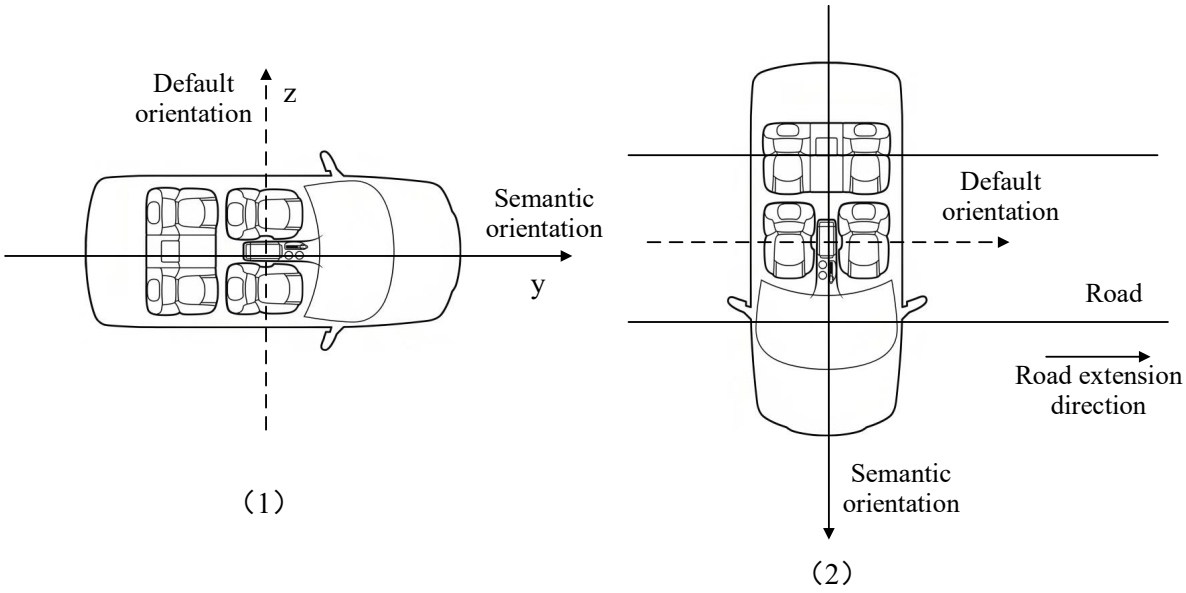
Default orientation
z
Semantic orientation
y
(1)
Default orientation
Road
Road extension direction
Semantic orientation
(2)

FIG. 1

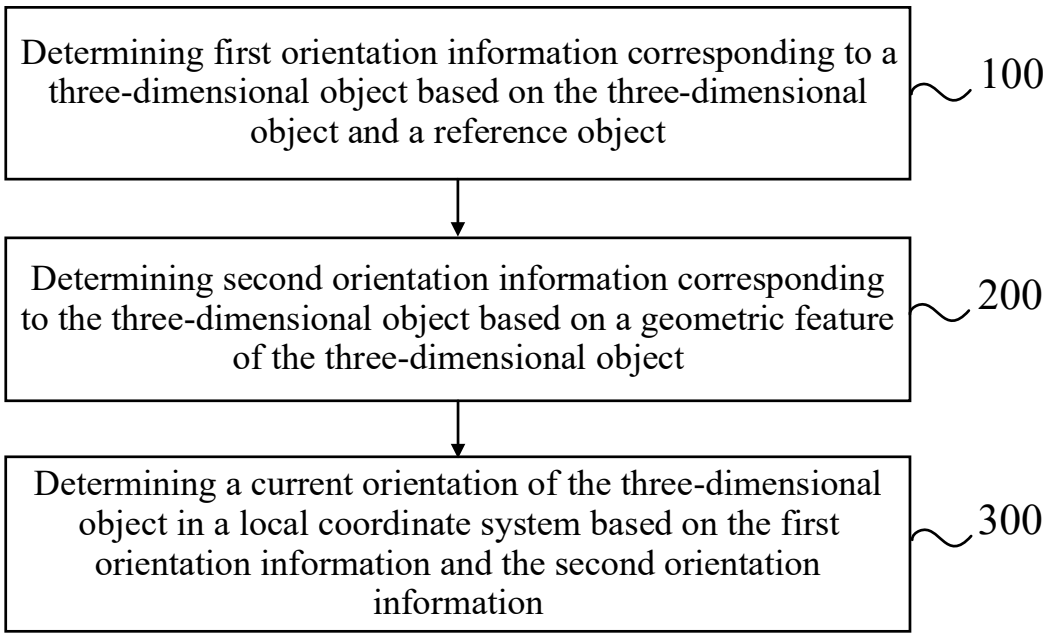
Determining first orientation information corresponding to a three-dimensional object based on the three-dimensional object and a reference object
100
Determining second orientation information corresponding to the three-dimensional object based on a geometric feature of the three-dimensional object
200
Determining a current orientation of the three-dimensional object in a local coordinate system based on the first orientation information and the second orientation information
300

