurement and one or more of: slope, area, and length of edges of at least some of a plurality of planar roof sections of the roof.

16. The computing system of claim 1 wherein the roof estimation module is further configured to deliver the floor area measurement estimate as part of a report including a plurality of floor area measurement estimates for a plurality of buildings in response to a request for a plurality of estimates from a single entity.

17. A computer-implemented method for generating an estimated floor area measurement, the method comprising:

- calculating roof edge measurements of a roof of a building with each section of the roof being set to a slope of zero, without regard to an actual slope of each section of the roof;
- using the roof edge measurements to calculate an estimated total roof area of the roof with the slope of each section of the roof being set to zero;
- and
- generating the estimated floor area measurement based on the calculated estimated total roof area of the roof, with the slope of each roof section set to zero.

18. The method of claim 17 further comprising:

- receiving information regarding how many stories the building has and regarding one or more sections of the roof below which one or more of the stories laterally extends, and wherein the generating the estimated floor area measurement further includes:
- generating the estimated floor area measurement based on a total area of the one or more sections of the roof under which the one or more of the stories laterally extends and based on the generated estimated total roof area of the roof.

19. The method of claim 17, wherein the generating the estimated floor area measurement based on the calculated estimated total roof area of the roof includes:

- receiving information regarding floor area spaces of the building that are not to be included in the estimated floor area measurement of the building; and
- generating the estimated floor area measurement based on an area corresponding to a an extent to which the spaces extend under the roof.

20. A computer-readable medium whose contents enable a computing system to generate an estimated floor area measurement, by performing a 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;

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;

generating an adjusted roof model by adjusting a slope of the planar roof sections in the three dimensional model of the roof to substantially zero;

obtaining an estimated total roof area measurement based on the adjusted model; and

generating, based at least in part on the estimated total roof area measurement, an estimated floor area measurement of the building.

21. The computer-readable medium of claim 20 wherein the generating the estimated floor area measurement of the building includes:

subtracting an amount from one or more of roof edge measurements obtained from the adjusted roof model corresponding to an estimated roof overhang over one or more walls of the building to obtain adjusted roof edge measurements; and

generating the estimated floor area based on the adjusted roof edge measurements.

22. The computer-readable medium of claim 20 wherein the contents further enable a computing system to deliver the estimated floor area in response to a request.

23. A floor area measurement report produced by a process comprising:

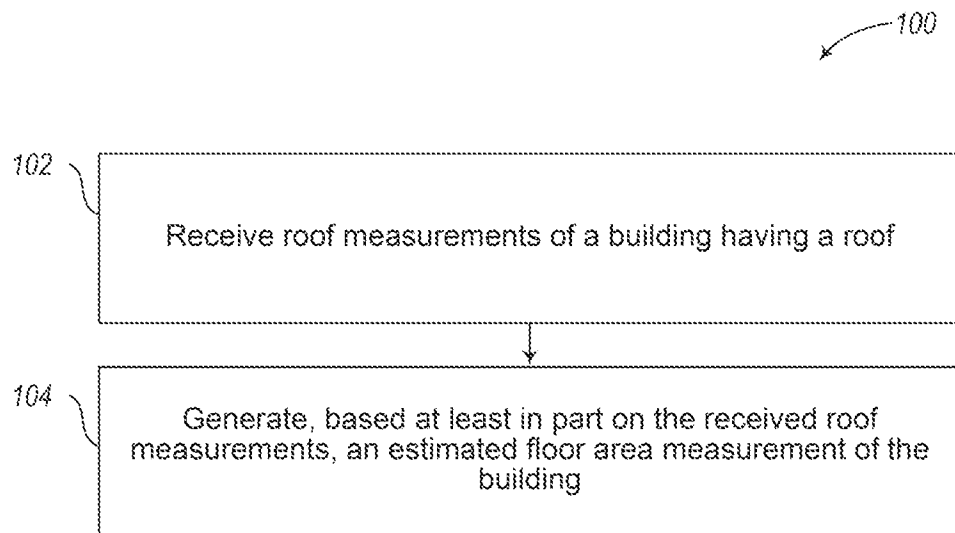
receiving roof measurements of a building having a roof;
generating, based at least in part on the received roof measurements, an estimated floor area measurement of the building; and
electronically communicating the estimated floor area measurement.

24. The floor area report of claim 23 wherein the generating the estimated floor area measurement includes:

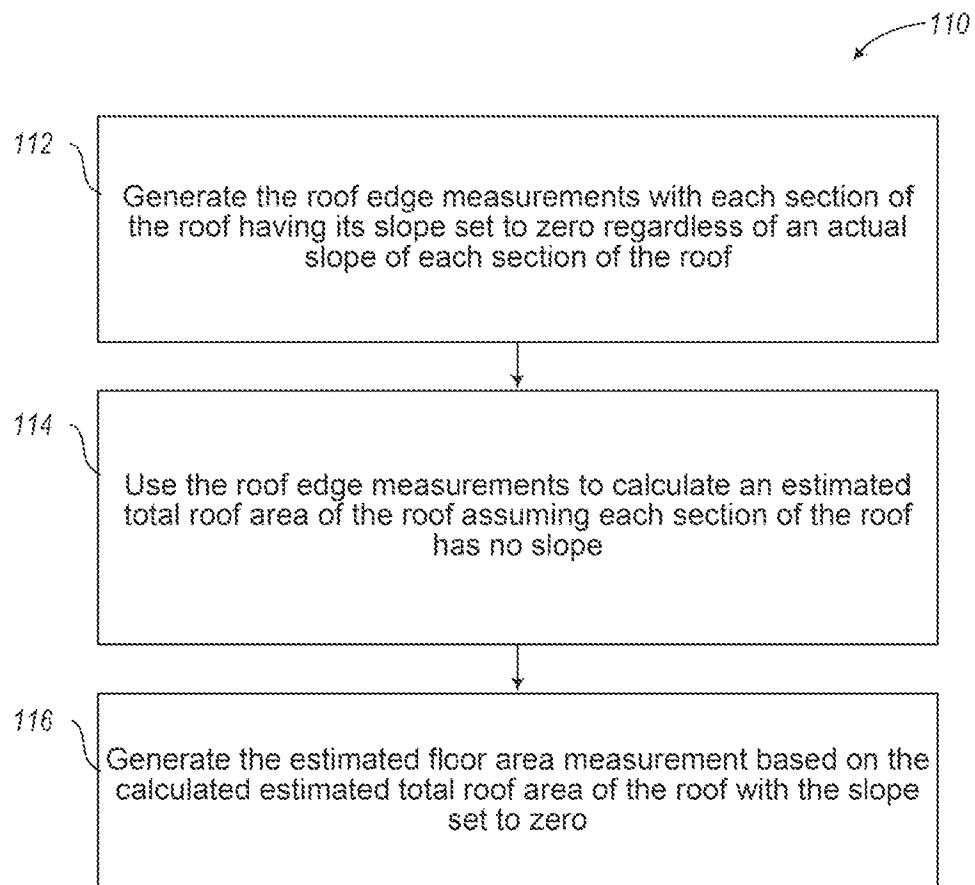
receiving information regarding how many stories the building has and regarding one or more sections of the roof below which one or more of the stories laterally extends;

generating an estimated total roof area of the roof assuming each section of the roof has no slope regardless of an actual slope of each of the roof sections; and

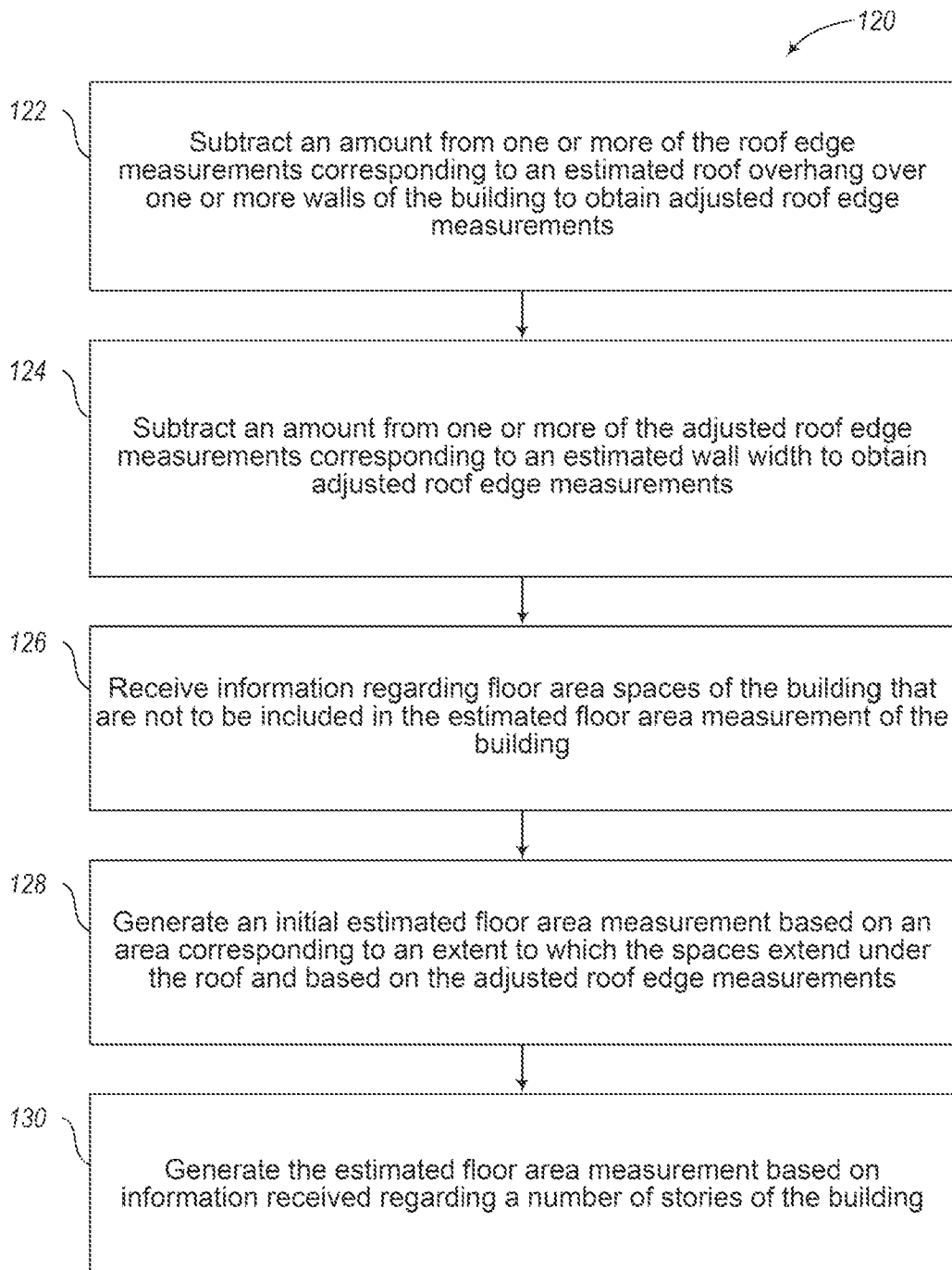
generating the estimated floor area measurement based on a total area of the one or more sections of the roof under which the one or more of the stories laterally extends and the generated estimated total roof area of the roof.

