

Claims

1. A method for non-tactile registration of an object with a position detection system, the method comprising:

generating a surface model of the object based on one or more images captured with an image sensor unit positioned at a capturing position, wherein the image sensor unit comprises a motion sensor;

determining the capturing position in a coordinate system of the position detection system, based on a sensor signal from the motion sensor; and

relating the surface model of the object to the position detection system, wherein relating the surface model of the object to the position detection system comprises:

locating at least one point on the surface model in a coordinate system of the motion sensor; and

transforming the location of the at least one point on the surface model in the coordinate system of the motion sensor to a location in the coordinate system of the position detection system, based on the capturing position,

wherein locating at least one point on the surface model in the coordinate system of the motion sensor comprises transforming (i) a location of the at least one point on the surface model in a coordinate system of the surface model to (ii) a location in the coordinate system of the motion sensor, based on a calibration function comprising a calibration vector representing an offset between an image sensor of the image sensor unit and the motion sensor of the image sensor unit.

2. The method of claim 1, wherein the image sensor unit comprises one or more stereographic cameras.

3. The method of claim 1, wherein the image sensor unit comprises one or more cameras in a multi-camera arrangement.

4. The method of claim 1, wherein the image sensor unit comprises an infrared image sensor.

5. The method of claim 4, wherein the infrared image sensor is configured to project a pattern onto the object while capturing the image, wherein the projected pattern has known dimensions such that distortions of the pattern as projected onto a surface of the object and used to establish the three-dimensional surface of the object.
6. The method of claim 4, wherein the method further comprises:
 - arranging a plurality of infrared markers on a surface of the object;
 - detecting the infrared markers with the infrared image sensor; and
 - photogrammetrically generating a surface topography of the surface model.
7. The method of claim 1, wherein the motion sensor is configured to detect at least one of an acceleration and a rotational rate of the image sensor unit.
8. The method of claim 1, wherein the surface model comprises a point cloud.
9. The method of claim 1, wherein determining the capturing position comprises:
 - detecting motion of the image sensor unit along a path relative to the position detection system, based on the sensor signal from the motion sensor;
 - defining a spatial relationship that relates at least one point on the path in a coordinate system of the motion sensor to a known position in a coordinate system of the position detection system; and
 - determining the capturing position in the coordinate system of the position detection system based on the detected motion of the image sensor along the path and the defined spatial relationship.
10. The method of claim 9, wherein the path starts at the known position in the coordinate system of the position detection system and ends at the capturing position.
11. The method of claim 9, wherein the path starts at the capturing position and ends at the known position in the coordinate system of the position detection system.
12. The method of claim 1, wherein the position detection system is an electromagnetic position detection system.

13. The method of claim 12, wherein the position detection system has a working space having a predetermined electromagnetic field strength.

14. The method of claim 13, wherein the method comprises capturing the one or more images with the image sensor unit positioned at a capturing position outside of the working space.

15. The method of claim 14, wherein capturing the one or more images captured with an image sensor unit positioned at a capturing position further comprises:

- analyzing streaming image data of the image sensor unit; and
- automatically triggering image capture based upon recognition of the object in a certain position relative to the image sensor unit.

16. The method of claim 14, wherein capturing the one or more images captured with an image sensor unit positioned at a capturing position further comprises:

- analyzing streaming image data of the image sensor unit; and
- automatically triggering image capture based upon a positional relation between a reference position sensor attached to the object and the image sensor unit.

17. The method of claim 1, wherein the motion sensor is configured to track position of the image sensor unit along a path on which the image sensor unit is moved.

18. The method of claim 1, wherein the object is a face of a subject depicted in the captured image.

19. A method for non-tactile registration of an object with a position detection system, the method comprising:

- generating a surface model of the object based on one or more images captured with an image sensor unit positioned at a capturing position, wherein the image sensor unit comprises a motion sensor positioned separate from the object;
- determining the capturing position in a coordinate system of the position detection system, based on a sensor signal from the motion sensor; and

relating the surface model of the object to the position detection system based at least in part on the capturing position.

20. The method of claim 19, wherein determining the capturing position comprises:

detecting motion of the image sensor unit along a path relative to the position detection system, based on the sensor signal from the motion sensor;

defining a spatial relationship that relates at least one point on the path in a coordinate system of the motion sensor to a known position in a coordinate system of the position detection system; and

determining the capturing position in the coordinate system of the position detection system based on the detected motion of the image sensor along the path and the defined spatial relationship.