FIG. 2

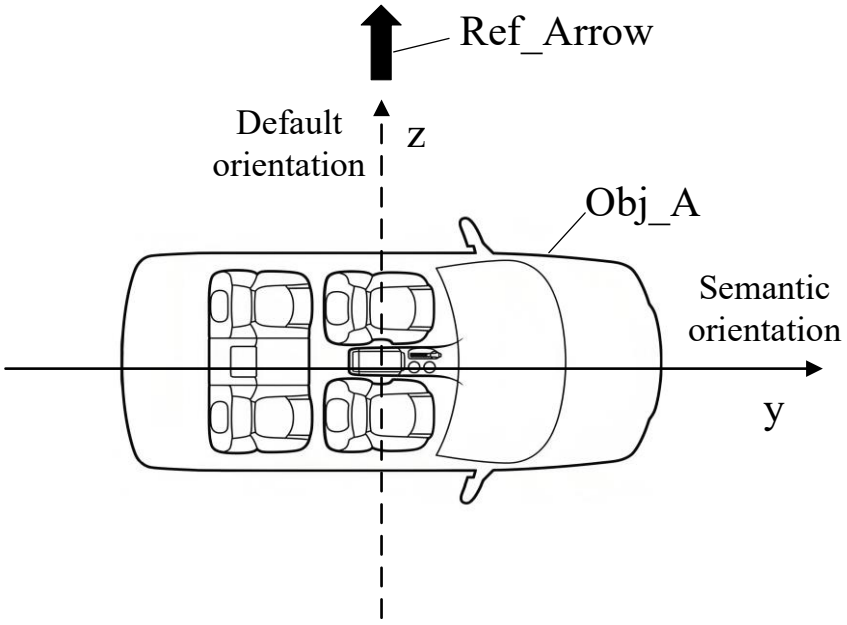
Ref_Arrow
Default orientation
z
Obj_A
Semantic orientation
y

FIG. 3

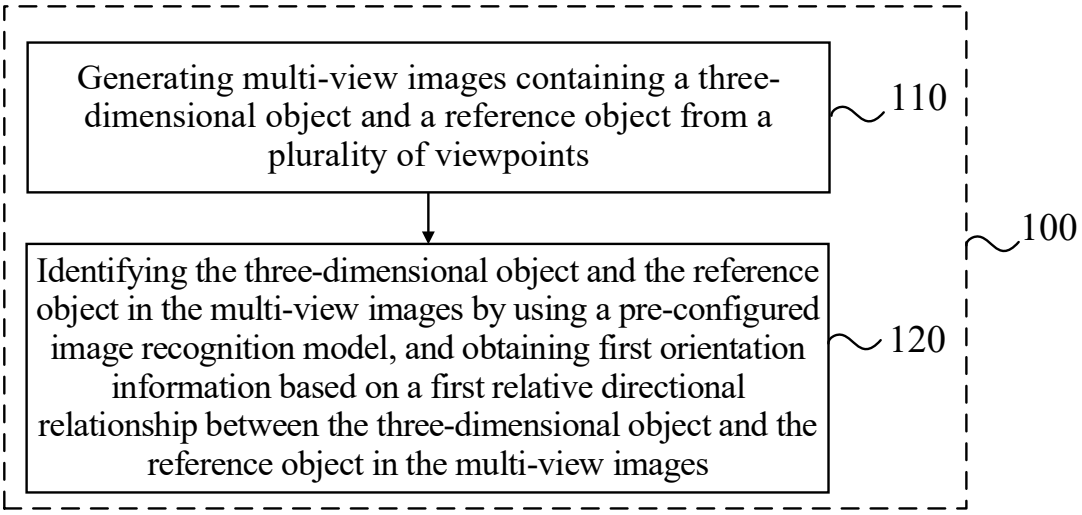
Generating multi-view images containing a three-dimensional object and a reference object from a plurality of viewpoints
110
Identifying the three-dimensional object and the reference object in the multi-view images by using a pre-configured image recognition model, and obtaining first orientation information based on a first relative directional relationship between the three-dimensional object and the reference object in the multi-view images
120
100