1/37**Fig. 1A**

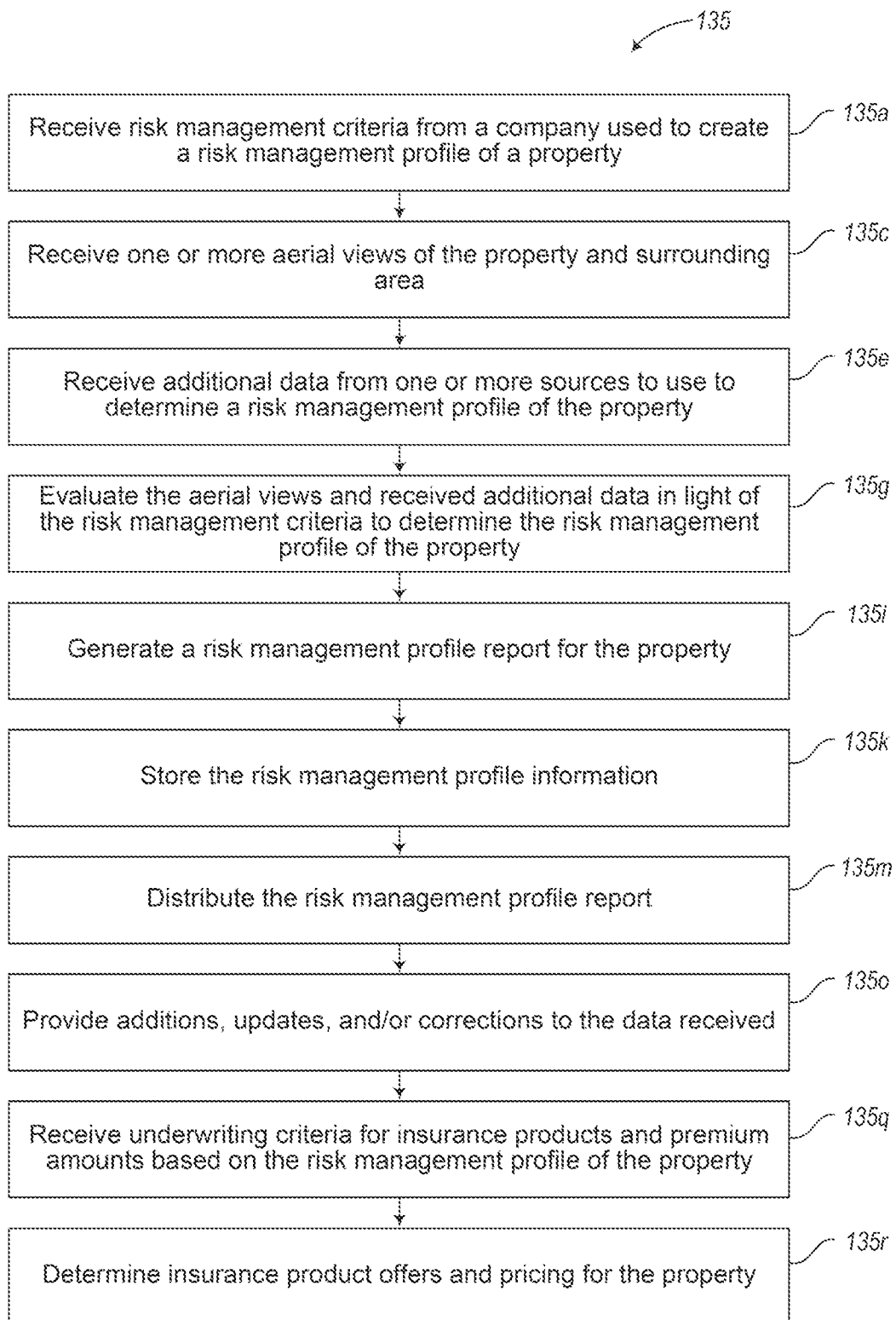
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**Fig. 1B**

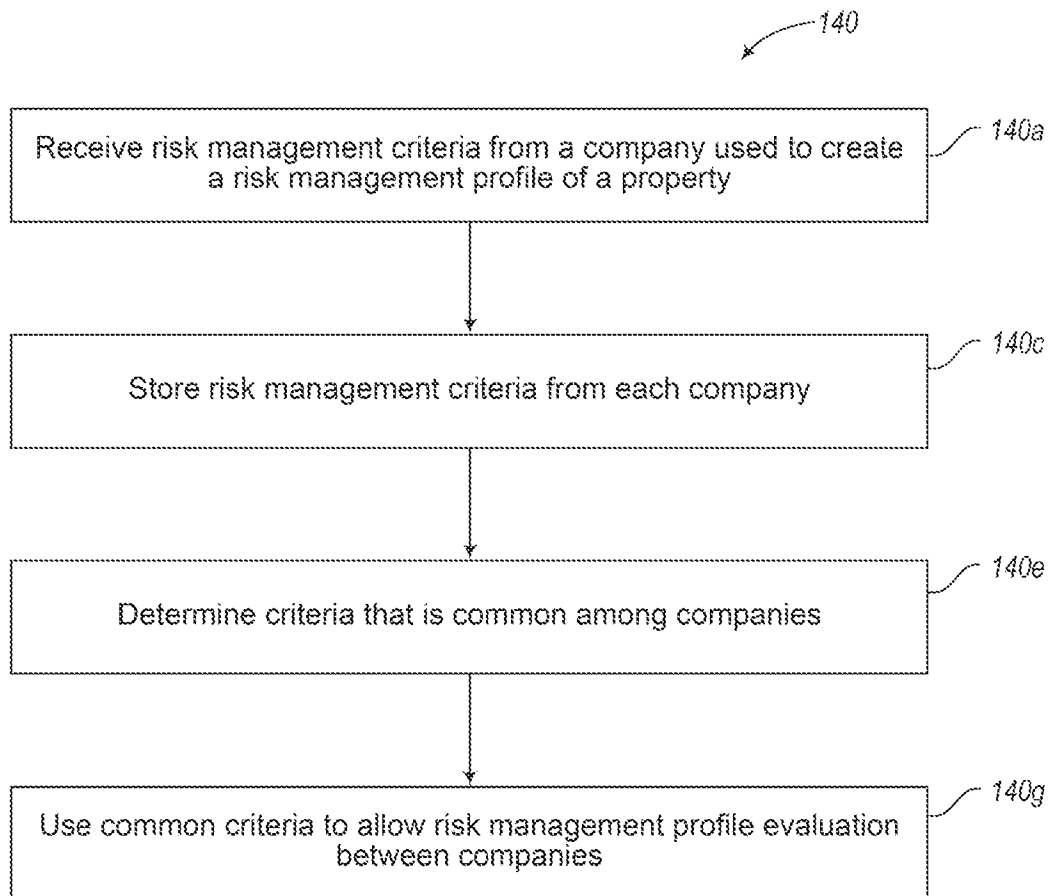
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**Fig. 1C**

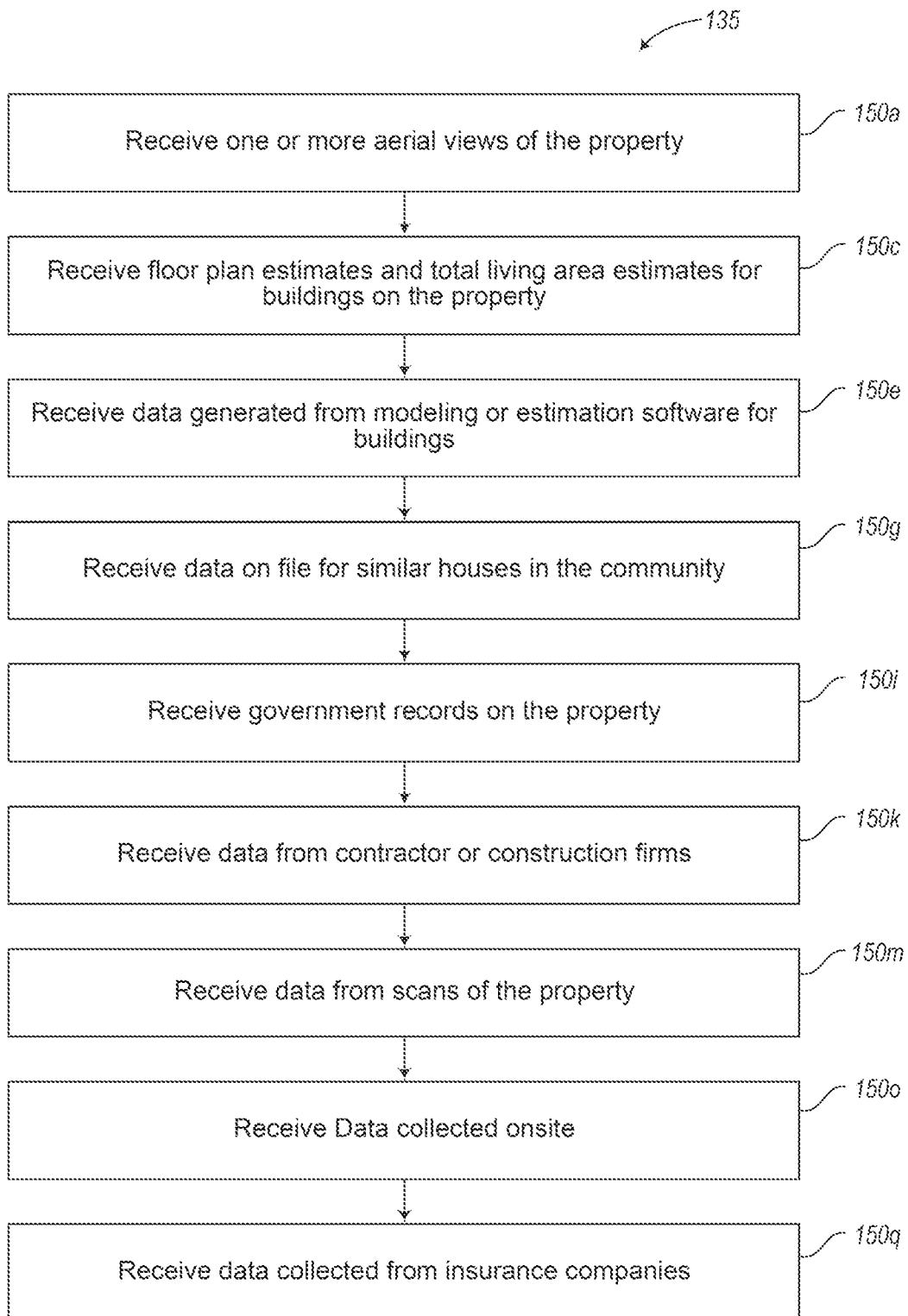
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**Fig. 1D**

