not provide accurate three-dimensional measurements of any detected anomalies on the components. Where systems are constructed to perform visual inspections, these systems are generally large, stationary machines that may have limited applications due to their size, thus restricting in situ inspections using these systems.

[006] The foregoing examples of the related art and limitations related thereto are intended to be illustrative and not exclusive. Other limitations of the related art will become apparent to those of skill in the art upon a reading of the specification and a study of the drawings.

SUMMARY

[007] The following embodiments and aspects thereof are described and illustrated in conjunction with systems, tools and methods which are meant to be exemplary and illustrative, not limiting in scope. In various embodiments, one or more of the above-described problems have been reduced or eliminated, while other embodiments are directed to other improvements.

[007a] According to a first aspect of the present invention, there is provided a three-dimensional scanning device comprising:

a light source configured to produce a coherent beam of light that is emitted towards an object, the coherent beam of light being reflected by the object;

a light receiving sensor configured to receive and measure the reflected coherent beam of light reflected by the object, the received reflected coherent beam of light forming a set of light measurements;

a sensor array configured to track the three-dimensional scanning device in three-dimensional space in real-time, the sensor array comprising an inertial measuring unit for measuring and tracking movement and acceleration of the three-dimensional scanning device and a linear distance sensor for measuring linear distance with respect to a fixed anchor point that is external to the three-dimensional scanning device;

a memory in which data representing the set of light measurements at each of a plurality of data acquisition points from the light receiving sensor and data representing measurements of the movement, the acceleration and the linear displacement of the three-dimensional scanning device from the sensor array are stored; and

a processor configured to:

measure, at the sensor array, the movement, the acceleration and the linear displacement of the three-dimensional scanning device during the movement of the three-dimensional scanning device to provide the data representing the movement, the acceleration and the linear displacement of the three-dimensional scanning device;

measure, at the light receiving sensor at the plurality of data acquisition points, the received reflected coherent beam of light reflected by the object to produce the data representing the set of light measurements at each of the plurality of data acquisition points, the plurality of data acquisition points occurring during the movement of the three-dimensional scanning device;

synchronize, from the memory at the plurality of data acquisition points, the data representing the movement, the acceleration and the linear displacement of the three-dimensional scanning device with the data representing the set of light measurements to generate a synchronized data set for each of the plurality of data acquisition points, wherein each synchronized data set comprises a position and orientation of the three-dimensional scanning device and a synchronized set of light measurements;

perform an error correction to the position and orientation of the three-dimensional scanning device in each of the synchronized data sets based on consecutive sets of the set of light measurements for each of the plurality of data acquisition points and the linear displacement; and

generate a three-dimensional representation of the object based on the synchronized data set for the plurality of data acquisition points.

[007b] According to a second aspect of the present invention, there is provided a three-dimensional scanning system comprising:

a three-dimensional scanning device comprising:

a light source configured to produce a coherent beam of light that is emitted towards an object, the coherent beam of light being reflected by the object;

a light receiving sensor configured to receive and measure the reflected coherent beam of light reflected by the object, the received reflected coherent beam of light forming a set of light measurements;

a sensor array configured to track the three-dimensional scanning device in three-dimensional space in real-time, the sensor array comprising an inertial measuring

unit for measuring and tracking movement and acceleration of the three-dimensional scanning device and a linear distance sensor for measuring a linear distance with respect to a fixed anchor point that is external to the three-dimensional scanning device;

a transmission unit for transmitting data representing the set of light measurements from the light receiving sensor for each of a plurality of data acquisition points occurring during the movement of the three-dimensional scanning device and data representing measurements of the movement, the acceleration and the linear displacement of the three-dimensional scanning device from the sensor array; and

a computer comprising:

an interface for receiving the data representing the set of light measurements for each of the plurality of data acquisition points from the light receiving sensor and the data representing measurements of the movement, the acceleration and the linear displacement of the three-dimensional scanning device from the sensor array;

a processor configured to:

determine a position and orientation of the three-dimensional scanning device at each of the plurality of data acquisition points based on the movement, the acceleration and the linear displacement measured by the sensor array;

determine an initial position and orientation of the object based on the set of light measurements at a first of the plurality of data acquisition points;

determine a position and orientation of the object for each subsequent one of the plurality of data acquisition points based on a difference between the set of light measurements from a previous consecutive one of the plurality of data acquisition points and between the set of light measurements at the subsequent one of the plurality of data acquisition points;

perform an error correction to the position and orientation of the three-dimensional scanning device at each of the plurality of data acquisition points based consecutive sets of the set of light measurements for each of the plurality of data acquisition points and the linear displacement; and

generate a three-dimensional representation of the object based on the position and orientation of the three-dimensional scanning device and the position and orientation of the object at the plurality of data acquisition points.