FIG. 4

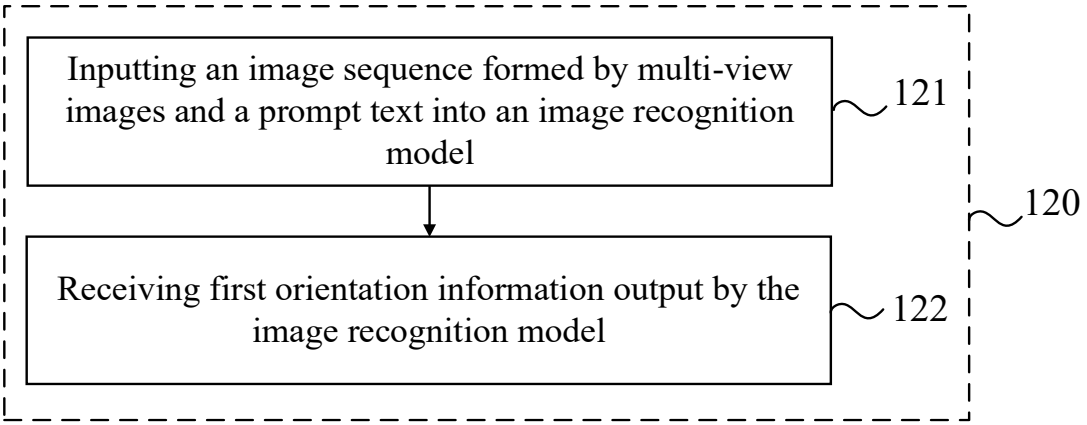
Inputting an image sequence formed by multi-view images and a prompt text into an image recognition model
121
Receiving first orientation information output by the image recognition model
122
120