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**Fig. 1E**

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**Fig. 1F**

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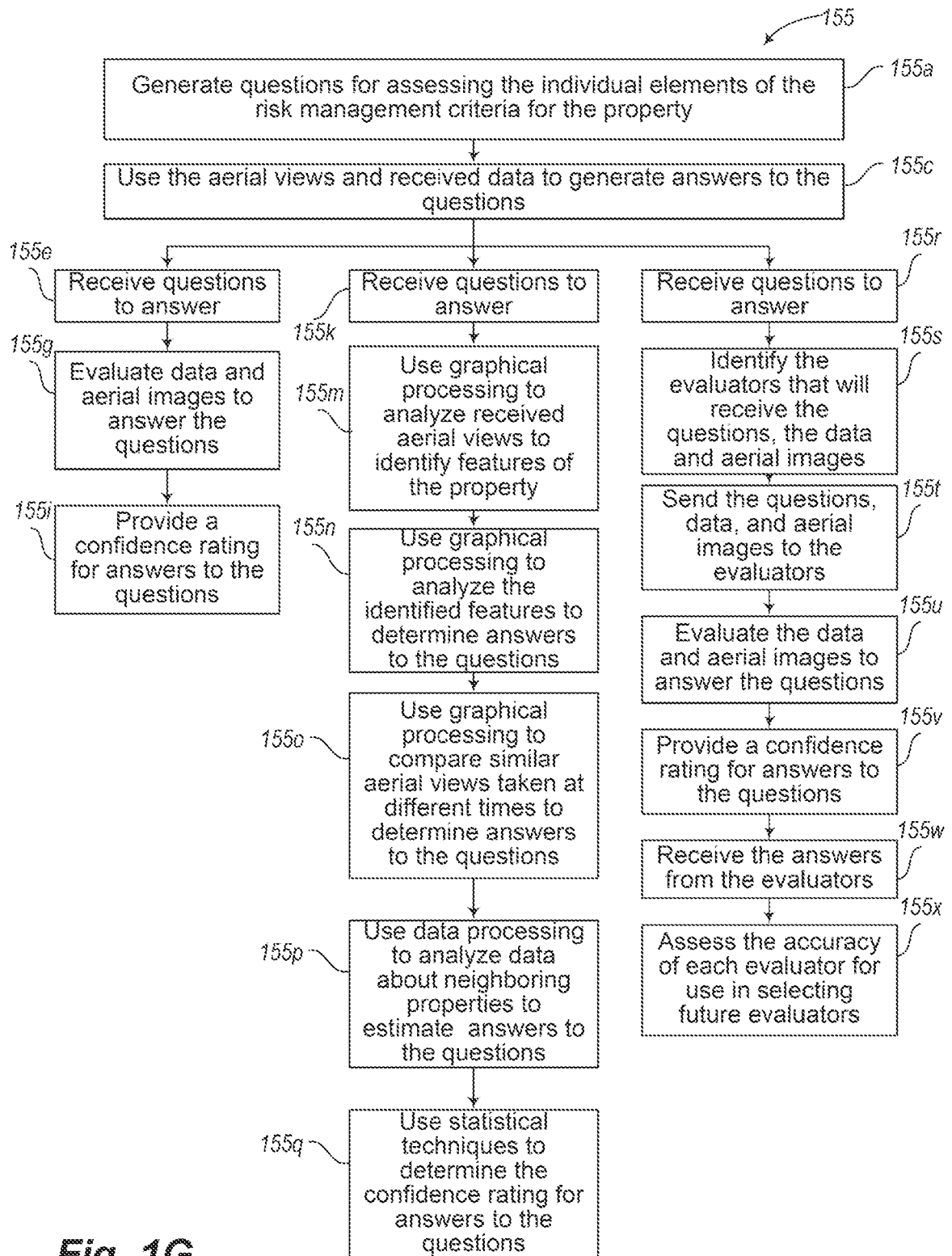
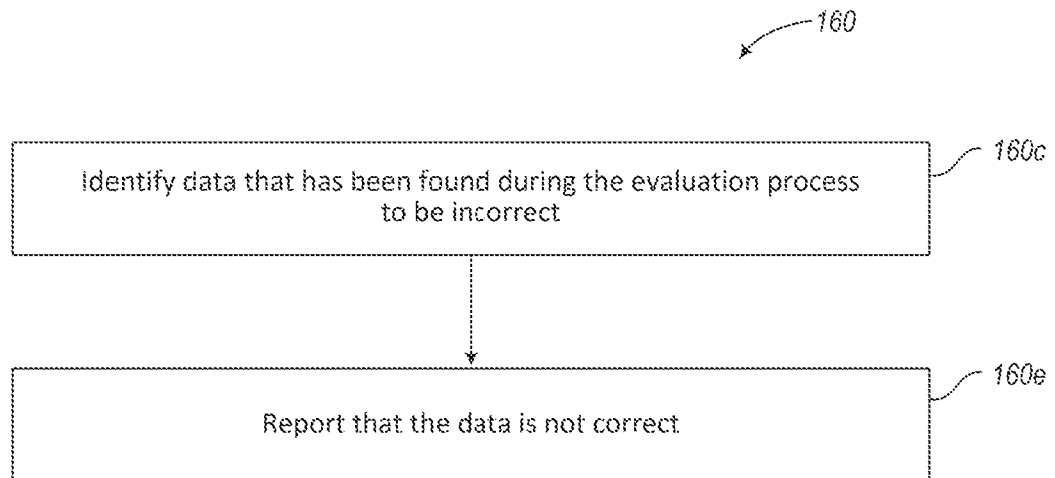
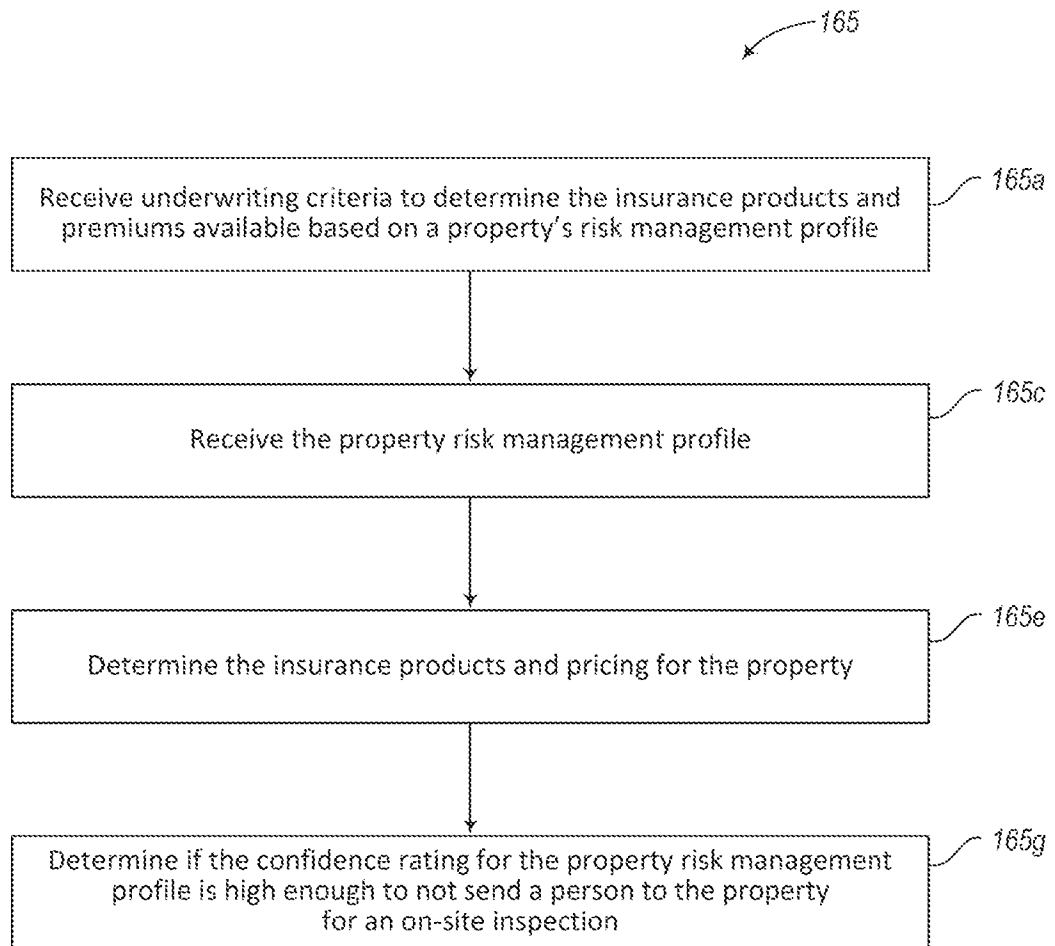


