

A METHOD AND A SYSTEM FOR GROUND SURVEILLANCE

FIELD OF INVENTION

5 The present invention relates broadly to a method and a system for ground surveillance.

BACKGROUND

10 Small unmanned aerial vehicles (UAVs) are often equipped with camera(s) for surveillance purposes. However, the camera that are currently being used provide a limited field of view in a direction. To survey a different area, the camera has to be tilted to the desired direction. Any given camera is typically unable to provide surveillance of a large area, especially areas in different directions. This
15 inevitably results in an inefficiency in detection of targets of interest.

 Further, to identify a target, the zoom function of the camera has to be activated. This greatly reduces the field of view further. The current cameras used are unable to allow a simultaneous detection of targets of opportunity outside the
20 field of view when the zoom function is activated.

 In addition, the usage of the video captured from UAV is currently limited to surveillance purposes only. The video has not been put into other applications, which may improve the surveillance of the area.
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 Therefore, there is a need to address at least one of the above-mentioned problems.

SUMMARY

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 In accordance with a first aspect of the present invention, there is provided a method of ground surveillance, the method comprising the steps of: capturing an original digital image, utilising a fisheye lens, of a surveillance area from an elevated

platform such that the resulting image comprises a substantially 360° view of the surveillance area and including horizon portions; processing the digital image at the elevated platform to generate a modified digital image having a resolution lower than the original digital image; transmitting data representing the modified digital image to
5 a land based platform; and processing the data representing the modified digital image, at the land based platform, to generate a rectilinear, map type image of a selected region of the surveillance area.

The step of processing the data representing the modified digital image may
10 comprise removing the horizon portion from the modified digital image.

The step of processing the data representing the modified digital image may further comprise selecting a portion of the map type digital image; retrieving a corresponding portion of the modified digital image and generating a perspective
15 view image of the selected region of the surveillance area based on the retrieved corresponding portion of the modified digital image.

The step of processing the data representing the modified digital image may further comprise selecting a portion of the map type digital image; requesting a
20 corresponding portion of the original digital image from the elevated platform; receiving the corresponding portion of the original digital image from the elevated platform and generating the perspective view image of the selected region of the surveillance area based on the received corresponding portion of the original digital image.

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The step of processing the data representing the modified digital image may further comprise selecting a portion of the map type digital image; instructing another digital image of the selected portion to be captured on the elevated platform by utilising a high zoom lens; receiving the digital image of the selected portion from
30 the elevated platform and generating the perspective view image of the selected region of the surveillance area based on the received digital image of the selected portion.

The perspective view image may show a substantially horizontal view of the selected region of the surveillance area.

5 The step of processing the data representing the modified digital image may further comprise superimposing the map type digital image on a satellite map.

10 The method may further comprise utilising the superimposed image of the map type digital image and the satellite map to update an attitude and location of the elevated platform.

The method may further comprise utilising the horizon portion of the original digital image, the modified digital image or both to update the attitude of the elevated platform.

15 In accordance with a second aspect of the present invention, there is provided a system ground surveillance, the system comprising: a digital camera for capturing an original digital image, utilising a fisheye lens, of a surveillance area from an elevated platform such that the resulting image comprises a substantially 360° view of the surveillance area and including horizon portions; a first processing
20 unit for processing the digital image at the elevated platform to generate a modified digital image having a resolution lower than the original digital image; a transmitter for transmitting data representing the modified digital image to a land based platform; and a second processing unit for processing the data representing the modified digital image, at the land based platform, to generate a perspective view
25 image of a selected region of the surveillance area.

The second processing unit may remove a horizon portion from the modified digital image and generate a map type digital image from a remaining portion of the modified digital image.
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The second processing unit may further select a portion of the map type digital image; retrieve a corresponding portion of the modified digital image and generate the perspective view image of the selected region of the surveillance area based on the retrieved corresponding portion of the modified digital image.

The second processing unit may select a portion of the map type digital image; request a corresponding portion of the original digital image from the elevated platform; receive the corresponding portion of the original digital image
5 from the elevated platform and generate the perspective view image of the selected region of the surveillance area based on the received corresponding portion of the original digital image.

The second processor unit may further select a portion of the map type digital
10 image; instruct another digital image of the selected portion to be captured on the elevated platform by a high zoom lens of the system; receive the digital image of the selected portion from the elevated platform and generate the perspective view image of the selected region of the surveillance area based on the received digital image of the selected portion.

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The perspective view image may show a substantially horizontal view of the selected region of the surveillance area.