FIG. 5

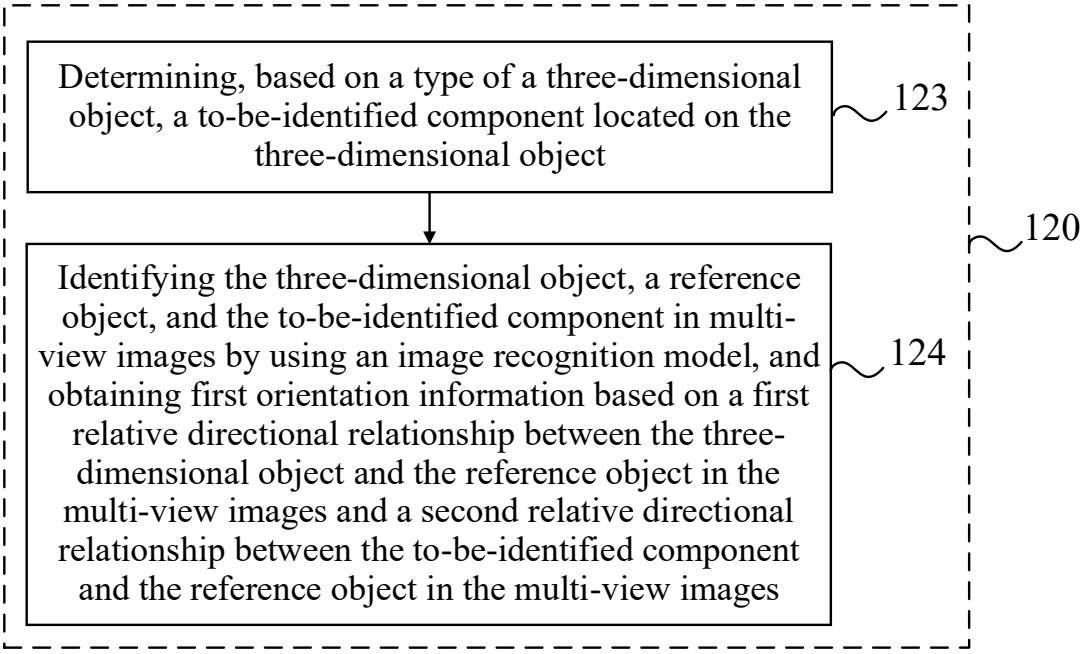
Determining, based on a type of a three-dimensional object, a to-be-identified component located on the three-dimensional object
123
Identifying the three-dimensional object, a reference object, and the to-be-identified component in multi-view images by using an image recognition model, and obtaining first orientation information based on a first relative directional relationship between the three-dimensional object and the reference object in the multi-view images and a second relative directional relationship between the to-be-identified component and the reference object in the multi-view images
124
120

FIG. 6

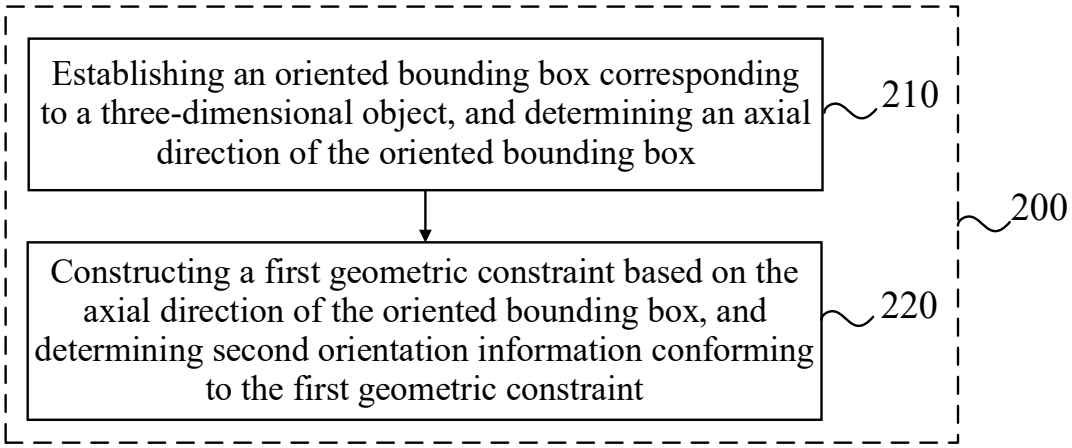
Establishing an oriented bounding box corresponding to a three-dimensional object, and determining an axial direction of the oriented bounding box
210
Constructing a first geometric constraint based on the axial direction of the oriented bounding box, and determining second orientation information conforming to the first geometric constraint
220
200