Fig. 1G

8/37**Fig. 1H**

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**Fig. 11**

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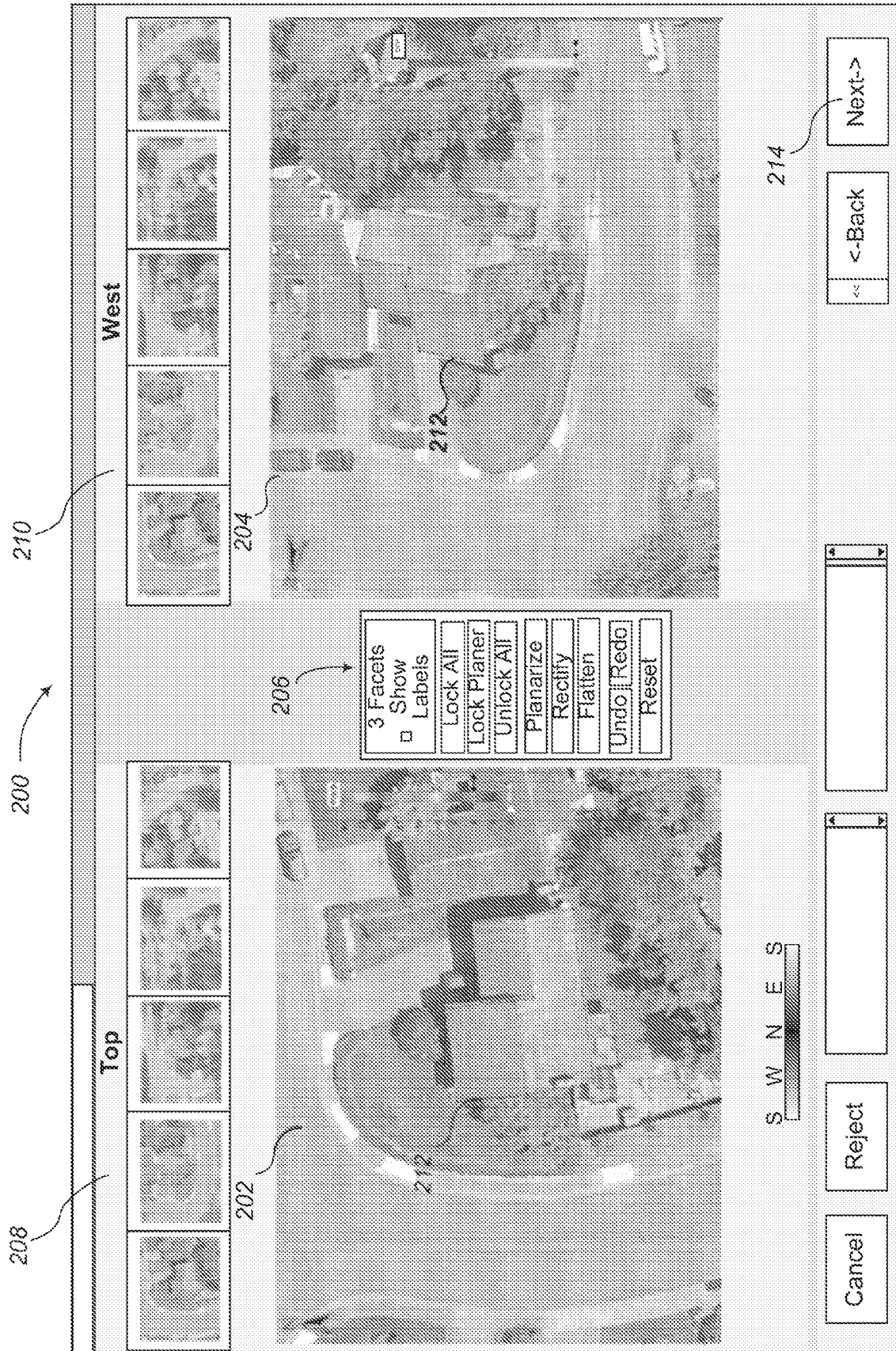


Fig. 2

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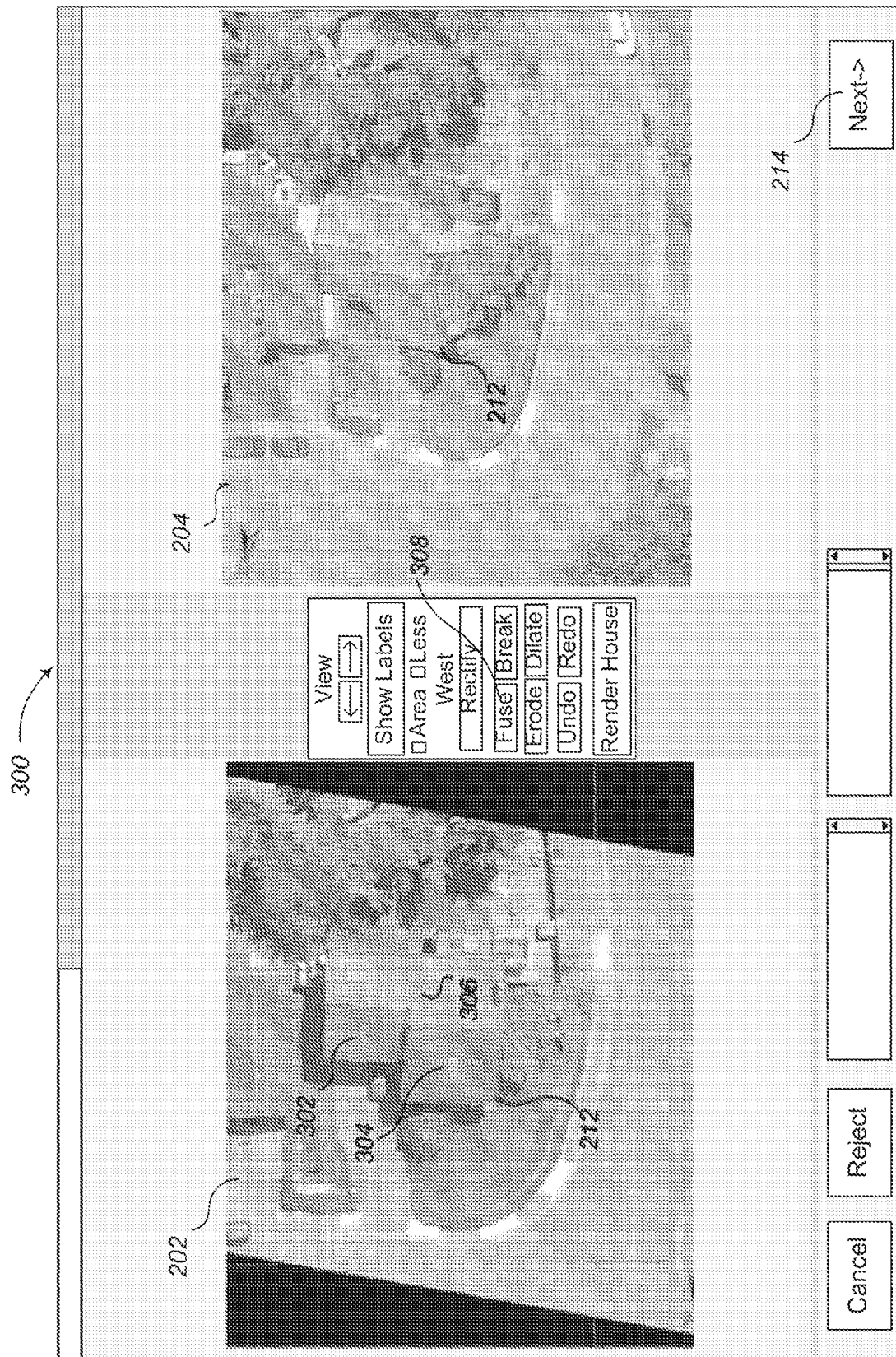