[007c] According to a third aspect of the present invention, there is provided a method of performing a three-dimensional scan of an object comprising:

obtaining sets of measurements representing a surface of the object, each of the sets of measurements corresponding to one of a plurality of data acquisition points and being produced when a beam from a three-dimensional scanning device is reflected by the surface of the object at the one of the plurality of data acquisition points, the plurality of data acquisition points occurring during movement of the three-dimensional scanning device;

obtaining an initial position and orientation of the object with respect to the three-dimensional scanning device based on a set of measurements at a first of the plurality of data acquisition points;

measuring movement and acceleration of the three-dimensional scanning device by tracking three-dimensional movement and linear displacement with respect to a fixed anchor point that is external to the three-dimensional scanning device by a sensor array of the three-dimensional scanning device;

determining a position and orientation of the three-dimensional scanning device at each of the plurality of data acquisition points based on the movement, the acceleration and the linear displacement;

determining a position and orientation of the object for each subsequent one of the plurality of data acquisition points based on a difference between the set of measurements from a previous consecutive one of the plurality of data acquisition points and the set of measurements at the subsequent one of the plurality of data acquisition points; and

performing an error correction of the position and orientation of the three-dimensional scanning device at each of the plurality of data acquisition points based consecutive sets of the set of measurements for each of the plurality of data acquisition points and the linear displacement; and

generating a three-dimensional representation of the object based on the position and orientation of the three-dimensional scanning device and the position and orientation of the object at the plurality of data acquisition points.

[008] There is provided a three-dimensional scanning device comprising: a light source configured to produce a coherent beam of light that is emitted towards an object, the coherent beam of light being reflected by the object; a light receiving

sensor configured to receive and measure the reflected coherent beam of light reflected by the object, the received reflected coherent beam of light forming at set of light measurements; a sensor array configured to track movement of the three-dimensional scanning device in three-dimensional space in real-time, the sensor array measuring movement of the three-dimensional scanning device and a linear displacement with respect to a fixed anchor point that is external to the three-dimensional scanning device; a memory in which data representing the set of light measurements from the light receiving sensor and data representing measurements of the movement and the linear displacement of the three-dimensional scanning device from the sensor array are stored; and a processor configured to: measure, at the sensor array, the movement and the linear displacement of the three-dimensional scanning device during the movement of the three-dimensional scanning device to provide the data representing the movement and the linear displacement of the three-dimensional scanning device; measure, at the light receiving sensor at a plurality of data acquisition points, the received reflected coherent beam of light reflected by the object to produce the data representing the set of light measurements at each of the plurality of data acquisition points, the plurality of data

acquisition points occurring during the movement of the three-dimensional scanning device; synchronize, from the memory at the plurality of data acquisition points, the data representing the movement and linear displacement of the three-dimensional scanning device with the data representing the set of light measurements to generate a synchronized data set for each of the plurality of data acquisition points; and generate a three-dimensional representation of the object based on the synchronized data set for the plurality of data acquisition points.

[009] There is provided a three-dimensional scanning system comprising: a three-dimensional scanning device comprising: a light source configured to produce a coherent beam of light that is emitted towards an object, the coherent beam of light being reflected by the object; a light receiving sensor configured to receive and measure the reflected coherent beam of light reflected by the object, the received reflected coherent beam of light forming at set of light measurements; a sensor array configured to track movement of the three-dimensional scanning device in three-dimensional space in real-time, the sensor array measuring movement of the three-dimensional scanning device and a linear displacement with respect to a fixed anchor point that is external to the three-dimensional scanning device; a transmission unit for transmitting data representing the set of light measurements from the light receiving sensor for each of a plurality of data acquisition points occurring during the movement of the three-dimensional scanning device and data representing measurements of the movement and the linear displacement of the three-dimensional scanning device from the sensor array; and a computer comprising: an interface for receiving the data representing the set of light measurements for each of the plurality of data acquisition points from the light receiving sensor and the data representing measurements of the movement and the linear displacement of the three-dimensional scanning device from the sensor array; a processor configured to: determine a position and orientation of the three-dimensional scanning device at each of the plurality of data acquisition points based on the measured movement and the linear displacement; determine an initial position and orientation of the object based on the set of light measurements at a first of the plurality of data acquisition points; determine a position and orientation of the object for each subsequent one of the plurality of data acquisition points based on a difference between the set of light measurements from a previous consecutive one of the plurality of data acquisition points and between the set of light measurements at the subsequent one of the plurality of data acquisition points; and generate a three-dimensional representation of the object based on the position and orientation of the three-dimensional

scanning device and the position and orientation of the object at the plurality of data acquisition points.