The second processor unit may further superimpose the map type digital
20 image on a satellite map.

The second processor unit may utilise the superimposed image of the map type digital image and the satellite map to update an attitude and location of the elevated platform.

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The second processor unit may utilise the horizon portion of the original digital image, the modified digital image or both to update the attitude of the elevated platform.

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The elevated platform may comprise an unmanned aerial vehicle.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention will be better understood and readily apparent to one of ordinary skill in the art from the following written description, by way of example only, and in conjunction with the drawings, in which:

5 Figure 1 shows a schematic diagram of an unmanned aerial vehicle (UAV).

Figure 2 shows an illustration of a coverage of a fisheye lens camera of the UAV.

10 Figure 3 shows a flow chart of a communication between the UAV and a ground station.

Figure 4 shows the processing of a low-resolution image at the ground station.

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Figure 4a shows the low-resolution image comprising an image of the horizon and an image of the ground features.

Figure 4b shows the circular map type image after correcting fisheye lens distortion into rectilinear view seen vertically down from UAV position and including removing the image of the horizon.

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Figure 4c shows a satellite map.

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Figure 4d shows a superimposed image of the circular map type image of Figure 4b and the satellite map of Figure 4c.

Figure 5 shows an example picture of a superimposed image of a map type image and a satellite map.

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Figure 6 shows the processing of the images of selected regions on the map type image into familiar perspective views at the ground station.

Figure 7 shows example perspective view images of two regions selected on the superimposed image of Figure 5 displayed at 60° respectively.

Figure 8 shows an illustration of the communication between the ground station and the UAV when a high-resolution image of a selected area is processed from an initial high-resolution image captured by the fisheye lens camera.

Figure 9 shows a schematic diagram illustrating using the horizon portion of the low-resolution image to determine the attitude of the UAV.

Figure 10 shows a schematic diagram of a computer system for implementing the method and system of an example embodiment.

Figure 11 shows a flow chart illustrating a method of ground surveillance according to an example embodiment.

DETAILED DESCRIPTION

Some portions of the description which follows are explicitly or implicitly presented in terms of algorithms and functional or symbolic representations of operations on data within a computer memory. These algorithmic descriptions and functional or symbolic representations are the means used by those skilled in the data processing arts to convey most effectively the substance of their work to others skilled in the art. An algorithm is here, and generally, conceived to be a self-consistent sequence of steps leading to a desired result. The steps are those requiring physical manipulations of physical quantities, such as electrical, magnetic or optical signals capable of being stored, transferred, combined, compared, and otherwise manipulated.

Unless specifically stated otherwise, and as apparent from the following, it will be appreciated that throughout the present specification, discussions utilizing terms such as "capturing", "processing", "transmitting", "retrieving", "generating", "selecting", "receiving", "instructing" or the like, refer to the action and processes of a computer system, or similar electronic device, that manipulates and transforms data represented as physical quantities within the computer system into other data similarly represented as physical

quantities within the computer system or other information storage, transmission or display devices.

5 The present specification also discloses apparatus for performing the operations of the methods. Such apparatus may be specially constructed for the required purposes, or may comprise a general purpose computer or other device selectively activated or reconfigured by a computer program stored in the computer. The algorithms and displays presented herein are not inherently related to any particular computer or other apparatus. Various general purpose machines may be used with programs in
10 accordance with the teachings herein. Alternatively, the construction of more specialized apparatus to perform the required method steps may be appropriate. The structure of a conventional general purpose computer will appear from the description below.

15 In addition, the present specification also implicitly discloses a computer program, in that it would be apparent to the person skilled in the art that the individual steps of the method described herein may be put into effect by computer code. The computer program is not intended to be limited to any particular programming language and implementation thereof. It will be appreciated that a variety of programming languages and coding thereof may be used to implement the teachings of the disclosure
20 contained herein. Moreover, the computer program is not intended to be limited to any particular control flow. There are many other variants of the computer program, which can use different control flows without departing from the spirit or scope of the invention.

25 Furthermore, one or more of the steps of the computer program may be performed in parallel rather than sequentially. Such a computer program may be stored on any computer readable medium. The computer readable medium may include storage devices such as magnetic or optical disks, memory chips, or other storage devices suitable for interfacing with a general purpose computer. The computer readable medium may also include a hard-wired medium such as exemplified in the Internet
30 system, or wireless medium such as exemplified in the GSM mobile telephone system. The computer program when loaded and executed on such a general-purpose computer effectively results in an apparatus that implements the steps of the preferred method.