Fig. 3

12/37

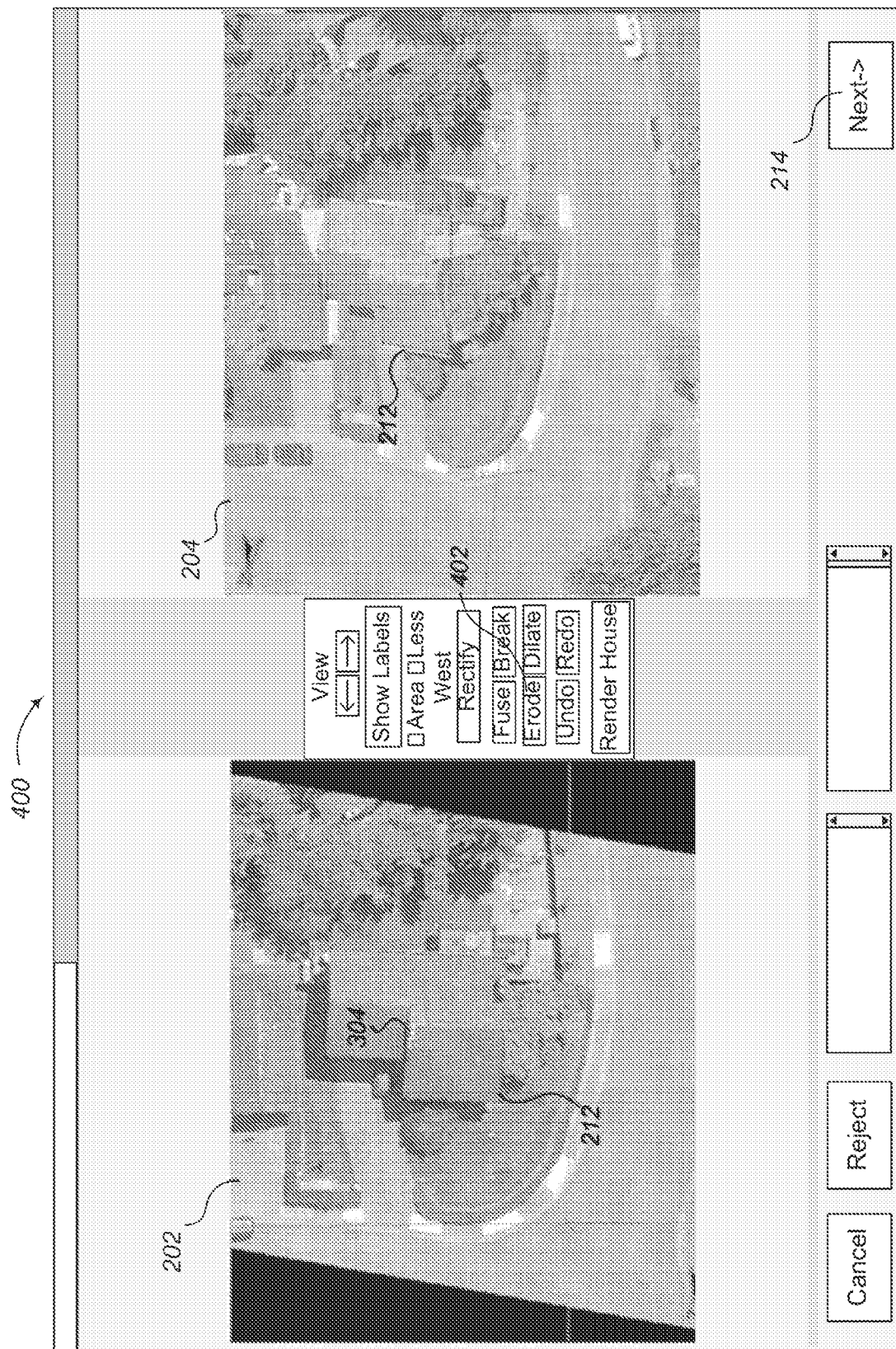


Fig. 4

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500

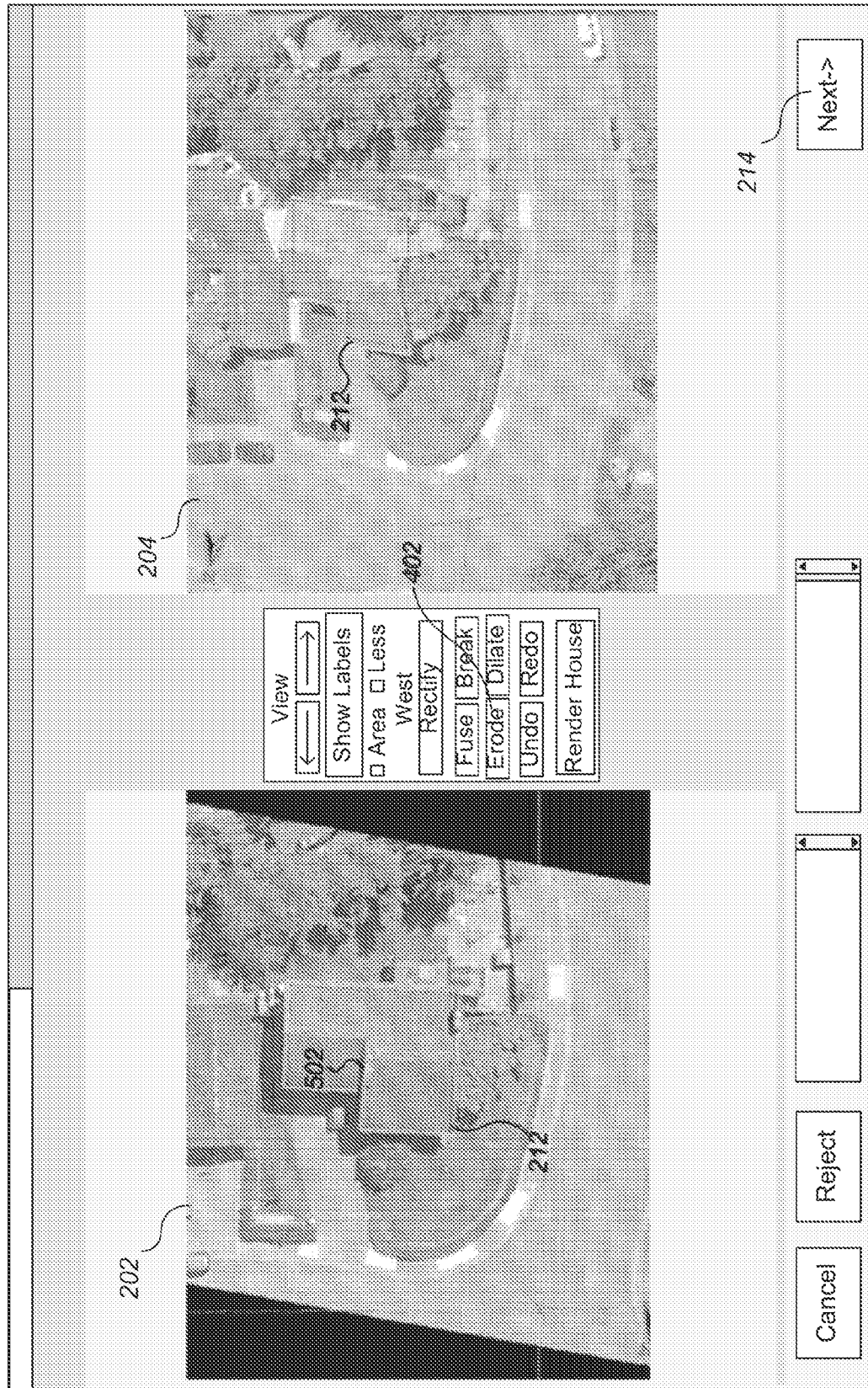


Fig. 5

14/37

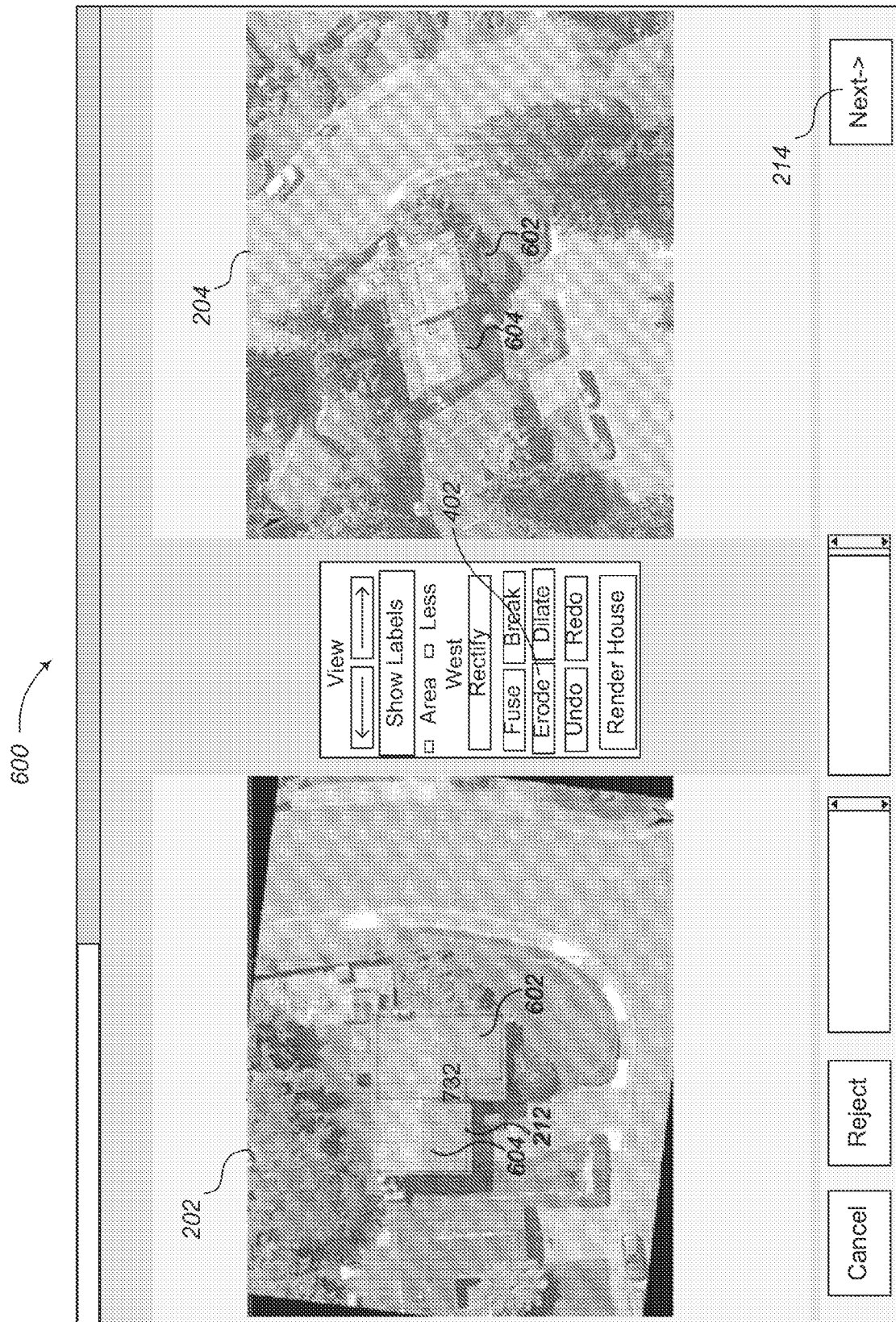


Fig. 6

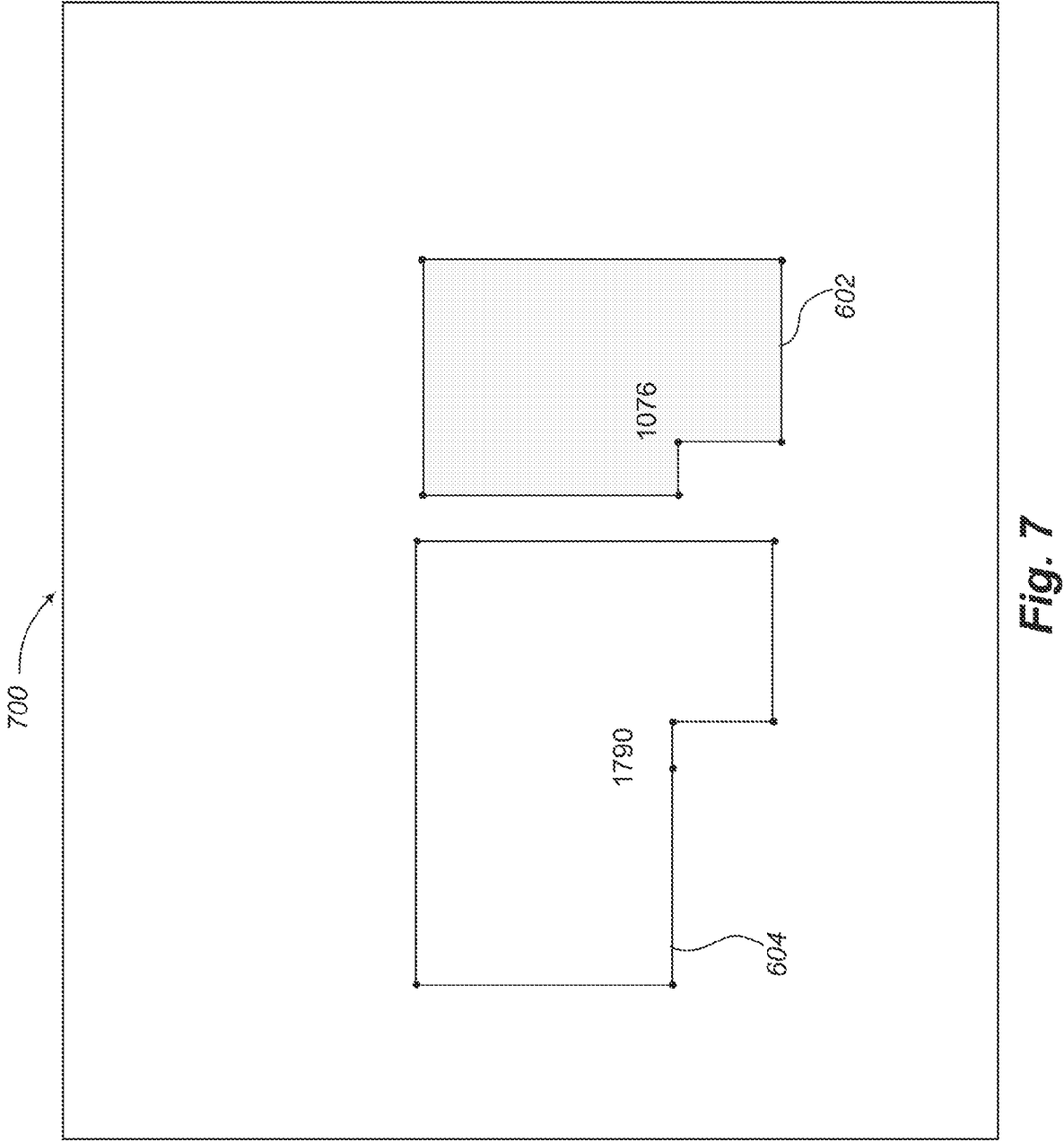


Fig. 7

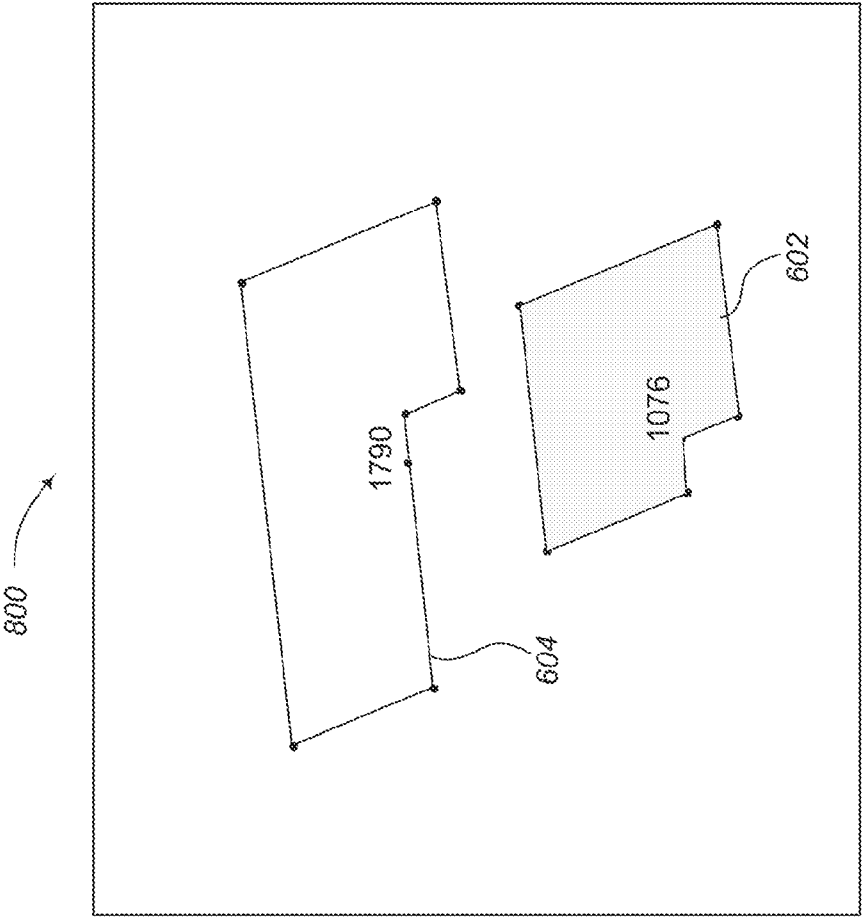
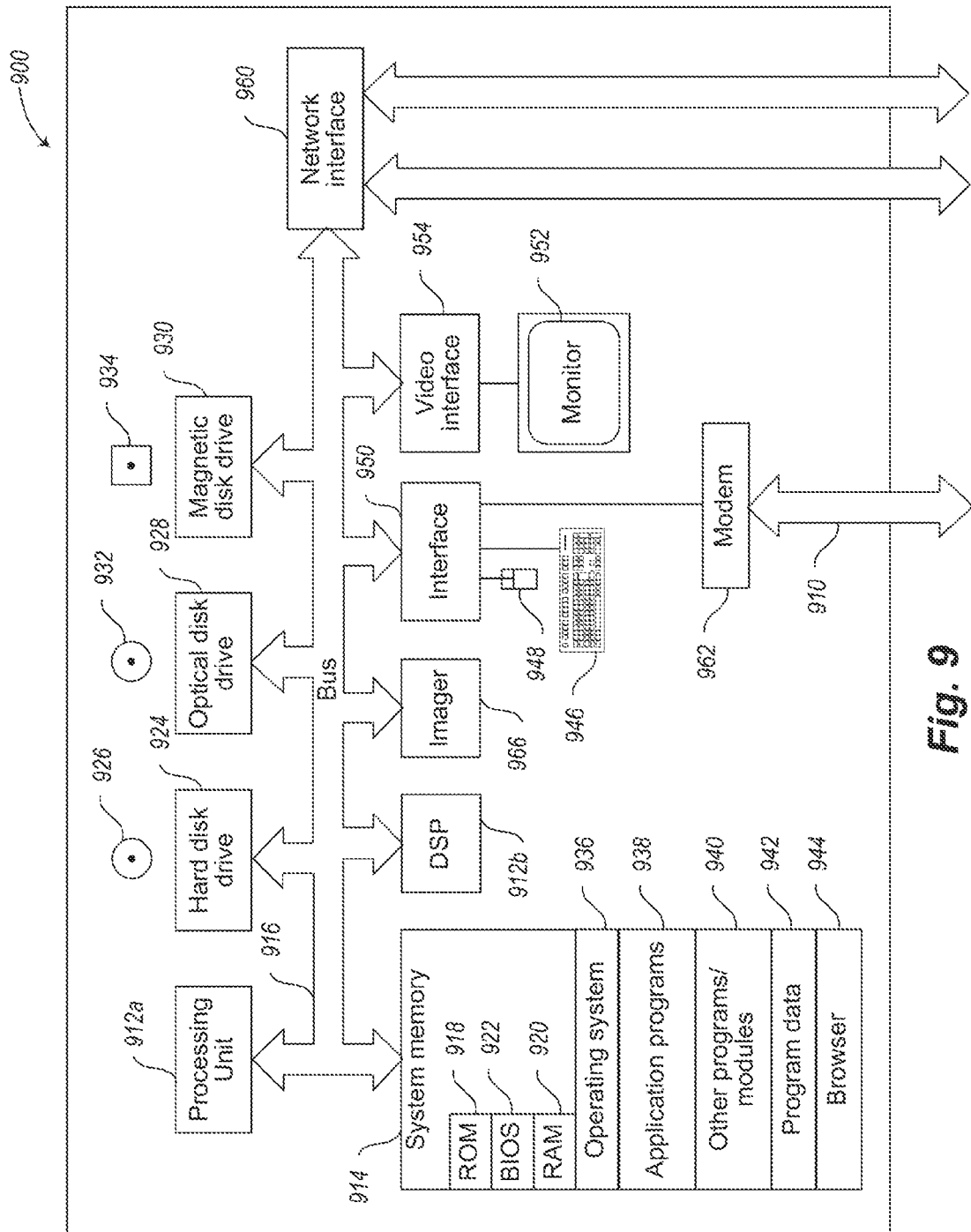


Fig. 8

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1997



Fig. 11

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706



Fig. 12

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Fig. 13

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Fig. 14

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Fig. 15

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prm.eagview.com/questions.aspx?ReportID=5635553

House

342 346 344

Bing Map/AreaView Image TopDown Image Obliques

2D 3D Road Aerial Bird's eye Labels <<



*How confident are you in the measurements?
(Please select a value) ▼

*How many stores are there?
(Please select a value) ▼

*What type of structure is it?
(Please select a value) ▼

*What is the Square Footage of the structure?
1538.58

Please enter a valid number between 0 and 100000

*How many corners are there?
1964.78

Please enter a valid number between 4 and 1000

*What is the combined total Living Area?
483.52

Please enter a valid number between 0 and 100000

*What type of garage?
(Please select a value) ▼

*What is the total Deck Area?
449.04

Please enter a valid number between 0 and 1000

*What is the total Patio Area?
0.00

Please enter a valid number between 0 and 1000

*What is the total Porch Area?
0.00

Please enter a valid number between 0 and 5000

*What is the combined Outbuilding(s) total area?
0.00

Please enter a valid number between 0 and 100000

(Next)

348

Fig. 16

prn.eagleview.com/questions.aspx?ReportID=5635553

Bing Map AreaView Image TopDown Image Obliques