[0010] There is provided a method of performing a three-dimensional scan of an object comprising: emitting a coherent beam of light from a three-dimensional scanning device to the object, the coherent beam of light being reflected by the object; measuring the reflected coherent beam of light at the three-dimensional scanning device to form a set of light measurements; obtaining an initial position and orientation of the object with respect to a three-dimensional scanning device based on a set of light measurements at a first of a plurality of data acquisition points; measuring movement of the three-dimensional scanning device by tracking three-dimensional movement and linear displacement with respect to a fixed anchor point that is external to the three-dimensional scanning device; measuring the reflected coherent beam of light at the three-dimensional scanning device at the plurality of data acquisition points to obtain a set of light measurements at each of the plurality of data acquisition points, the plurality of data acquisition points occurring during the movement of the three-dimensional scanning device; determining a position and orientation of the three-dimensional scanning device at each of the plurality of data acquisition points based on the measured movement and the linear displacement; determining an initial position and orientation of the object based on the set of light measurements at a first of the plurality of data acquisition points; determining a position and orientation of the object for each subsequent one of the plurality of data acquisition points based on a difference between the set of light measurements from a previous consecutive one of the plurality of data acquisition points and between the set of light measurements at the subsequent one of the plurality of data acquisition points; and generating a three-dimensional representation of the object based on the position and orientation of the three-dimensional scanning device and the position and orientation of the object at the plurality of data acquisition points.

[0011] In addition to the exemplary aspects and embodiments described above, further aspects and embodiments will become apparent by reference to the drawings and by study of the following detailed descriptions.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The advantages of the present techniques will be better understood by referring to the following detailed description and the attached drawings. It is intended that the

CLAIMS:

1. A three-dimensional scanning device comprising:

a light source configured to produce a coherent beam of light that is emitted towards an object, the coherent beam of light being reflected by the object;

a light receiving sensor configured to receive and measure the reflected coherent beam of light reflected by the object, the received reflected coherent beam of light forming a set of light measurements;

a sensor array configured to track the three-dimensional scanning device in three-dimensional space in real-time, the sensor array comprising an inertial measuring unit for measuring and tracking movement and acceleration of the three-dimensional scanning device and a linear distance sensor for measuring linear distance with respect to a fixed anchor point that is external to the three-dimensional scanning device;

a memory in which data representing the set of light measurements at each of a plurality of data acquisition points from the light receiving sensor and data representing measurements of the movement, the acceleration and the linear displacement of the three-dimensional scanning device from the sensor array are stored; and

a processor configured to:

measure, at the sensor array, the movement, the acceleration and the linear displacement of the three-dimensional scanning device during the movement of the three-dimensional scanning device to provide the data representing the movement, the acceleration and the linear displacement of the three-dimensional scanning device;

measure, at the light receiving sensor at the plurality of data acquisition points, the received reflected coherent beam of light reflected by the object to produce the data representing the set of light measurements at each of the plurality of data acquisition points, the plurality of data acquisition points occurring during the movement of the three-dimensional scanning device;

synchronize, from the memory at the plurality of data acquisition points, the data representing the movement, the acceleration and the linear displacement of the three-dimensional scanning device with the data representing the set of light measurements to generate a synchronized data set for each of the plurality of data acquisition points, wherein each synchronized data set comprises a position and

orientation of the three-dimensional scanning device and a synchronized set of light measurements;

perform an error correction to the position and orientation of the three-dimensional scanning device in each of the synchronized data sets based on consecutive sets of the set of light measurements for each of the plurality of data acquisition points and the linear displacement; and

generate a three-dimensional representation of the object based on the synchronized data set for the plurality of data acquisition points.

2. The three-dimensional scanning device of claim 1, wherein the light source comprises at least one of a diode, a laser and a light emitting diode and wherein the coherent beam of light comprises one of multiple beams of light configured in a dot pattern, a line scan and a beam that moves in a pattern at each of the plurality of data acquisition points.

3. The three-dimensional scanning device of claim 1, further comprising a camera configured to obtain an image of the object at each of the plurality of data acquisition points.

4. The three-dimensional scanning device of claim 1, further comprising a transmission unit interfacing with a computer system to transmit the data representing the set of light measurements for each of the plurality of data acquisition points and the data representing the measurements of the movement, the acceleration and the linear displacement of the three-dimensional scanning device thereto.

5. The three-dimensional scanning device of claim 1, wherein the three-dimensional scanning device is at least one of a handheld device and configured for use in an external frame system.

