

CLAIMS

1. A method for determining an orientation of a target object, comprising:

acquiring a visible surface of a target object in an image;

acquiring position information of multiple points in the visible surface in a horizontal plane of a three-dimensional (3D) space; and

determining an orientation of the target object based on the position information.

2. The method of claim 1, wherein the target object comprises a vehicle, and the target object comprises at least one of following surfaces:

a vehicle front-side surface comprising a front side of a vehicle roof, a front side of a vehicle headlight and a front side of a vehicle chassis;

a vehicle rear-side surface comprising a rear side of the vehicle roof, a rear side of a vehicle tail light and a rear side of the vehicle chassis;

a vehicle left-side surface comprising a left side of the vehicle roof, left-side surfaces of the vehicle headlight and the vehicle tail light, a left side of the vehicle chassis and vehicle left-side tires; and

a vehicle right-side surface comprising a right side of the vehicle roof, right-side surfaces of the vehicle headlight and the vehicle tail light, a right side of the vehicle chassis and vehicle right-side tires.

3. The method of claim 1, wherein the image comprises:

a video frame in a video shot by a photographic device arranged on a movable object;

or

a video frame in a video shot by a photographic device arranged at a fixed position.

4. The method of any one of claims 1-3, wherein acquiring the visible surface of the target object in the image comprises:

performing image segmentation on the image; and

obtaining the visible surface of the target object in the image based on an image segmentation result.

5. The method of claim 1, wherein acquiring the position information of the multiple points in the visible surface in the horizontal plane of the 3D space comprises:

when the number of the visible surface is multiple, selecting one visible surface from multiple visible surfaces as a surface to be processed; and

acquiring position information of multiple points in the surface to be processed in the horizontal plane of the 3D space.

6. The method of claim 5, wherein selecting one visible surface from the multiple visible surfaces as the surface to be processed comprises:

randomly selecting one visible surface from the multiple visible surfaces as the surface to be processed; or

selecting one visible surface from the multiple visible surfaces as the surface to be processed based on sizes of the multiple visible surfaces; or

selecting one visible surface from the multiple visible surfaces as the surface to be processed based on sizes of effective regions of the multiple visible surfaces,

wherein the effective region of the visible surface comprises a complete region of the visible surface or a partial region of the visible surface;

wherein an effective region of the vehicle left/right-side surface comprises the complete region of the visible surface; and

an effective region of the vehicle front/rear-side surface comprises the partial region of the visible surface.

7. The method of claim 6, wherein selecting one visible surface from the multiple visible surfaces as the surface to be processed based on the sizes of the effective regions of the multiple visible surfaces comprises:

determining each position box respectively corresponding to each visible surface and configured to select an effective region based on position information of a point in each visible surface in the image;

determining an intersection region of each visible surface and each position box as an effective region of each visible surface; and

determining a visible surface with a largest effective region from the multiple visible surfaces as the surface to be processed.

8. The method of claim 7, wherein determining each position box respectively corresponding to each visible surface and configured to select an effective region based on the position information of the point in each visible surface in the image comprises:

determining a vertex position of a position box configured to select an effective region and a width and height of a visible surface based on position information of a point in the visible surface in the image; and

determining the position box corresponding to the visible surface based on the vertex position, a part of the width and a part of the height of the visible surface.

9. The method of claim 8, wherein the vertex position of the position box comprises a position

obtained based on a minimum x coordinate and a minimum y coordinate in position information of multiple points in the visible surface in the image.

10. The method of claim 5, wherein acquiring the position information of the multiple points in the surface to be processed in the horizontal plane of the 3D space comprises:

selecting multiple points from an effective region of the surface to be processed; and

acquiring position information of the multiple points in the horizontal plane of the 3D space.

11. The method of claim 10, wherein selecting the multiple points from the effective region of the surface to be processed comprises:

selecting the multiple points from a points selection region of the effective region of the surface to be processed, the points selection region comprising a region at a distance meeting a predetermined distance requirement from an edge of the effective region.

12. The method of claim 5, wherein determining the orientation of the target object based on the position information comprises:

performing straight line fitting based on the position information of the multiple points in the surface to be processed in the horizontal plane of the 3D space; and

determining the orientation of the target object based on a slope of a straight line obtained by fitting.

13. The method of claim 1, wherein

acquiring the position information of the multiple points in the visible surface in the horizontal plane of the 3D space comprises:

when the number of the visible surface is multiple, acquiring position information of multiple points in the multiple visible surfaces in the horizontal plane of the 3D space respectively; and

determining the orientation of the target object based on the position information comprises:

performing straight line fitting based on the position information of the multiple points in the multiple visible surfaces in the horizontal plane of the 3D space respectively, and

determining the orientation of the target object based on slopes of multiple straight lines obtained by fitting.

14. The method of claim 13, wherein determining the orientation of the target object based on the slopes of the multiple straight lines obtained by fitting comprises:

determining the orientation of the target object based on the slope of one straight line in the multiple straight lines; or

determining multiple orientations of the target object based on the slopes of the multiple straight lines, and determining a final orientation of the target object based on the multiple orientations and a balance factor of the multiple orientations.

15. The method of any one of claims 5-14, wherein acquiring the position information of the multiple points in the horizontal plane of the 3D space comprises:

acquiring depth information of the multiple points; and

obtaining position information of the multiple points on a horizontal coordinate axis in the horizontal plane of the 3D space based on the depth information and coordinates of the multiple points in the image.

16. The method of claim 15, wherein the depth information of the multiple points is acquired

in any one of following manners:

inputting the image to a first neural network, performing depth processing through the first neural network, and obtaining the depth information of the multiple points based on an output of the first neural network;

inputting the image to a second neural network, performing parallax processing through the second neural network, and obtaining the depth information of the multiple points based on a parallax output by the second neural network;

obtaining the depth information of the multiple points based on a depth image shot by a depth photographic device; and

obtaining the depth information of the multiple points based on point cloud data obtained by a Lidar device.

17. A method for controlling intelligent driving, comprising:

acquiring a video stream of a road where a vehicle is through a photographic device arranged on the vehicle;

acquiring a visible surface of a target object in an image;

acquiring position information of multiple points in the visible surface in a horizontal plane of a three-dimensional (3D) space;

determining an orientation of the target object based on the position information; and

generating and outputting a control instruction for the vehicle based on the orientation of the target object.

18. An apparatus for determining an orientation of a target object, comprising:

a first acquisition module, configured to acquire a visible surface of a target object in an image;

a second acquisition module, configured to acquire position information of multiple points in the visible surface in a horizontal plane of a Three-Dimensional (3D) space; and

a determination module, configured to determine an orientation of the target object based on the position information.

19. An apparatus for controlling intelligent driving, comprising:

a third acquisition module, configured to acquire a video stream of a road where a vehicle is through a photographic device arranged on the vehicle;

the apparatus of claim 18, configured to perform processing of determining an orientation of a target object on at least one video frame in the video stream to obtain the orientation of the target object; and

a control module, configured to generate and output a control instruction for the vehicle based on the orientation of the target object.

20. A computer-readable storage medium, in which a computer program is stored that, when executed by a processor, implements the methods of any one of claims 1-17.