

CLAIMS

1. A method for image georegistration, the method comprising the procedures of:

5 acquiring at least one sensor-image of a scene with at least one imaging sensor;

 obtaining imaging parameters of the acquired sensor-image, said imaging parameters comprising at least the detected three-dimensional (3D) position and orientation of said imaging sensor when acquiring said sensor-image, as detected using at least
10 one location measurement unit;

 generating at least one model-image of said scene from a textured 3D geographic model, said model-image representing a two-dimensional (2D) image of said scene as acquired in said 3D geographic model using said imaging parameters, said model-image
15 comprising detailed textural image content besides edge features;

 comparing the detailed image content of said sensor-image with the detailed image content of said model-image and determining discrepancies therebetween;

 determining an updated 3D position and orientation of said
20 imaging sensor in accordance with the discrepancies between said sensor-image and said model-image; and

displaying supplementary content overlaid on said sensor-image, in relation to a selected location on said sensor-image, as determined based on said updated 3D position and orientation of said imaging sensor.

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2. The method of claim 1, further comprising the procedure of determining the geographic location coordinates of a scene element, using said 3D geographic model and said updated 3D position and orientation of said imaging sensor.

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3. The method of claim 1, wherein said imaging parameters further comprises at least one parameter selected from the list consisting of:

range from said imaging sensor to said scene;

field of view of said imaging sensor;

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focal length of said imaging sensor;

optical resolution of said imaging sensor;

dynamic range of said imaging sensor;

sensitivity of said imaging sensor;

signal-to-noise ratio (SNR) of said imaging sensor; and

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lens aberrations of said imaging sensor.

4. The method of claim 1, wherein said 3D geographic model comprises a street level view of a real-world environment.

5. The method of claim 1, further comprising the procedure of updating the texture data of said 3D geographic model, in accordance with texture data obtained from said sensor-image.

6. The method of claim 1, further comprising the procedures of:
tracking the location of a scene element over a sequence of image frames of said sensor-image; and
displaying supplementary content overlaid on at least one image frame of said sequence of image frames, in relation to the location of said scene element in said image frame, as determined with respect to a previous image frame of said sequence of image frames.

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7. The method of claim 1, further comprising the procedures of:
obtaining at least a second set of imaging parameters for at least a second sensor-image of said at least one sensor-image acquired by said imaging-sensor;

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generating at least a second model-image of said scene from said 3D geographic model, said second model-image representing a

2D image of said scene as acquired in said 3D geographic model using said second set of imaging parameters;

comparing said second sensor-image and said second model image and determining the discrepancies therebetween;

5 determining an updated 3D position and orientation of said imaging sensor respective of said second sensor-image, in accordance with the discrepancies between said second sensor-image and said second model-image; and

10 displaying supplementary content overlaid on said second sensor-image, in relation to a selected location on said second sensor-image, as determined based on said updated 3D position and orientation of said imaging sensor respective of said second sensor-image.

15 8. The method of claim 1, wherein said supplementary content is displayed on at least a partially transparent display situated in the field of view of a user, allowing a simultaneous view of said sensor-image presented on said display and of said scene through said display.

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9. The method of claim 1, further comprising the procedures of:

comparing a new sensor-image with a previously georegistered sensor-image and determining the discrepancies therebetween; and

determining an updated 3D position and orientation of said imaging sensor when acquiring said new sensor-image, in accordance with the discrepancies between said new sensor-image and said previously georegistered sensor-image.

10. A system for image georegistration, the system comprising:

at least one imaging sensor, configured to acquire at least one sensor-image of a scene;

at least one location measurement unit, configured to detect the 3D position and orientation of said imaging sensor when acquiring said sensor-image;

a textured 3D geographic model of at least said scene, said model including imagery and texture data relating to geographical features and terrain, including artificial features; and

a processor, communicatively coupled with said imaging sensor, with said location measurement unit, and with said 3D geographic model, said processor configured to obtain imaging parameters of the acquired sensor-image, said imaging parameters comprising at least the detected 3D position and orientation of said imaging sensor when acquiring said sensor-image as detected using said location

measurement unit, said processor further configured to generate at least one model-image of said scene from said 3D geographic model, said model-image representing a 2D image of said scene as acquired in said 3D geographic model using said imaging parameters, said
5 model-image comprising detailed textural image content besides edge features, said processor further configured to compare the detailed image content of said sensor-image with the detailed image content of said model-image and determine discrepancies therebetween, and to determine an updated 3D position and
10 orientation of said imaging sensor in accordance with the discrepancies between said sensor-image and said model-image;
and

a display, communicatively coupled with said processor, said display configured to display supplementary content overlaid on said
15 sensor-image, in relation to a selected location on said sensor-image, as determined based on said updated 3D position and orientation of said imaging sensor.

11. The system of claim 10, wherein said processor is configured to
20 determine the geographic location coordinates of a scene element, using said 3D geographic model and said updated 3D position and orientation of said imaging sensor.

12. The system of claim 10, wherein said 3D geographic model comprises a street level view of a real-world environment.
- 5 13. The system of claim 10, wherein said processor is configured to update the texture data of said 3D geographic model, in accordance with texture data obtained from said sensor-image.
14. The system of claim 10, wherein said location measurement unit is
10 selected from the list consisting of:
- a global positioning system (GPS);
 - a compass;
 - an inertial navigation system (INS);
 - an inertial measurement unit (IMU);
 - 15 a motion sensor;
 - a rotational sensor; and
 - a rangefinder.
15. The system of claim 10, wherein said display comprises at least a
20 partially transparent display situated in the field of view of a user, allowing a simultaneous view of said sensor-image presented on said display and of said scene through said display.

16. The system of claim 10, wherein said display is selected from the list consisting of:

a smartphone display screen;

5 a camera display screen;

a tablet computer display screen;

eyeglasses;

goggles;

contact lenses;

10 a wearable display device;

a camera viewfinder;

a head-up display (HUD);

a head-mounted display (HMD); and

a transparent display.

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17. An image georegistration module,

characterized in that said module is configured to obtain imaging parameters of at least one sensor-image acquired by at least one imaging-sensor, said imaging parameters comprising at least the detected 3D position and orientation of said imaging sensor when acquiring said sensor-image as detected using at least one location measurement unit; said module being further configured to generate

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at least one model-image of said scene from a textured 3D geographic model, said model including imagery and texture data relating to geographical features and terrain, including artificial features, said model-image representing a 2D image of said scene as acquired in said 3D geographic model using said imaging parameters, said model-image comprising detailed textural image content besides edge features; said module being further configured to compare the detailed image content of said sensor-image with the detailed image content of said model-image and determine discrepancies therebetween, and to determine an updated 3D position and orientation of said imaging sensor in accordance with the discrepancies between said sensor-image and said model-image; and said module configured to display supplementary content overlaid on said sensor-image, in relation to a selected location on said sensor-image, as determined based on said updated 3D position and orientation of said imaging sensor.

18. The module of claim 17, wherein said module is configured to determine the geographic location coordinates of a scene element, using said 3D geographic model and said updated 3D position and orientation of said imaging sensor.

19. The module of claim 17, wherein said module is configured to update the texture data of said 3D geographic model, in accordance with texture data obtained from said sensor-image.