6. The three-dimensional scanning device of claim 1, wherein the sensor array further comprises at least one of the group consisting of at least one accelerometer, at least one gyroscope, at least one magnetometer, a Global Positioning System module, and a Global Navigation Satellite System module.

7. The three-dimensional scanning device of claim 1, wherein the inertial measurement unit measures the movement of the three-dimensional scanning device by measuring in one or

more axes of movement one or more of linear displacement, axis velocity, linear acceleration, orientation and vector data.

8. The three-dimensional scanning device of claim 1, wherein the linear distance sensor comprises a plurality of linear distance sensors positioned around the three-dimensional scanning device.

9. The three-dimensional scanning device of claim 1, wherein synchronize comprises:

determine the position and orientation of the three-dimensional scanning device at each of the plurality of data acquisition points based on the measurements of the movement, the acceleration and the linear displacement;

wherein determine the position and orientation of the three-dimensional scanning device comprises:

determine an initial position and orientation of the three-dimensional scanning device based on measurements from the sensor array at a first of the plurality of data acquisition points;

determine a position and orientation of the three-dimensional scanning device for each subsequent one of the plurality of data acquisition points based on a displacement from a previous consecutive one of the plurality of data acquisition points to the subsequent one of the plurality of data acquisition points, comprising:

determine the displacement of the three-dimensional scanning device from the previous consecutive one of the plurality of data acquisition points to the subsequent one of the plurality of data acquisition points by one of:

derive the displacement based on the acceleration between the previous consecutive one of the plurality of data acquisition points and the subsequent one of the plurality of data acquisition points;

derive the displacement based on a difference in the linear displacement between the previous consecutive one of the plurality of data acquisition points and the subsequent one of the plurality of data acquisition points; and

derive the displacement based on an alignment of the set of light measurements at the previous consecutive one of the plurality of data acquisition points with the set of light measurements at the subsequent one of the plurality of data acquisition points; and

apply the displacement to a position and orientation of the three-dimensional scanning device at the previous consecutive one of the plurality of data acquisition points to obtain the position and orientation of the three-dimensional scanning device at the subsequent one of the plurality of data acquisition points.

10. The three-dimensional scanning device of claim 9, wherein derive the displacement based on the alignment comprises:

determine a difference in position and orientation of identifiable features on the object by comparing the set of light measurements at the previous consecutive one of the plurality of data acquisition points with the set of light measurements at the subsequent one of the plurality of data acquisition points, the difference being considered to be representative of the displacement of the three-dimensional scanning device from the previous consecutive one of the plurality of data acquisition points to the subsequent one of the plurality of data acquisition points.

11. The three-dimensional scanning device of claim 1, wherein synchronize comprises:

determine the position and orientation of the three-dimensional scanning device at each of the plurality of data acquisition points based on the measurements of the movement, the acceleration and the linear displacement;

wherein determine the position and orientation of the three-dimensional scanning device comprises:

determine an initial position and orientation of the three-dimensional scanning device based on measurements from the sensor array at a first of the plurality of data acquisition points;

determine a position and orientation of the three-dimensional scanning device for each subsequent one of the plurality of data acquisition points based on a displacement from a previous consecutive one of the plurality of data acquisition points to the subsequent one of the plurality of data acquisition points, comprising:

determine the displacement of the three-dimensional scanning device from the previous consecutive one of the plurality of data acquisition points to the subsequent one of the plurality of data acquisition points by:

derive a first displacement based on the acceleration between the previous consecutive one of the plurality of data acquisition points and the subsequent one of the plurality of data acquisition points;

derive a second displacement based on a difference in the linear displacement between the previous consecutive one of the plurality of data acquisition points and the subsequent one of the plurality of data acquisition points;

derive a third displacement based on an alignment of the set of light measurements at the previous consecutive one of the plurality of data acquisition points with the set of light measurements at the subsequent one of the plurality of data acquisition points; and

combining the first displacement, the second displacement and the third displacement to provide the displacement of the three-dimensional scanning device; and

apply the displacement to a position and orientation of the three-dimensional scanning device at the previous consecutive one of the plurality of data acquisition points to obtain the position and orientation of the three-dimensional scanning device at the subsequent one of the plurality of data acquisition points.