FIG. 7

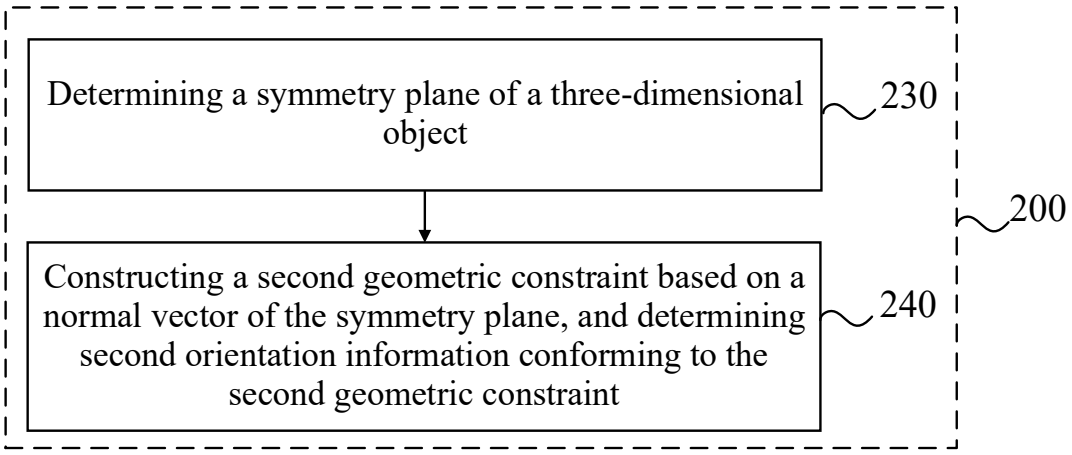
Determining a symmetry plane of a three-dimensional object
230
Constructing a second geometric constraint based on a normal vector of the symmetry plane, and determining second orientation information conforming to the second geometric constraint
240
200

