Claims

1. A marker-combined simultaneous localization and mapping (SLAM) navigation method, comprising:

providing an initialization area for a located object;

adding a first maker in the initialization area for the located object, wherein the first marker comprises: pose information or identification information;

starting from the initialization area for the located object, and determining an initial pose of the located object based on the first marker;

adding a second marker on a travelling path of the located object; and

in response to the located object passing the second marker, updating a current pose of the located object based on the second marker;

wherein, when the first marker comprises the pose information, and the determining the initial pose of the located object based on the first marker comprises:

directly determining initial pose information of the located object by performing a coordinate transformation on the pose information carried in the first marker based on a relative pose between the first marker and the located object;

when the first marker comprises the identification information, and the determining the initial pose of the located object based on the first marker comprises:

when the located object starts from the first marker, recording the identification information carried in the first marker, and locating and making a map by using the identification information as a coordinate origin;

when the located object repeatedly passes the first marker for multiple times, obtaining the pose information of the located object by using the identification information carried in the first marker to perform matching, recording a plurality of pieces of pose information and errors of the located object, and transforming the plurality of pieces of pose information and errors of the located object into a plurality of pieces of pose information and errors of the first marker;

fusing the plurality of pieces of pose information of the first marker via a Gaussian model to estimate optimal pose information and an error of the first marker; and

directly determining initial pose information of the located object by performing a coordinate transformation on the optimal pose information carried in the first marker based on a relative pose between the first marker and the located object.

2. The method of claim 1, wherein the located object comprises a robot that travels in simultaneous localization and mapping navigation and a mobile device that needs to dock with the docking device.

3. The method of claim 1, wherein the docking device comprises a conveyor belt or a mechanical arm.

4. The method of claim 1, wherein the second marker comprises pose information, and

the updating the current pose of the located object based on the second marker comprises:

directly determining current pose information of the located object by performing a coordinate transformation on the pose information carried in the second marker based on a relative pose between the second marker and the located object.

5. The method of claim 1, wherein the second marker comprises identification information, and

the updating the current pose of the located object based on the second marker comprises:

when the located object repeatedly passes the second marker, obtaining pose information of the located object by using the identification information carried in the second marker to perform matching, recording a plurality of pieces of pose information and errors of the located object, and transforming the plurality of pieces of pose information and errors of the located object into a plurality of pieces of pose information and errors of the second marker;

fusing the plurality of pieces of pose information of the second marker to estimate optimal pose information and an error of the second marker via a Gaussian model; and

directly determining current pose information of the located object by performing a coordinate transformation on the optimal pose information carried in the second marker based on a relative pose between the second marker and the located object.

6. The method of claim 1, wherein the second marker comprises the non- identification graphic information, and

the updating the current pose of the located object based on the second marker comprises:

determining whether a marker that the located object repeatedly passes for multiple times is the second marker by using a similarity of poses of the located object when

the located object passes a same marker;

in response to the second marker is determined, recording a plurality of pieces of pose information and errors of the located object passing the second marker, and transforming the plurality of pieces of pose information and errors of the located object into a plurality of pieces of pose information and errors of the second marker;

fusing the plurality of pieces of pose information of the second marker to estimate optimal pose information and an error of the second marker via a Gaussian model; and

directly determining current pose information of the located object by performing a coordinate transformation on the optimal pose information carried in the second marker based on a relative pose between the second marker and the located object.

7. The method of claim 1, wherein a plurality of second markers are provided.

8. The method of claim 7, wherein an auxiliary locating belt connecting two adjacent second markers is provided between the two adjacent second markers among the plurality of second markers for correcting an angular deviation of the located object relative to the auxiliary locating belt as the located object passes the auxiliary locating belt, such that the located object travels along the auxiliary locating belt.