12. The three-dimensional scanning device of claim 1, wherein synchronize comprises:

determine an initial position and orientation of the object based on the set of light measurements at a first of the plurality of data acquisition points;

determine a position and orientation of the object for each subsequent one of the plurality of data acquisition points based on a difference between the set of light measurements from a previous consecutive one of the plurality of data acquisition points and between the set of light measurements at the subsequent one of the plurality of data acquisition points,

wherein determine the position and orientation of the object at each subsequent one of the plurality of data acquisition points comprises:

compare the set of light measurements at the previous consecutive one of the plurality of data acquisition points with the set of light measurements at the subsequent one of the plurality of data acquisition points;

determine a translational and rotational difference between the set of light measurements at the previous consecutive one of the plurality of data acquisition points and the set of light measurements at the subsequent one of the plurality of data acquisition points based on the comparison; and

apply the translation and rotation difference to the set of light measurements at the subsequent one of the plurality of data acquisition points to obtain the position and orientation of the object at the subsequent one of the plurality of data acquisition points.

13. The three-dimensional scanning device of claim 1, wherein generate the three-dimensional representation comprises:

align a position and orientation of the object at each of the plurality of data acquisition points in three-dimensional space;

generate a three-dimensional point cloud from the aligned position and orientation of the object; and

generate a three-dimensional model from the three-dimensional point cloud.

14. A three-dimensional scanning system comprising:

a three-dimensional scanning device comprising:

a light source configured to produce a coherent beam of light that is emitted towards an object, the coherent beam of light being reflected by the object;

a light receiving sensor configured to receive and measure the reflected coherent beam of light reflected by the object, the received reflected coherent beam of light forming a set of light measurements;

a sensor array configured to track the three-dimensional scanning device in three-dimensional space in real-time, the sensor array comprising an inertial measuring unit for measuring and tracking movement and acceleration of the three-dimensional scanning device and a linear distance sensor for measuring a linear distance with respect to a fixed anchor point that is external to the three-dimensional scanning device;

a transmission unit for transmitting data representing the set of light measurements from the light receiving sensor for each of a plurality of data acquisition points occurring during the movement of the three-dimensional scanning device and

data representing measurements of the movement, the acceleration and the linear displacement of the three-dimensional scanning device from the sensor array; and

a computer comprising:

an interface for receiving the data representing the set of light measurements for each of the plurality of data acquisition points from the light receiving sensor and the data representing measurements of the movement, the acceleration and the linear displacement of the three-dimensional scanning device from the sensor array;

a processor configured to:

determine a position and orientation of the three-dimensional scanning device at each of the plurality of data acquisition points based on the movement, the acceleration and the linear displacement measured by the sensor array;

determine an initial position and orientation of the object based on the set of light measurements at a first of the plurality of data acquisition points;

determine a position and orientation of the object for each subsequent one of the plurality of data acquisition points based on a difference between the set of light measurements from a previous consecutive one of the plurality of data acquisition points and between the set of light measurements at the subsequent one of the plurality of data acquisition points;

perform an error correction to the position and orientation of the three-dimensional scanning device at each of the plurality of data acquisition points based consecutive sets of the set of light measurements for each of the plurality of data acquisition points and the linear displacement; and

generate a three-dimensional representation of the object based on the position and orientation of the three-dimensional scanning device and the position and orientation of the object at the plurality of data acquisition points.

15. The three-dimensional scanning device of claim 14, wherein the light source comprises at least one of a diode, a laser and a light emitting diode and wherein the coherent beam of light comprises one of multiple beams of light configured in a dot pattern, a line scan and a beam that moves in a pattern at each of the plurality of data acquisition points.

16. The three-dimensional scanning device of claim 14, further comprising a camera configured to obtain an image of the object at each of the plurality of data acquisition points.

17. The three-dimensional scanning device of claim 14, wherein the three-dimensional scanning device is at least one of a handheld device and configured for use in an external frame system.

18. The three-dimensional scanning device of claim 14, wherein the sensor array further comprises at least one of the group consisting of at least one accelerometer, at least one gyroscope, at least one magnetometer, a Global Positioning System module, and a Global Navigation Satellite System module.

19. The three-dimensional scanning device of claim 14, wherein the inertial measuring unit measures the movement of the three-dimensional scanning device by measuring in one or more axes of movement one or more of linear displacement, axis velocity, linear acceleration, orientation and vector data.

20. The three-dimensional scanning device of claim 14, wherein the linear distance sensor comprises a plurality of linear distance sensors positioned around the three-dimensional scanning device.