FIG. 8

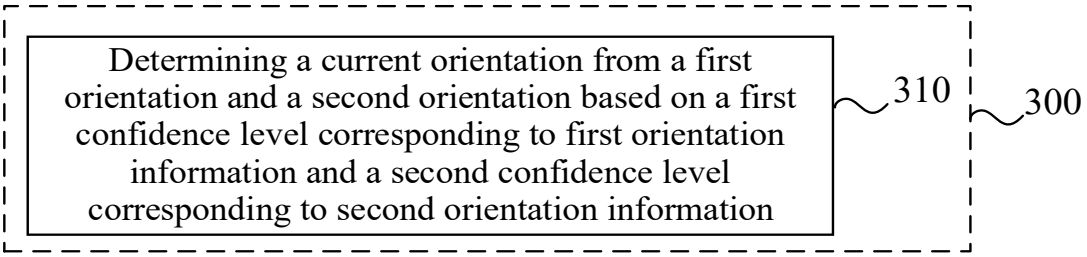

FIG. 9

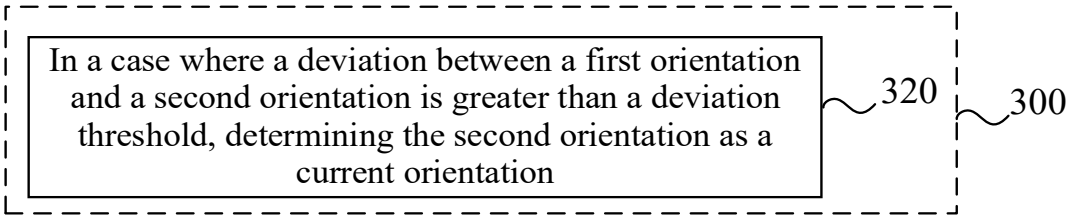

FIG. 10

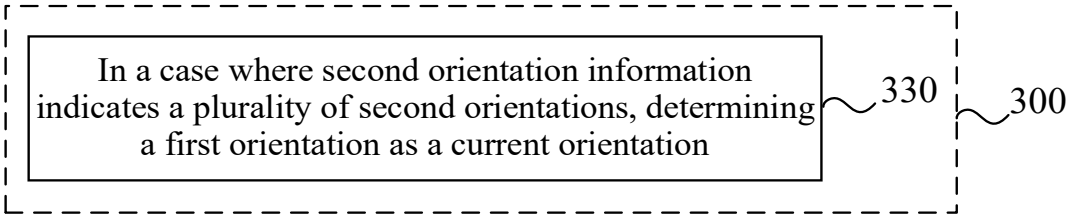

FIG. 11

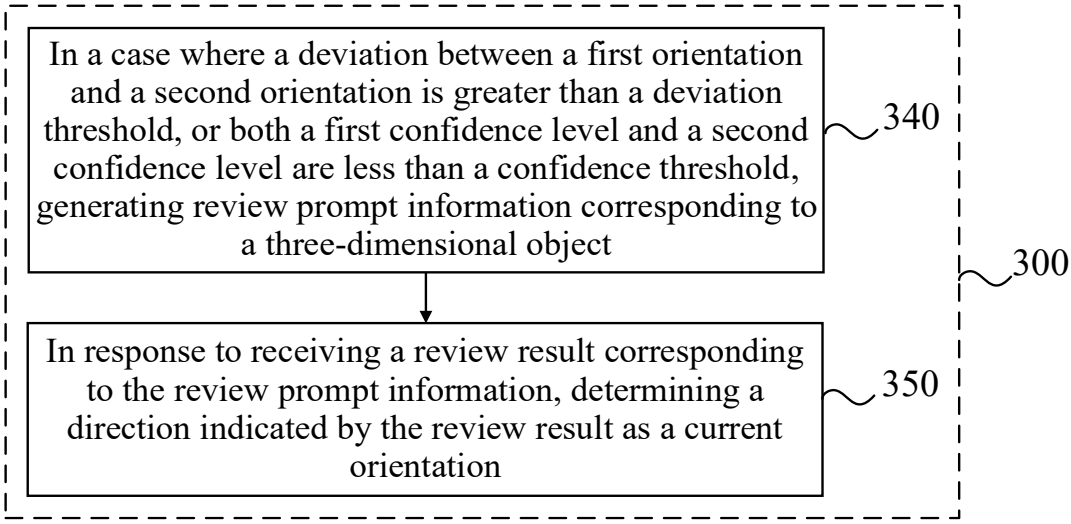

FIG. 12

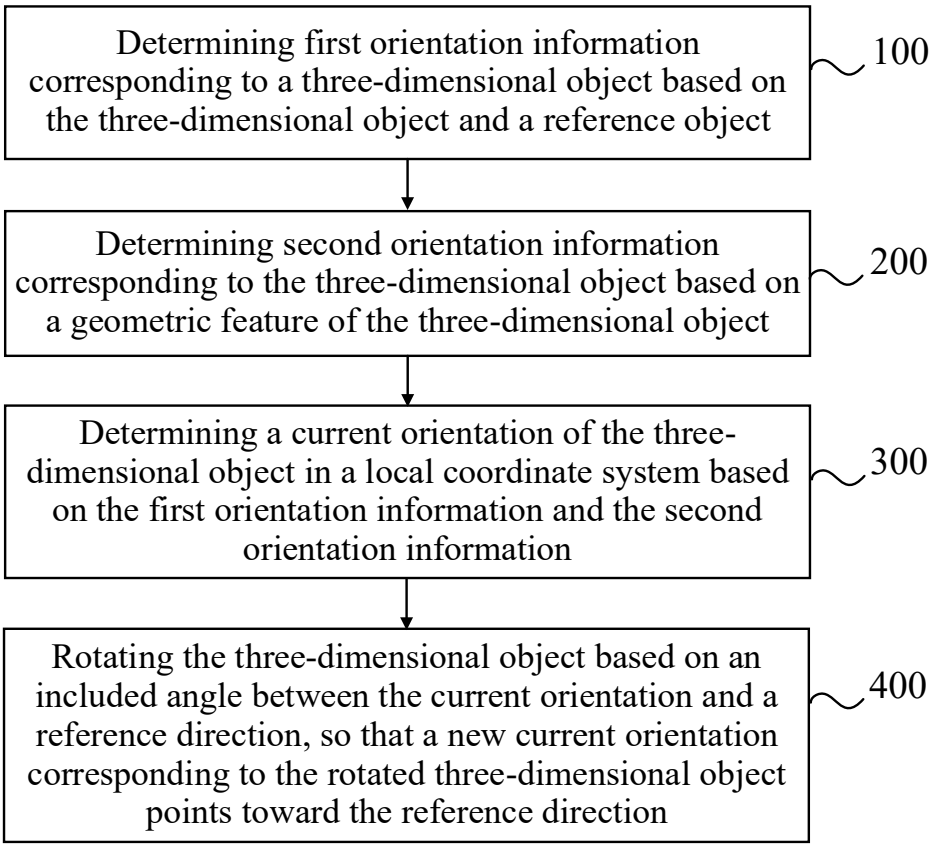
Determining first orientation information corresponding to a three-dimensional object based on the three-dimensional object and a reference object
100
Determining second orientation information corresponding to the three-dimensional object based on a geometric feature of the three-dimensional object
200
Determining a current orientation of the three-dimensional object in a local coordinate system based on the first orientation information and the second orientation information
300
Rotating the three-dimensional object based on an included angle between the current orientation and a reference direction, so that a new current orientation corresponding to the rotated three-dimensional object points toward the reference direction
400