2D 3D Road Aerial Bird's eye Labels <<



House

*How confident are you in the measurements?

4

*How many stores are there?

2

*What type of structure is it?

(Please select a value)

*What is the Square Footage of the structure?

1538.58

Please enter a valid number between 0 and 100000

*How many corners are there?

6

Please enter a valid number between 4 and 1000

*What is the combined total Living Area?

1964.78

Please enter a valid number between 0 and 100000

*What is the total Garage Area?

483.52

Please enter a valid number between 0 and 100000

*What type of garage?

Attached

*What is the total Deck Area?

449.04

Please enter a valid number between 0 and 1000

*What is the total Patio Area?

0.00

Please enter a valid number between 0 and 1000

*What is the total Porch Area?

0.00

Please enter a valid number between 0 and 5000

*What is the combined Outbuilding(s) total area?

0.00

Please enter a valid number between 0 and 100000

350

(Next)

Fig. 17

716

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718

346

354

Property Risk Management Site

Bing Map Area View Image Top Down Image Oblique

2D 3D Road Aerial Bird's eye Labels <<

358

360

362

Exposures

*Where is the nearest non-residential exposures within 1000 ft. radius?

435.88 Measure distance in map

Please enter a valid number between 0 and 1000

*Where is the nearest steep slope within 1000 ft radius?

Please enter a valid number between 0 and 1000

Get distance from map

*Where is the nearest water hazard within 1000 ft radius?

Measure distance in map

Please enter a valid number between 0 and 1000

*Where is the nearest natural vegetation exposures within 1000 ft radius?

Measure distance in map

Please enter a valid number between 0 and 1000

*What type of vegetation is present?

☐ Tree ☐ Grass ☐ Bush/Brush ☐ None

*Are there any recreational vehicles, boats, motorcycles?