21. The three-dimensional scanning device of claim 14, wherein determine the position and orientation of the three-dimensional scanning device comprises:

determine an initial position and orientation of the three-dimensional scanning device based on measurements from the sensor array at a first of the plurality of data acquisition points;

determine a position and orientation of the three-dimensional scanning device for each subsequent one of the plurality of data acquisition points based on a displacement from a previous consecutive one of the plurality of data acquisition points to the subsequent one of the plurality of data acquisition points, comprising:

determine the displacement of the three-dimensional scanning device from the previous consecutive one of the plurality of data acquisition points to the subsequent one of the plurality of data acquisition points by one of:

derive the displacement based on the acceleration between the previous consecutive one of the plurality of data acquisition points and the subsequent one of the plurality of data acquisition points;

derive the displacement based on a difference in the linear displacement between the previous consecutive one of the plurality of data acquisition points and the subsequent one of the plurality of data acquisition points; and

derive the displacement based on an alignment of the set of light measurements at the previous consecutive one of the plurality of data acquisition points with the set of light measurements at the subsequent one of the plurality of data acquisition points; and

apply the displacement to a position and orientation of the three-dimensional scanning device at the previous consecutive one of the plurality of data acquisition points to obtain the position and orientation of the three-dimensional scanning device at the subsequent one of the plurality of data acquisition points.

22. The three-dimensional scanning device of claim 21, wherein derive the displacement based on an alignment comprises:

determine a difference in position and orientation of identifiable features on the object by comparing the set of light measurements at the previous consecutive one of the plurality of data acquisition points with the set of light measurements at the subsequent one of the plurality of data acquisition points, the difference being considered to be representative of the displacement of the three-dimensional scanning device from the previous consecutive one of the plurality of data acquisition points to the subsequent one of the plurality of data acquisition points.

23. The three-dimensional scanning device of claim 14, wherein determine the position and orientation of the three-dimensional scanning device comprises:

determine an initial position and orientation of the three-dimensional scanning device based on measurements from the sensor array at a first of the plurality of data acquisition points;

determine a position and orientation of the three-dimensional scanning device for each subsequent one of the plurality of data acquisition points based on a displacement from a

previous consecutive one of the plurality of data acquisition points to the subsequent one of the plurality of data acquisition points, comprising:

determine the displacement of the three-dimensional scanning device from the previous consecutive one of the plurality of data acquisition points to the subsequent one of the plurality of data acquisition points by:

derive a first displacement based on the acceleration between the previous consecutive one of the plurality of data acquisition points and the subsequent one of the plurality of data acquisition points;

derive a second displacement based on a difference in the linear displacement between the previous consecutive one of the plurality of data acquisition points and the subsequent one of the plurality of data acquisition points;

derive a third displacement based on an alignment of the set of light measurements at the previous consecutive one of the plurality of data acquisition points with the set of light measurements at the subsequent one of the plurality of data acquisition points; and

combining the first displacement, the second displacement and the third displacement to provide the displacement of the three-dimensional scanning device; and

apply the displacement to a position and orientation of the three-dimensional scanning device at the previous consecutive one of the plurality of data acquisition points to obtain the position and orientation of the three-dimensional scanning device at the subsequent one of the plurality of data acquisition points.

24. The three-dimensional scanning device of claim 14, wherein determine the position and orientation of the object at each subsequent one of the plurality of data acquisition points comprises:

compare the set of light measurements at the previous consecutive one of the plurality of data acquisition points with the set of light measurements at the subsequent one of the plurality of data acquisition points;

determine a translational and rotational difference between the set of light measurements at the previous consecutive one of the plurality of data acquisition points and

the set of light measurements at the subsequent one of the plurality of data acquisition points based on the comparison; and

apply the translation and rotation difference to the set of light measurements at the subsequent one of the plurality of data acquisition points to obtain the position and orientation of the object at the subsequent one of the plurality of data acquisition points.

25. The three-dimensional scanning device of claim 14, wherein generate the three-dimensional representation comprises:

align a position and orientation of the object at each of the plurality of data acquisition points in three-dimensional space;

generate a three-dimensional point cloud from the aligned position and orientation of the object; and

generate a three-dimensional model from the three-dimensional point cloud.

26. A method of performing a three-dimensional scan of an object comprising:

obtaining sets of measurements representing a surface of the object, each of the sets of measurements corresponding to one of a plurality of data acquisition points and being produced when a beam from a three-dimensional scanning device is reflected by the surface of the object at the one of the plurality of data acquisition points, the plurality of data acquisition points occurring during movement of the three-dimensional scanning device;

obtaining an initial position and orientation of the object with respect to the three-dimensional scanning device based on a set of measurements at a first of the plurality of data acquisition points;

measuring movement and acceleration of the three-dimensional scanning device by tracking three-dimensional movement and linear displacement with respect to a fixed anchor point that is external to the three-dimensional scanning device by a sensor array of the three-dimensional scanning device;

determining a position and orientation of the three-dimensional scanning device at each of the plurality of data acquisition points based on the movement, the acceleration and the linear displacement;

determining a position and orientation of the object for each subsequent one of the plurality of data acquisition points based on a difference between the set of measurements

from a previous consecutive one of the plurality of data acquisition points and the set of measurements at the subsequent one of the plurality of data acquisition points; and

performing an error correction of the position and orientation of the three-dimensional scanning device at each of the plurality of data acquisition points based consecutive sets of the set of measurements for each of the plurality of data acquisition points and the linear displacement; and

generating a three-dimensional representation of the object based on the position and orientation of the three-dimensional scanning device and the position and orientation of the object at the plurality of data acquisition points.