Figure 1 shows a schematic diagram of an unmanned aerial vehicle (UAV) 100. A fisheye lens camera 102 is positioned facing the ground when the UAV 100 is at an altitude. The fisheye lens camera 102 uses digital single lens reflex (SLR) camera technology and is able to capture images at a high resolution of e.g. about
5 10 mega pixels.

A secondary camera 104 can also be fixed onto the UAV 100. The secondary camera 104 is capable of high optical zoom. Both the fisheye lens camera 102 and the secondary camera 104 are coupled to a processing unit 106. The processing
10 unit 106 performs tasks such as video optimization, multiplexing data link and control of the secondary camera 104.

Figure 2 shows an illustration of a coverage of the fisheye lens camera 102 (Figure 1) on the UAV 100. Using the fisheye lens camera 102 (Figure 1) on the
15 UAV 100 advantageously provides a horizon to horizon coverage. Therefore, the UAV 100 is able to survey a vast region of 360° around a horizontal platform of the UAV 100 when the UAV 100 is at an altitude.

It will be appreciated by a person skilled in the art that the centre of the
20 coverage of the fisheye lens camera 102 (Figure 1), e.g. region A has a better resolution than the horizon of the coverage, e.g. regions B and C.

Figure 3 shows a flow chart of a communication between the UAV 100 and a ground station 300. The ground station 300 usually comprises a display screen and
25 a processing unit (not shown). The ground station 300 can be a computer, a laptop or a personal digital assistant (PDA). Data transmission between the ground station 300 and the UAV 100 is achieved by using a wireless data link. As appreciated by the person skilled in the art, there can be a plurality of ground stations 300 and data transmission can occur simultaneously between the UAV 100 and two or more ground
30 stations 300.

The UAV 100 and the ground station(s) 300 form a surveillance system. The surveillance system provides processing by both the UAV 100 and the ground station(s)

300. The details of the processing of the UAV 100 and the ground station 300 are described in the following.

At step 302, the fisheye lens camera 102 (Figure 1) captures an initial image of a high resolution. At step 304, the processing unit 106 (Figure 1) converts the initial high-resolution image into a low-resolution image by reducing the resolution of the initial high-resolution image and changing the colour of the initial high-resolution image into greyscale. Since the initial image has a high resolution, the low-resolution image generated after processing still has a usable resolution for the purpose of surveying a large area.

At step 306, the low-resolution image is continuously transmitted to the ground station 300 via the data link. By changing the initial high-resolution image into the low-resolution image at step 304, the bandwidth of the data link required for transmission of the low-resolution image is advantageously reduced and optimized. The low resolution image is transmitted to the ground station 300 as continuous video, allowing target detection to be performed at the ground station 300.

Figure 4 shows the processing of the low-resolution image at the ground station 300. Initially, the low-resolution image 400 as shown in Figure 4a comprises an image of the horizon portion 402 and an image of the ground features 404, e.g. buildings and hills. It will be appreciated by the person skilled in the art that due to the use of the fisheye lens, the centre 406 of the image of the ground features 404 has a better resolution than the other areas of the image of the ground features 404. The centre 406 of the image of the ground features 404 has less distortion while the other areas have greater distortion.

Figure 4b shows the map type image of the ground features 408. The circular map type image 408 is generated after correcting fisheye lens distortion into a rectilinear view seen vertically down from UAV position with the image of the horizon portion 402 removed as part of this process.. The rectilinear view is obtained when an image is captured from a position directly above the area of interest at an infinite distance away. In the rectilinear view, e.g. a tall building will appear as a rectangle as only the top of the building is visible. The fisheye lens will show the side of

building if the building is not directly below the lens. Similarly, a straight road on running hills will appear straight in the rectilinear view but will appear as curved from the fisheye lens. Hence, image processing is used to correct such fisheye lens distortions. The processing also takes terrain elevation into account using a terrain
5 elevation database. For example, the road junction on the map type image 408 and a satellite map 410 shown in Figure 4c can be matched after the image processing.

Further, the circular map type image 408 can be superimposed on the satellite map 410 for matching of terrain features, as shown in Figure 4d. The the
10 superimposed image of the map type image 408 and the satellite map 410 can be utilised to update an attitude and location of the elevated platform.

Figure 5 shows an example picture of a superimposed image 500 of a map type image 502 and a satellite map 504.
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When there is a plurality of ground stations 300, each ground station 300 is able to perform the processing of the low-resolution image 400 as described above. It is also possible that the processing is performed at one main ground station 300 and the map type image 408 is then provided to the plurality of secondary ground
20 stations 300 via a wireless data link between the ground stations 300.