9. A marker-combined simultaneous localization and mapping navigation system, comprising:

a located object, configured to locate and build a map in real time in a scene;

a first marker, comprising pose information or identification information;

a second marker; and

a simultaneous localization and mapping device, comprising:

an initialization area setting unit, configured to provide an initialization area for a located object;

a first marker adding unit, configured to add the first marker in the initialization area for the located object provided by the initialization area setting unit;

a located object starting unit, configured to enable the located object start from the initialization area for the located object provided by the initialization area setting unit, and determine an initial pose of the located object based on the first marker added by the first marker adding unit;

a second marker adding unit, configured to add the second marker on a travelling path of the located object; and

a pose updating unit, configured to update a current pose of the located object based on the marker when the located object passes the second marker on the travelling path;

wherein, when the first marker comprises the pose information, and the located object starting unit is further configured to:

directly determine initial pose information of the located object by performing a coordinate transformation on the pose information carried in the first marker based on a relative pose between the first marker and the located object;

when the first marker comprises the identification information, and the located object starting unit is configured to:

when the located object starts from the first marker, record identification information comprised in the first marker, and locate and make a map by using the identification information as a coordinate origin;

when the located object repeatedly passes the first marker for multiple times, obtain pose information of the located object by using the identification information carried in the first marker to perform matching, record a plurality of pieces of pose information and errors of the located object, and transform the plurality of pieces of pose information and errors of the located object into a plurality of pieces of pose information and errors of the first marker;

fuse the plurality of pieces of pose information of the first marker to estimate optimal pose information and an error of the first marker via a Gaussian model; and

directly determine initial pose information of the located object by performing a coordinate transformation on the optimal pose information carried in the first marker based on a relative pose between the first marker and the located object.

10. The system of claim 9, wherein the located object comprises a robot that travels in simultaneous localization and mapping navigation and a mobile device that needs to dock with the docking device.

11. The system of claim 9, wherein the docking device comprises a conveyor belt or a mechanical arm.

12. The system of claim 9, wherein the second marker comprises the pose information, and

the pose updating unit is further configured to:

directly determine current pose information of the located object by performing a coordinate transformation on the pose information carried in the second marker based

on a relative pose between the second marker and the located object.

13. The system of claim 9, wherein the second marker comprises the identification information, and

the pose updating unit is further configured to:

when the located object repeatedly passes the second marker for multiple times, obtain pose information of the located object by using the identification information carried in the second marker to perform matching, record a plurality of pieces of pose information and errors of the located object, and transform the plurality of pieces of pose information and errors of the located object into a plurality of pieces of pose information and errors of the second marker;

fuse the plurality of pieces of pose information of the second marker to estimate optimal pose information and an error of the second marker via a Gaussian model; and

directly determine current pose information of the located object by performing a coordinate transformation on the optimal pose information carried in the second marker based on a relative pose between the second marker and the located object.

14. The system of claim 9, wherein the marker provided on the travelling path of the located object is a second marker, wherein the second marker comprises the non-identification graphic information, and

wherein the pose updating unit is further configured to:

determine whether a marker that the located object repeatedly passes for multiple times is the second marker by using a similarity of poses of the located object when the located object passes a same marker;

in response to the second marker is determined, record a plurality of pieces of pose information and errors of the located object passing the second marker, and transform the plurality of pieces of pose information and errors of the located object into a plurality of pieces of pose information and errors of the second marker;

fuse the plurality of pieces of pose information of the second marker to estimate optimal pose information and an error of the second marker via a Gaussian model; and

directly determine current pose information of the located object by performing a coordinate transformation on the optimal pose information carried in the second marker based on a relative pose between the second marker and the located object.

15. The system of claim 9, wherein a plurality of second markers are provided.

16. The system of claim 15, wherein an auxiliary locating belt is provided between two

adjacent second markers among the plurality of second markers, and

wherein the simultaneous localization and mapping device further comprises:

an auxiliary locating unit, configured to correct an angular deviation of the located object relative to the auxiliary locating belt as the located object passes the auxiliary locating belt such that the located object travels along the auxiliary locating belt.