27. The method of claim 26, wherein measuring the movement and the acceleration of the three-dimensional scanning device comprises:

measuring the movement of the three-dimensional scanning device using one or more of an inertial measuring unit, at least one linear distance sensor, at least accelerometer, at least one gyroscope, at least one magnetometer, a Global Positioning System module, and a Global Navigation Satellite System module.

28. The method of claim 26,wherein determining the position and orientation of the three-dimensional scanning device at each of the plurality of data acquisition points comprises:

determining an initial position and orientation of the three-dimensional scanning device based on measurements from the sensor array at the first of the plurality of data acquisition points;

determining the position of the three-dimensional scanning device for each subsequent one of the plurality of data acquisition points based on a displacement from a previous consecutive one of the plurality of data acquisition points to the subsequent one of the plurality of data acquisition points, comprising:

determining the displacement of the three-dimensional scanning device from the previous consecutive one of the plurality of data acquisition points to the subsequent one of the plurality of data acquisition points by one of:

deriving the displacement based on the acceleration between the previous consecutive one of the plurality of data acquisition points and the subsequent one of the plurality of data acquisition points;

deriving the displacement based on a difference in the linear displacement between the previous consecutive one of the plurality of data acquisition points and the subsequent one of the plurality of data acquisition points; and

deriving the displacement based on an alignment of the set of measurements at the previous consecutive one of the plurality of data acquisition points with the set of measurements at the subsequent one of the plurality of data acquisition points; and

applying the displacement to a position and orientation of the three-dimensional scanning device at the previous consecutive one of the plurality of data acquisition points to obtain the position and orientation of the three-dimensional scanning device at the subsequent one of the plurality of data acquisition points.

29. The method of claim 28, wherein deriving the displacement based on an alignment comprises:

determining a difference in position and orientation of identifiable features on the object by comparing the set of measurements at the previous consecutive one of the plurality of data acquisition points with the set of measurements at the subsequent one of the plurality of data acquisition points, the difference being considered to be representative of the displacement of the three-dimensional scanning device from the previous consecutive one of the plurality of data acquisition points to the subsequent one of the plurality of data acquisition points.

30. The method of claim 26,wherein determining the position and orientation of the three-dimensional scanning device at each of the plurality of data acquisition points comprises:

determining an initial position and orientation of the three-dimensional scanning device based on measurements from the sensor array at the first of the plurality of data acquisition points;

determining a position and orientation of the three-dimensional scanning device for each subsequent one of the plurality of data acquisition points based on a displacement from a previous consecutive one of the plurality of data acquisition points to the subsequent one of the plurality of data acquisition points, comprising:

determining the displacement of the three-dimensional scanning device from the previous consecutive one of the plurality of data acquisition points to the subsequent one of the plurality of data acquisition points by:

deriving a first displacement based on the acceleration between the previous consecutive one of the plurality of data acquisition points and the subsequent one of the plurality of data acquisition points;

deriving a second displacement based on a difference in the linear displacement between the previous consecutive one of the plurality of data acquisition points and the subsequent one of the plurality of data acquisition points;

deriving a third displacement based on an alignment of the set of measurements at the previous consecutive one of the plurality of data acquisition points with the set of measurements at the subsequent one of the plurality of data acquisition points; and

combining the first displacement, the second displacement and the third displacement to provide the displacement of the three-dimensional scanning device; and

applying the displacement to a position and orientation of the three-dimensional scanning device at the previous consecutive one of the plurality of data acquisition points to obtain the position and orientation of the three-dimensional scanning device at the subsequent one of the plurality of data acquisition points.

31. The method of claim 30, wherein determining the position and orientation of the object at each subsequent one of the plurality of data acquisition points comprises:

comparing the set of measurements at the previous consecutive one of the plurality of data acquisition points with the set of ligt measurements at the subsequent one of the plurality of data acquisition points;

determining a translational and rotational difference between the set of measurements at the previous consecutive one of the plurality of data acquisition points and the set of measurements at the subsequent one of the plurality of data acquisition points based on the comparison; and

applying the translation and rotation difference to the set of measurements at the subsequent one of the plurality of data acquisition points to obtain the position and orientation of the object at the subsequent one of the plurality of data acquisition points.