FIG. 13

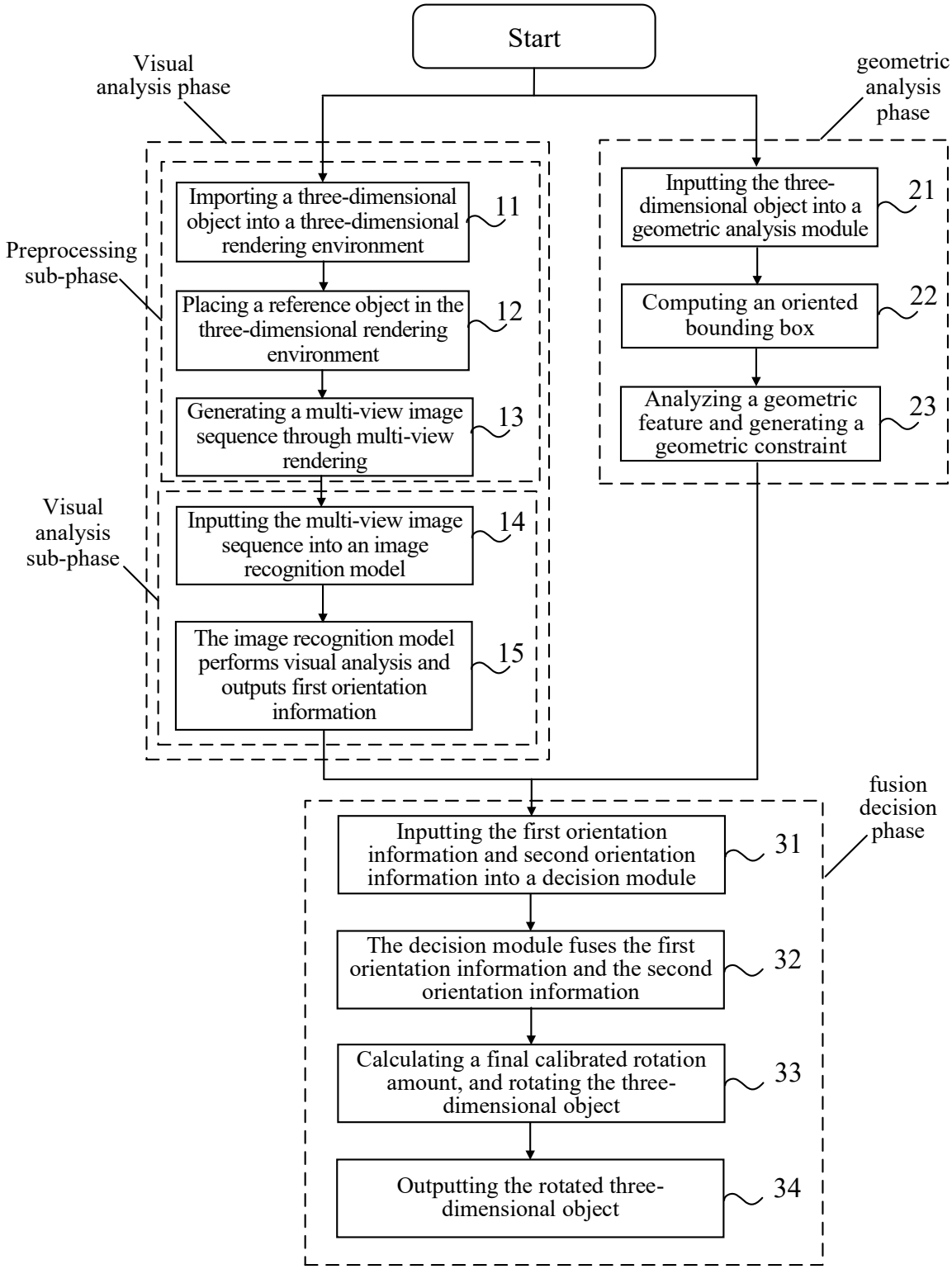
Start
Visual analysis phase
geometric analysis phase
Preprocessing sub-phase
Importing a three-dimensional object into a three-dimensional rendering environment
11
Placing a reference object in the three-dimensional rendering environment
12
Generating a multi-view image sequence through multi-view rendering
13
Visual analysis sub-phase
Inputting the multi-view image sequence into an image recognition model
14
The image recognition model performs visual analysis and outputs first orientation information
15
Inputting the three-dimensional object into a geometric analysis module
21
Computing an oriented bounding box
22
Analyzing a geometric feature and generating a geometric constraint
23
fusion decision phase
Inputting the first orientation information and second orientation information into a decision module
31
The decision module fuses the first orientation information and the second orientation information
32
Calculating a final calibrated rotation amount, and rotating the three-dimensional object
33
Outputting the rotated three-dimensional object
34

