

## CLAIMS

1. A three-dimensional (3D) object detection method, comprising:  
obtaining two-dimensional (2D) coordinates of at least one key point of a target object in an image to be processed;  
constructing a pseudo 3D detection body of the target object according to the 2D coordinates of the at least one key point;  
obtaining depth information of the at least one key point; and  
determining a 3D detection body of the target object according to the depth information of the at least one key point and the pseudo 3D detection body.

2. The method of claim 1, wherein the image to be processed comprises: a video frame of a video captured by a shooting device arranged on a moving body, or a video frame of a video captured by a shooting device arranged at a fixed position,

wherein the target object comprises one or more of: a motor vehicle, a non-motor vehicle, a pedestrian, an animal, a building, a plant, an obstacle, a dangerous article, a traffic sign, or an article.

3. The method of any one of claims 1 to 2, wherein constructing the pseudo 3D detection body of the target object according to the 2D coordinates of the at least one key point comprises:

constructing at least one possible plane of the target object according to first predetermined belonging relationships between the at least one key point and planes included by the target object and according to the 2D coordinates of the at least one key point; and

constructing the pseudo 3D detection body of the target object according to the at least one possible plane.

4. The method of claim 3, wherein constructing the pseudo 3D detection body of the target object according to the at least one possible plane comprises:

determining an optimal plane from among the at least one constructed possible plane according to a predetermined rule for plane quality determination;  
and

constructing the pseudo 3D detection body of the target object according to the optimal plane.

5. The method of claim 4, wherein determining the optimal plane from among the at least one constructed possible plane according to the predetermined rule for plane quality determination comprises:

determining the optimal plane and a suboptimal plane from among the at least one constructed possible plane according to the predetermined rule for plane quality determination,

wherein constructing the pseudo 3D detection body of the target object according to the optimal plane comprises:

constructing the pseudo 3D detection body of the target object according to the optimal plane and the suboptimal plane.

6. The method of any one of claims 1 to 5, wherein the at least one key point of the target object includes multiple key points,

wherein the method further comprises: before constructing the pseudo 3D detection body of the target object according to the 2D coordinates of the at least one key point,

selecting one or more key points that meet a prediction accuracy requirement from among the multiple key points; and

wherein constructing the pseudo 3D detection body of the target object according to the 2D coordinates of the at least one key point comprises:

constructing the pseudo 3D detection body of the target object according to the 2D coordinates of selected key points.

7. The method of any one of claims 1 to 6, further comprising: before obtaining the 2D coordinates of the at least one key point of the target object in the image to be processed,

performing target object detection on the image to be processed to obtain a 2D target bounding box including the target object,

wherein obtaining the 2D coordinates of the at least one key point of the target object in the image to be processed comprises:

obtaining the 2D coordinates of the at least one key point of the target object based on an image part of the image to be processed corresponding to the 2D target bounding box.

8. The method of claim 7, further comprising:

in response to that the 2D target bounding box including the target object is not successfully obtained during the target object detection, not performing 3D detection processing on the target object.

9. The method of claim 5, wherein constructing the pseudo 3D detection body of the target object according to the optimal plane and the suboptimal plane comprises:

determining a normal vector of the optimal plane; and

forming the pseudo 3D detection body according to an extension of vertices in the optimal plane along a direction of the normal vector.

10. The method of claim 9, wherein determining the normal vector of the optimal plane comprises:

determining, as the normal vector of the optimal plane, a perpendicular line that is made from a key point in the suboptimal plane to the optimal plane; or

determining a perpendicular line as the normal vector of the optimal plane, the perpendicular line being made from a key point with a greatest prediction

accuracy, among remaining ones of the key points other than one or more key points corresponding to the optimal plane, to the optimal plane; or

determining, as the normal vector of the optimal plane, a difference between coordinates of two key points on an edge that is in a plane adjacent to the optimal plane and is perpendicular to the optimal plane.

11. The method of any one of claims 1 to 10, wherein determining the 3D detection body of the target object according to the depth information of the at least one key point and the pseudo 3D detection body comprises:

converting the 2D coordinates of the at least one key point into 3D coordinates in a 3D space according to the depth information of the at least one key point;

constructing an initial 3D detection body of the target object according to the 3D coordinates of the at least one key point; and

correcting the initial 3D detection body according to the pseudo 3D detection body to form the 3D detection body of the target object.

12. The method of claim 11, wherein converting the 2D coordinates of the at least one key point into the 3D coordinates in the 3D space comprises:

converting the 2D coordinates of one or more key points that meet a prediction accuracy requirement into the 3D coordinates in the 3D space.

13. The method of claim 12, wherein constructing the initial 3D detection body of the target object according to the 3D coordinates of the at least one key point comprises:

determining an optimal plane of the target object according to planes respectively corresponding to the 3D coordinates of the one or more key points, and constructing the optimal plane of the target object in the 3D space;

determining a normal vector of the optimal plane; and

forming the initial 3D detection body according to an extension of vertices in

the optimal plane along a direction of the normal vector.

14. The method of claim 13, wherein determining the normal vector of the optimal plane comprises:

determining, as the normal vector of the optimal plane, a perpendicular line that is made from a key point in the suboptimal plane to the optimal plane; or

determining a perpendicular line as the normal vector of the optimal plane, the perpendicular line being made from a key point with a greatest prediction accuracy, among remaining ones of the key points other than one or more key points corresponding to the optimal plane, to the optimal plane; or

determining, as the normal vector of the optimal plane, a difference between coordinates of two key points on an edge that is in a plane adjacent to the optimal plane and is perpendicular to the optimal plane.

15. The method of any one of claims 11 to 14, wherein correcting the initial 3D detection body according to the pseudo 3D detection body to form the 3D detection body of the target object comprises:

adjusting the initial 3D detection body in the 3D space according to the pseudo 3D detection body in a 2D plane to increase an overlap area between a region of the adjusted 3D detection body projected on the 2D plane and the pseudo 3D detection body.

16. The method of claim 15, wherein correcting the initial 3D detection body according to the pseudo 3D detection body to form the 3D detection body of the target object further comprises one or more of:

correcting the initial 3D detection body according to a preset length-to-width-to-height ratio of the target object; or

correcting the initial 3D detection body according to a bounding box of the target object in the image to be processed, so that the region of the adjusted 3D detection body projected on the 2D plane is included in the bounding box.

17. The method of any one of claims 1 to 16, further comprising:

performing smoothing processing on the 3D detection bodies of a same target object in a plurality of images to be processed that are temporally correlated.

18. The method of claim 17, wherein the smoothing processing comprises one or more of: smoothing processing on a length, a width and a height of the 3D detection body, smoothing processing on a motion direction of the 3D detection body, smoothing processing on a central point of a bird's eye view of the 3D detection body, or smoothing processing on vertices of the 3D detection body.

19. An electronic device comprising:

a memory configured to store a computer program; and

a processor configured to execute the computer program stored in the memory, wherein when the computer program is executed, the processor is caused to implement the method according to any one of claims 1 to 18.

20. A computer-readable storage medium having stored thereon a computer program that, when executed by a processor, causes the method according to any one of claims 1 to 18 to be implemented.