32. The method of claim 26, wherein generating the three-dimensional representation comprises:

aligning a position and orientation of the object at each of the plurality of data acquisition points in three-dimensional space;

generating a three-dimensional point cloud from the aligned position and orientation of the object; and

generating a three-dimensional model from the three-dimensional point cloud.

33. The three-dimensional scanning device of claim 1, wherein perform the error correction comprises:

identify at least two features on a surface of the object based on the set of the light measurements at one of the plurality of data acquisition points;

obtain the set of the light measurements at a consecutive one of the plurality of data acquisition points from the one of the plurality of data acquisition points;

determine a displacement of each of the at least two features between the one of the plurality of data acquisition points and the consecutive one of the plurality of data acquisition points;

compare the displacement of each of the at least two features to identify a difference in the displacements of each of the at least two features; and

determine an error correction for the position and orientation of the three-dimensional scanning device based on the comparison of the displacements of the at least two features.

34. The three-dimensional scanning device of claim 1, wherein perform the error correction comprises:

determine a difference between the position and orientation of the three-dimensional scanning device from two synchronized data sets at two consecutive points from the plurality of data acquisition points based on the movement and the acceleration to obtain a first displacement of the three-dimensional scanning device;

determine a second displacement of the three-dimensional scanning device corresponding to the linear displacement from the two synchronized data sets at the two consecutive points from the plurality of data acquisition points;

compare the first displacement and the second displacement to obtain an error in the position and orientation of the three-dimensional scanning device at one of the two consecutive points from the plurality of data acquisition points; and

determine the error correction for the position and orientation of the three-dimensional scanning device at the one of the two consecutive points from the plurality of data acquisition points based on the comparison of the first displacement and the second displacement.

35. The three-dimensional scanning system of claim 14, wherein perform the error correction comprises:

identify at least two features on a surface of the object based on the set of the light measurements at one of the plurality of data acquisition points;

obtain the set of the light measurements at a consecutive one of the plurality of data acquisition points from the one of the plurality of data acquisition points;

determine a displacement of each of the at least two features between the one of the plurality of data acquisition points and the consecutive one of the plurality of data acquisition points;

compare the displacement of each of the at least two features to identify a difference in the displacements of each of the at least two features; and

determine an error correction for the position and orientation of the three-dimensional scanning device based on the comparison of the displacements of the at least two features.

36. The three-dimensional scanning system of claim 14, wherein perform the error correction comprises:

determine a difference between the position and orientation of the three-dimensional scanning device from two synchronized data sets at two consecutive points from the plurality of data acquisition points based on the movement and the acceleration to obtain a first displacement of the three-dimensional scanning device;

determine a second displacement of the three-dimensional scanning device corresponding to the linear displacement from the two synchronized data sets at the two consecutive points from the plurality of data acquisition points;

compare the first displacement and the second displacement to obtain an error in the position and orientation of the three-dimensional scanning device at one of the two consecutive points from the plurality of data acquisition points; and

determine the error correction for the position and orientation of the three-dimensional scanning device at the one of the two consecutive points from the plurality of data acquisition points based on the comparison of the first displacement and the second displacement.

37. The method of claim 26, wherein performing the error correction comprises:

identifying at least two features on the surface of the object based on the set of the measurements at one of the plurality of data acquisition points;

obtaining the set of measurements at a consecutive one of the plurality of data acquisition points from the one of the plurality of data acquisition points;

determining a displacement of each of the at least two features between the one of the plurality of data acquisition points and the consecutive one of the plurality of data acquisition points;

comparing the displacement of each of the at least two features to identify a difference in the displacements of each of the at least two features; and

determining an error correction for the position and orientation of the three-dimensional scanning device based on the comparison of the displacements of the at least two features.

38. The method of claim 26, wherein performing the error correction comprises:

determining a difference between the position and orientation of the three-dimensional scanning device from two synchronized data sets at two consecutive points from the plurality of data acquisition points based on the movement and the acceleration to obtain a first displacement of the three-dimensional scanning device;

determining a second displacement of the three-dimensional scanning device corresponding to the linear displacement from the two synchronized data sets at the two consecutive points from the plurality of data acquisition points;

comparing the first displacement and the second displacement to obtain an error in the position and orientation of the three-dimensional scanning device at one of the two consecutive points from the plurality of data acquisition points; and

determining the error correction for the position and orientation of the three-dimensional scanning device at the one of the two consecutive points from the plurality of data acquisition points based on the comparison of the first displacement and the second displacement.