Referring back to Figure 3, for situation awareness at step 308, one or more regions can be selected on the map type image 408 (Figure 4b) at step 312 to display the selected regions as perspective view images. Figure 6 shows the
25 processing of the images of the selected regions on the map type image 408 into perspective view images at the ground station 300. After the regions are selected, the corresponding regions on the low-resolution image 400 are retrieved from the database at the ground station 300 at step 602. Software is implemented in the ground station 300 to transform the images of the selected regions from the low-
30 resolution image 400 into perspective views at step 604. The ground station 300 also performs image processing to ensure that the perspective views are corrected for distortions. The perspective views are generated by using the low-resolution image 400 and performing image processing on the selected regions E and F using techniques such as those described in United States Patent Nos. 6,574,376,

5,185,667, 5,870,135 and 6,201,574, the contents of which are hereby incorporated by cross-reference.

Although the two regions E and F are at 2 different directions, the perspective
5 view images of regions E and F can be displayed simultaneously as though there
are two separate cameras mounted on the UAV 100, pointing at directions towards
regions E and F respectively. This advantageously increases the situation
awareness and allows investigation and identification of suspicious objects in
different regions using familiar perspective views at the same time. Also, in the
10 example shown in Figure 6, for area F the selected angle is high to an extent that no
horizon portion is within the field of view, while for area E a portion of the horizon is
in the field of view.

The regions can also be selected on a superimposed image. Figure 7 shows
15 example perspective view images 702 and 704 of two regions selected on the
superimposed image 500 (Figure 5) displayed at 60° respectively.

Referring back to Figure 3, it is possible to obtain a higher resolution image
of the region (step 308) if the low-resolution perspective view image is not clear. A
20 higher resolution image of the selected area can be obtained by either activating the
secondary camera 104 (Figure 1) (step 314) or processing from the initial high-
resolution image captured by the fisheye lens camera 102 (Figure 1) (step 316).

If the secondary camera 104 (Figure 1) is activated at step 314, the
25 secondary camera 104 (Figure 1) zooms into the selected area and captures the
image. A "zoom in" image of the selected area is transmitted to the ground
station 300 at step 318. Using the secondary camera 104 to zoom into the selected area
advantageously provides simultaneous detailed image of the area and/or
identification of a target in the area and detection of targets of opportunity in other
30 areas.

Figure 8 shows an illustration of the communication between the ground
station 300 and the UAV 100 if step 316 is selected. After an area of interest 802 is
selected on the map type image 408, a request is transmitted to the UAV 100 from

the ground station 300 at step 804. A corresponding high-resolution image of the selected area 802 is extracted from the high-resolution initial image 806. At step 808, the high-resolution image of the selected area 802 is transmitted to the ground station 300. Since the image of the selected area 802 is extracted from the existing
5 initial high-resolution image 806 captured by the fisheye lens camera 102 (Figure 1), a continuous surveillance operation without interruption is advantageously provided during the processing of the image of the selected area 802.

At step 810, the high-resolution image of the selected area 802 is processed
10 and transformed into a perspective image 812 at the ground station 300. The ground station 300 processes the image to correct distortion introduced by the fisheye lens. A zoom, tilt function using digital processing of the mega pixel image 806 obtained from fisheye lens camera 102 (Figure 1) is advantageously provided using the described sequence of processing.

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It will be appreciated by the person skilled in the art that different areas can be selected by a plurality of ground stations 300 and the transmission of the "zoom in" image of the selected area from the secondary camera 104 (Figure 1) or the high-resolution image of the selected area from initial high-resolution image 806 captured
20 by the fisheye lens camera 102 (Figure 1) to the plurality of ground stations can occur simultaneously.

Referring back to Figure 3, if the location of the UAV 100 is to be determined (step 310), superimposing the map type image on a satellite map provides a more
25 accurate position of the UAV 100 by matching terrain features and also provides a higher accuracy in controlling the UAV 100. The ground station 300 contains the database of satellite maps and by comparing with the low- resolution image 400, the terrain features can be matched and the location of the UAV 100 can be determined.