☐ Motorcycles ☐ Watercraft ☐ Rv ☐ Other ☐ None

Previous Next

Fig. 18

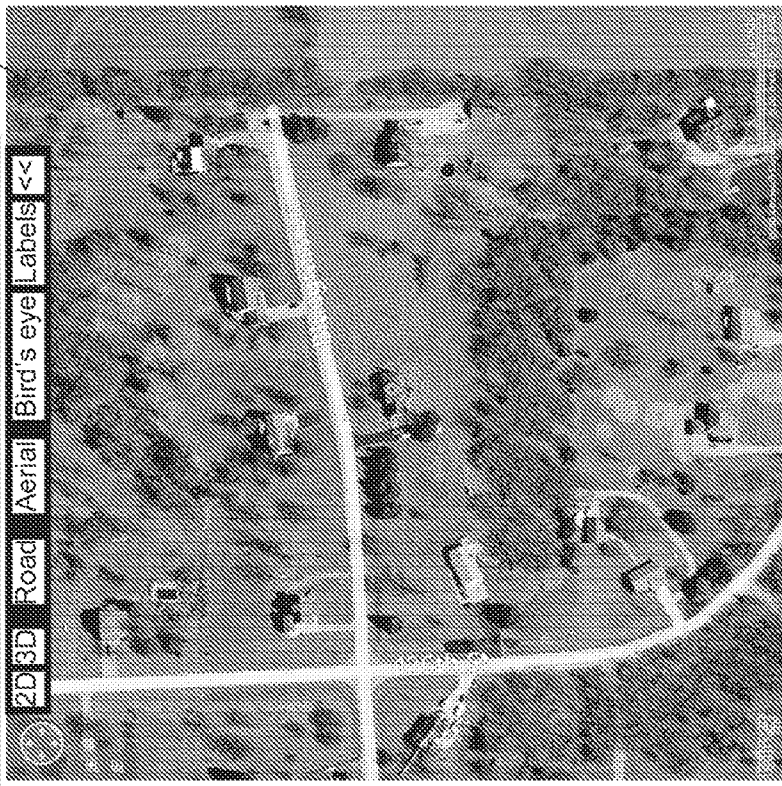
27/37

346 354 720

PROPERTY RISK MANAGEMENT SITE

Bing Map Area View Image Top Down Image Obliques

2D 3D Road Aerial Bird's eye Labels <<



Exposures

*Where is the nearest non-residential exposures within 1000 ft. radius?

435.88 Measure distance in map ?
Please enter a valid number between 0 and 1000

*Where is the nearest steep slope within 1000 ft radius?

117.02 Measure distance in map ?
Please enter a valid number between 0 and 1000

*Where is the nearest water hazard within 1000 ft radius?

0.00 Measure distance in map ?
Please enter a valid number between 0 and 1000

*Where is the nearest natural vegetation exposures within 1000 ft radius?

161.15 Measure distance in map ?
Please enter a valid number between 0 and 1000

*What type of vegetation is present?

☒ Tree
☐ Grass
☐ Bush/Brush
☐ None

*Are there any recreational vehicles, boats, motorcycles?

☐ Motorcycles
☐ Watercraft
☐ RV
☐ Other
☐ None

Previous Next

Fig. 19

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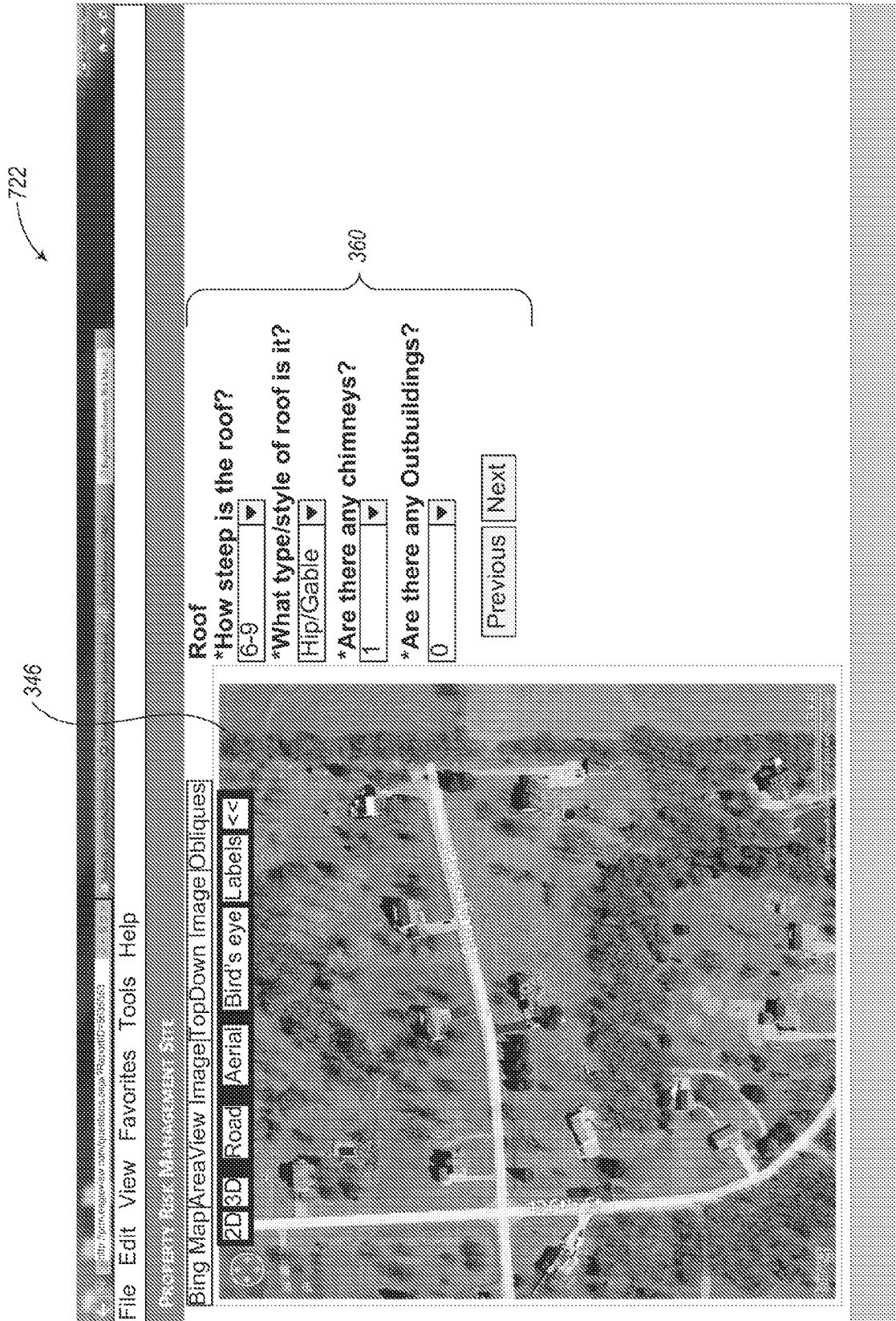


Fig. 20

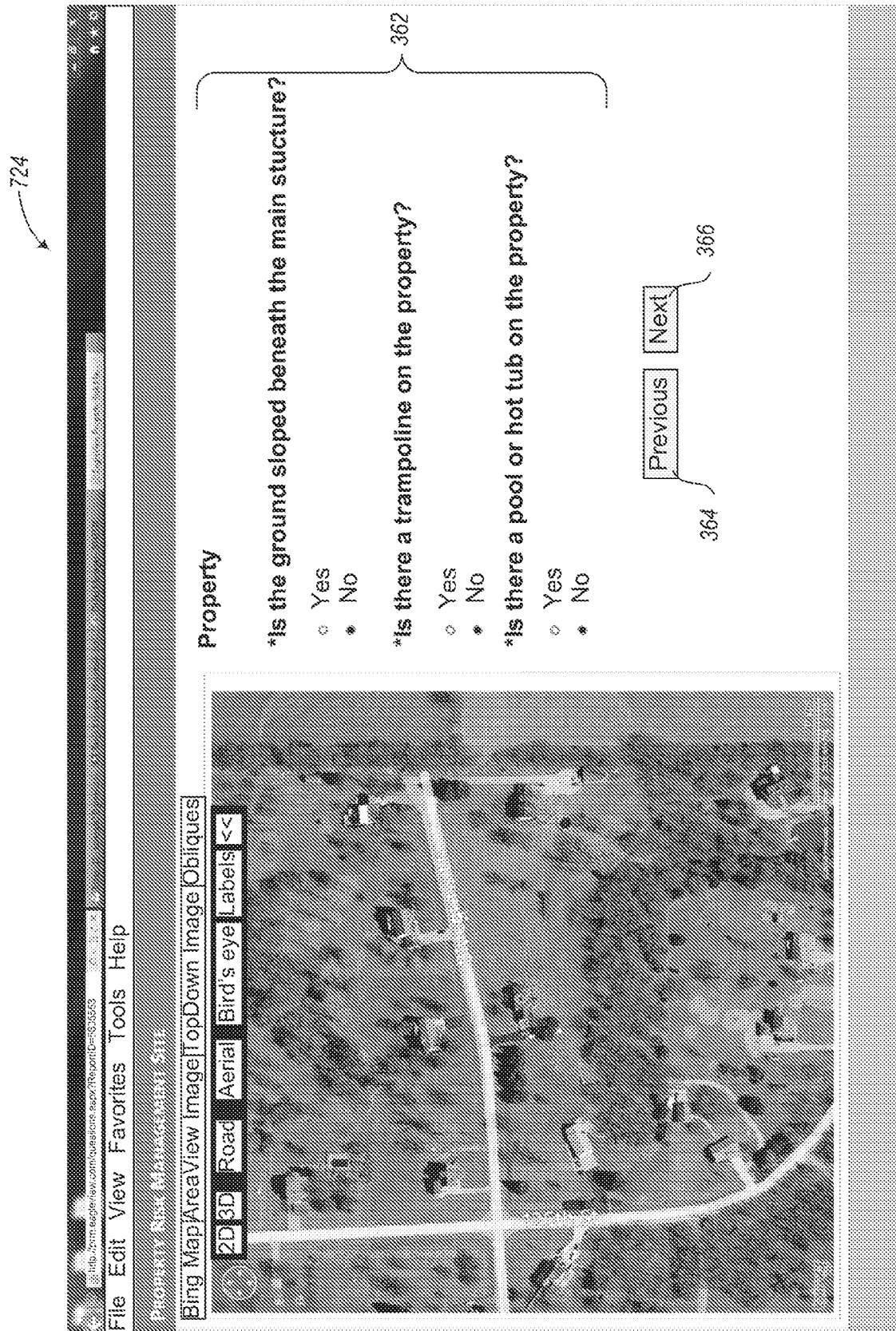


Fig. 21

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726

368



PROPERTY RISK MANAGEMENT REPORT

370

Custom Residential Report

Report Date: ** <Date.
Property: 123 Main St., Anytown, WA 98xxx
Policy #: N/A

372

PREPARED FOR:
John Doe
EagleLuke Technologies
1234 First St.
Nortnerntown, WA 98xxx

374

Fig. 22

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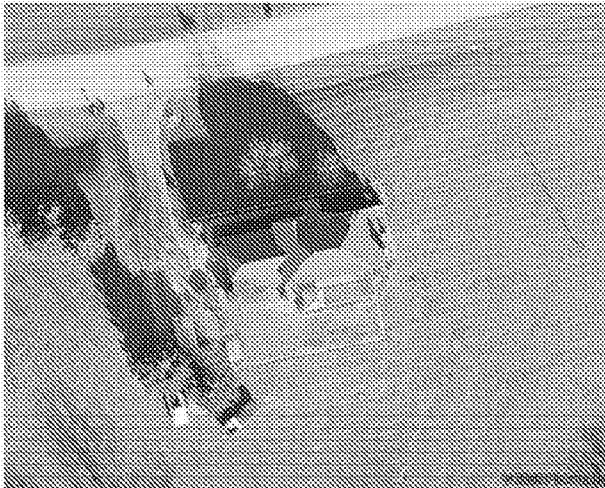
728



Property Risk Management Report

123 Main St., Anytown, WA 98xxx

<Date>



REPORT DETAILS

Report:	5635553
Policy:	N/A
Renewal Date:	N/A
Date of Photo:	12/13/2006
Geocode:	40.2119742, 93.8694994

BUILDING SUMMARY

Year Built:	1983
Number of Stories:	2
Estimated Living Area:	1,965 sq. ft.
Garage (Attached):	484 sq. ft.