30 Further, the UAV 100 provides on-board object detection by recognition or motion. As such, the UAV 100 is able to provide coordinates of suspicious objects to the ground station 300 and thus, reducing the need of the ground station 300 to manually scan for target of interest. Movement of objects can be analysed with intelligent image processing on board the UAV 100 to determine if the movements of

the objects are due to natural causes such as wind or external factors. Positions of suspicious objects are transmitted to the ground station 300 and if necessary, the region(s) can be selected for further inspections. Artificial intelligence such as neural network is particularly useful for such processing and discriminating between objects of no interest and suspicious objects. It is also possible to derive accurate coordinates of the UAV 100 and any suspicious objects using geo-locations at the ground stations 300 because the wide area coverage of the fisheye lens camera 102 (Figure 1) allows the ground stations 300 to determine the positions of the objects relative to terrain features and by matching terrain features with satellite image produces coordinates with accuracy close to surveyed GPS coordinates.

An algorithm of the processing unit 106 (Figure 1) of the UAV 100 is able to orientate an image regardless of dynamic changes in attitude and heading using the image of terrain. Using the ground features such as roads, horizon and hills as reference, the attitude of the UAV 100 can be determined at step 324. Thus, platform stabilization is advantageously provided. If there are any changes in the attitude of the UAV 100, the attitude is updated at step 326. It will be appreciated by the person skilled in the art that any inertial attitude sensor (not shown) on board the UAV 100 is subjected to drift effects and requires updates to correct the accumulated drift errors. With the horizon captured by the fisheye lens, it can be readily determined if UAV 100 is flying straight and level or bank at a certain angle. Other terrain features such as hills and road can also be used as references using the similar principle of using horizon. Artificial intelligence is preferably used for proper detection of the horizon and matching of terrain features such as roads. For example, to estimate the horizon, hills blocking the view of the horizon should be ignored. To correlate a road to the correct road in the database, weather conditions should be compensated.

Alternatively or additionally, Figure 9 shows a schematic diagram of using the horizon portion 402 of the low-resolution image 400 to determine the attitude of the UAV 100. The direction of flight of the UAV 100 is indicated by arrow 902. A pitch angle of the UAV 100 is obtained by comparing respective widths $W1$, $W2$ and X of the horizon portion 402. A roll angle of the UAV 100 is obtained by comparing respective widths Y and Z of the horizon portion 402. It will be appreciated by the

person skilled in the art that the horizon portion of the initial high-resolution image can also be used.

5 The method and system as described above can be implemented on a computer system 1000, schematically shown in Figure 10. It may be implemented as software, such as a computer program being executed within the computer system 1000, and instructing the computer system 1000 to conduct the method.

10 The computer system 1000 comprises a computer module 1002, input modules such as a keyboard 1004 and mouse 1006 and a plurality of output devices such as a display 1008, and printer 1010.

15 The computer module 1002 is connected to a computer network 1012 via a suitable transceiver device 1014, to enable access to e.g. the Internet or other network systems such as Local Area Network (LAN) or Wide Area Network (WAN).

20 The computer module 1002 includes a processor 1018, a Random Access Memory (RAM) 1020 and a Read Only Memory (ROM) 1022. The computer module 1002 also includes a number of Input/Output (I/O) interfaces, for example I/O interface 1024 to the display 1008, and I/O interface 1026 to the keyboard 1004.

25 The components of the computer module 1002 typically communicate via an interconnected bus 1028 and in a manner known to the person skilled in the relevant art.

30 The application program is typically supplied to the user of the computer system 1000 encoded on a data storage medium such as a CD-ROM or flash memory carrier and read utilising a corresponding data storage medium drive of a data storage device 1030. The application program is read and controlled in its execution by the processor 1018. Intermediate storage of program data may be accomplished using RAM 1020.

Figure 11 shows a flow chart 1100 illustrating a method of ground surveillance according to an example embodiment. At step 1102, an original digital

image is captured, utilising a fisheye lens, of a surveillance area from an elevated platform such that the resulting image comprises a substantially 360° view of the surveillance area and including horizon portions. At step 1104, the digital image is processed at the elevated platform to generate a modified digital image having a resolution lower than the original digital image. At step 1106, data representing the modified digital image is transmitted to a land based platform. At step 1108, the data representing the modified digital image is processed, at the land based platform, to generate a rectilinear, map type image of a selected region of the surveillance area.

10 It will be appreciated by a person skilled in the art that numerous variations and/or modifications may be made to the present invention as shown in the specific embodiments without departing from the spirit or scope of the invention as broadly described. The present embodiments are, therefore, to be considered in all respects to be illustrative and not restrictive.

CLAIMS

1. A method of ground surveillance, the method comprising the steps of:
capturing an original digital image, utilising a fisheye lens, of a surveillance
5 area from an elevated platform such that the resulting image comprises a
substantially 360° view of the surveillance area and including horizon portions;
processing the digital image at the elevated platform to generate a modified
digital image having a resolution lower than the original digital image;
transmitting data representing the modified digital image to a land based
10 platform; and
processing the data representing the modified digital image, at the land
based platform, to generate a rectilinear, map type image of a selected region of the
surveillance area.
- 15 2. The method as claimed in claim 1, wherein the step of processing the data
representing the modified digital image comprises removing the horizon portion from
the modified digital image.
- 20 3. The method as claimed in claim 2, wherein the step of processing the data
representing the modified digital image further comprises selecting a portion of the
map type digital image; retrieving a corresponding portion of the modified digital
image and generating a perspective view image of the selected region of the
surveillance area based on the retrieved corresponding portion of the modified
digital image.
- 25 4. The method as claimed in claims 1 or 2, wherein the step of processing the
data representing the modified digital image further comprises selecting a portion of
the map type digital image; requesting a corresponding portion of the original digital
image from the elevated platform; receiving the corresponding portion of the original
30 digital image from the elevated platform and generating the perspective view image
of the selected region of the surveillance area based on the received corresponding
portion of the original digital image.

5. The method as claimed in claims 1 or 2, wherein the step of processing the data representing the modified digital image further comprises selecting a portion of the map type digital image; instructing another digital image of the selected portion to be captured on the elevated platform by utilising a high zoom lens; receiving the digital image of the selected portion from the elevated platform and generating the perspective view image of the selected region of the surveillance area based on the received digital image of the selected portion.

6. The method as claimed in any one of the preceding claims, wherein the perspective view image shows a substantially horizontal view of the selected region of the surveillance area.

7. The method as claimed in any one of the preceding claims, wherein the step of processing the data representing the modified digital image further comprises superimposing the map type digital image on a satellite map.

8. The method as claimed in claim 7, further comprising utilising the superimposed image of the map type digital image and the satellite map to update an attitude and location of the elevated platform.

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9. The method as claimed in any one of the preceding claims, further comprising utilising the horizon portion of the original digital image, the modified digital image or both to update the attitude of the elevated platform.

25 10. A system ground surveillance, the system comprising:

a digital camera for capturing an original digital image, utilising a fisheye lens, of a surveillance area from an elevated platform such that the resulting image comprises a substantially 360° view of the surveillance area and including horizon portions;

30 a first processing unit for processing the digital image at the elevated platform to generate a modified digital image having a resolution lower than the original digital image;

a transmitter for transmitting data representing the modified digital image to a land based platform; and

a second processing unit for processing the data representing the modified digital image, at the land based platform, to generate a perspective view image of a selected region of the surveillance area.

5 11. The system as claimed in claim 10, wherein the second processing unit removes a horizon portion from the modified digital image and generates a map type digital image from a remaining portion of the modified digital image.

10 12. The system as claimed in claim 11, wherein the second processing unit further selects a portion of the map type digital image; retrieves a corresponding portion of the modified digital image and generates the perspective view image of the selected region of the surveillance area based on the retrieved corresponding portion of the modified digital image.

15 13. The system as claimed in claims 10 or 11, wherein the second processing unit selects a portion of the map type digital image; requests a corresponding portion of the original digital image from the elevated platform; receives the corresponding portion of the original digital image from the elevated platform and generates the perspective view image of the selected region of the surveillance area
20 based on the received corresponding portion of the original digital image.

14. The system as claimed in claims 10 or 11, wherein the second processor unit further selects a portion of the map type digital image; instructs another digital image of the selected portion to be captured on the elevated platform by a high zoom lens
25 of the system; receives the digital image of the selected portion from the elevated platform and generates the perspective view image of the selected region of the surveillance area based on the received digital image of the selected portion.

15. The system as claimed in any one of claims 10 to 14, wherein the
30 perspective view image shows a substantially horizontal view of the selected region of the surveillance area.

16. The system as claimed in any one of claims 10 to 15, wherein the second processor unit further superimposes the map type digital image on a satellite map.

17. The system as claimed in claim 16, wherein the second processor unit utilises the superimposed image of the map type digital image and the satellite map to update an attitude and location of the elevated platform.

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18. The system as claimed in any one of claims 10 to 17, wherein the second processor unit utilises the horizon portion of the original digital image, the modified digital image or both to update the attitude of the elevated platform.

10 19. The system as claimed in any one of claims 10 to 18, wherein the elevated platform comprises an unmanned aerial vehicle.