REPORT CONTENTS

Report Images.....	2
Living Area Diagram.....	5
Structural & Property Observations.....	7

PREPARED FOR:

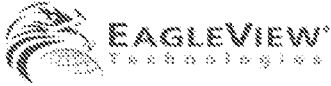
EagleLuke Technologies

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Fig. 23

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Property Risk Management Report

123 Main St., Anytown, WA 98000

<Date>

REPORT IMAGES

Report #: 5635553
 Geocode: 40.2119742,
 93.8694994

The following aerial images show different angles of this structure for your reference. Additional images may have been used in the creation of this report and not included in this final document.



Area View

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Fig. 24

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Property Risk Management Report

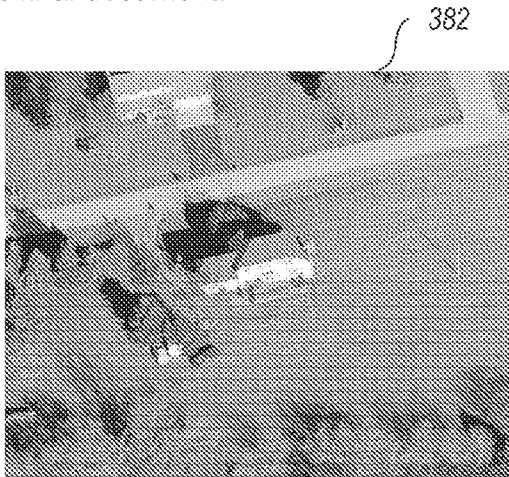
123 Main St., Anytown, WA 98xxx

<Date>

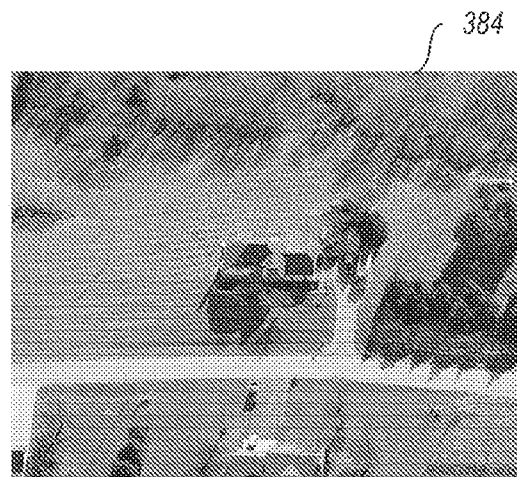
REPORT IMAGES

 Report #: 5635553
 Geocode: 40.2119742,
 93.8694994

The following aerial images show different angles of this structure for your reference. Additional images may have been used in the creation of this report and not included in this final document.



North View



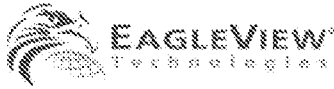
South View

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Fig. 25

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Property Risk Management Report

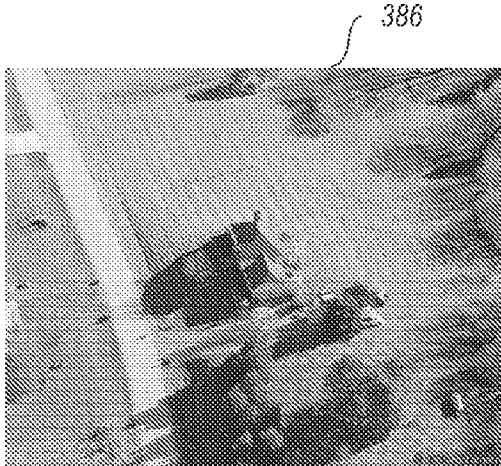
123 Main St., Anytown, WA 98000

<Date>

REPORT IMAGES

 Report #: 5635553
 Geocode: 40.2119742,
 93.8694994

The following aerial images show different angles of this structure for your reference. Additional images may have been used in the creation of this report and not included in this final document.



East View



West View

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Fig. 26

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Property Risk Management Report

123 Main St. Anytown, WA 98xxx

<Date>

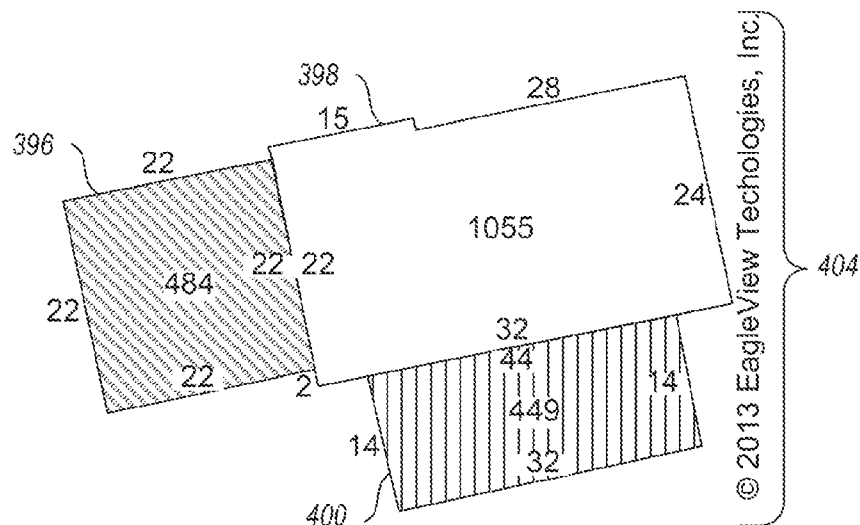
REPORT IMAGES

 Report #: 5635553
 Geocode: 40.2119742,
 93.8694994

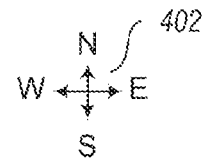
 Total Estimated Living Area: 1,965 sq. ft. 390
 Number of Stories: 2

First Floor 393

- 394 {
- ☐ = Living Area
 - ☒ = Garage
 - ☐ = Porch
 - ☐ = Deck
 - ☐ = Patio
 - ☒ = Footprint



Note: Any garage area that is underneath the first floor living area is indicated with a pink dotted grid.



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Fig. 27

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Property Risk Management Report

123 Main St., Anytown, WA 98xxx

<Date>

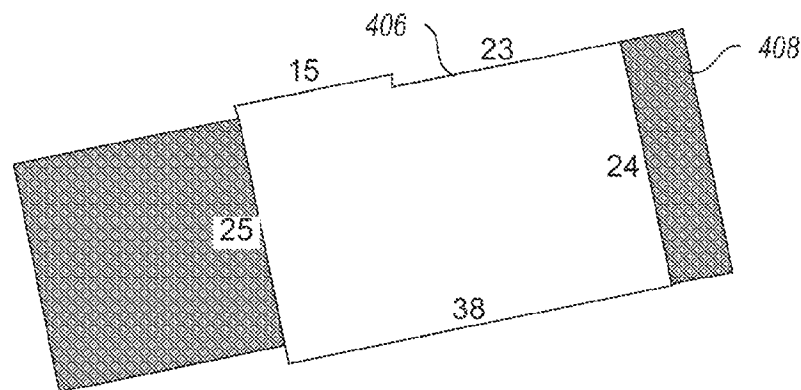
REPORT IMAGES

Report #: 5635553
 Geocode: 40.2119742,
 93.8694994

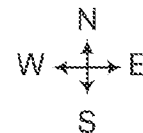
Total Estimated Living Area: 1,965 sq. ft.
 Number of Stories: 2

Second Floor

- 394 {
- ☐ = Living Area
 - ☒ = Garage
 - ☐ = Porch
 - ☐ = Deck
 - ☐ = Patio
 - ☒ = Footprint



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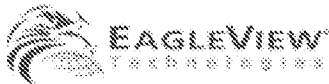
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Fig. 28

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Property Risk Management Report

123 Main St., Anytown, WA 98xxx	<Data>
REPORT IMAGES	Report #: 5635553 Geocode: 40.2119742, 93.8694994

CONFIDENCE RATING: ■ ■ ■ ■ 410

4-Very High: Straightforward construction, often single story, easily-defined garage, quality images

3-High: Potential for minor discrepancies, like vaulted ceilings on two storied home, or minor tree coverage.

2-Medium: Very complex construction with multiple stories often combined with poor or incomplete image sets.

1-Low: Very poor or incomplete images.

STRUCTURAL OBSERVATIONS 412	PROPERTY OBSERVATIONS 413
Year Built: 1983	Building Permit: No
Number of Stories: 2	EagleView Roof Report: No
Number of Family Structure: Single Family	EagleView Wall Report: No
Structure Footprint: 1,539 sq. ft.	Dist. To Commercial Exposure: 436 ft.
Corners: 6	Distance to Steep Slope: 117 ft.
Estimated Total Living Area: 1,965 sq. ft.	Distance to Water Hazard: 0 ft.
Garage Area: 484 sq. ft.	Distance to Vegetation: 161 ft.
Garage Type: Attached	Type of Vegetation: Tree
Deck Area: 449 sq. ft.	Cross-Sell Identification: Motorcycles
Patio Area: 0 sq. ft.	Slope on Property: No
Porch Area: 0 sq. ft.	Trampoline: No
Estimated Roof Pitch: 6-9	Swimming
Roof Shape: Hip/Gable	Pool/Hot Tub: No
Number of Chimneys: 1	Responding Fire Station: Leavenworth Country Fire Department District 1 Station 1
Outbuilding Count: 0	Responding Fire Station Type: Combination
Outbuilding Total Area: 0 sq. ft.	Responding Fire Station Dist.: 4-5 Miles
Basement Area: 1,012 sq. ft.	Owner Occupied: N/A
Finished Basement Area: 1,012 sq. ft.	
Basement Type: Full	
Basement Description: Finished	

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Fig. 29

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