FIG. 14

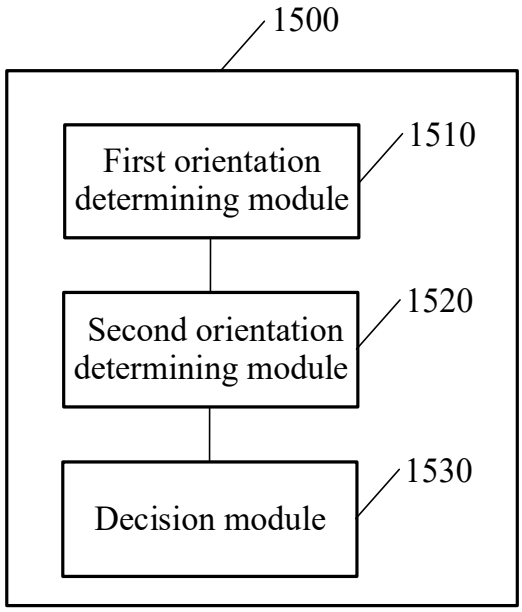
1500
First orientation determining module
1510
Second orientation determining module
1520
Decision module
1530

FIG. 15

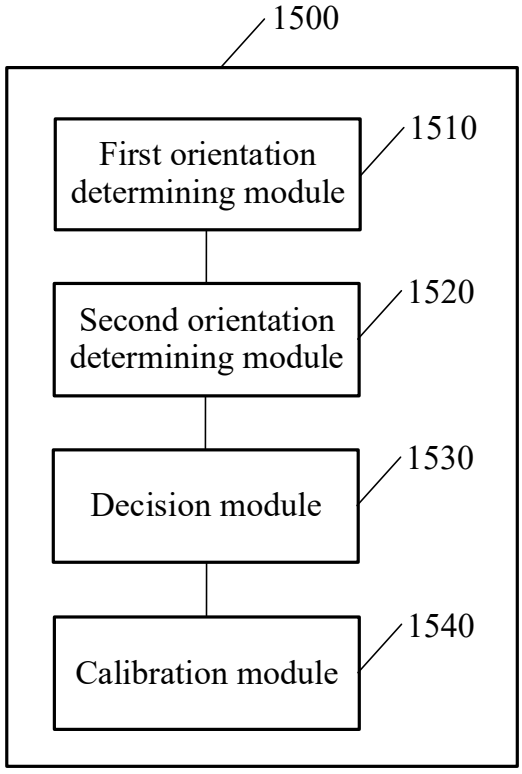
1500
First orientation determining module
1510
Second orientation determining module
1520
Decision module
1530
Calibration module
1540

FIG. 16

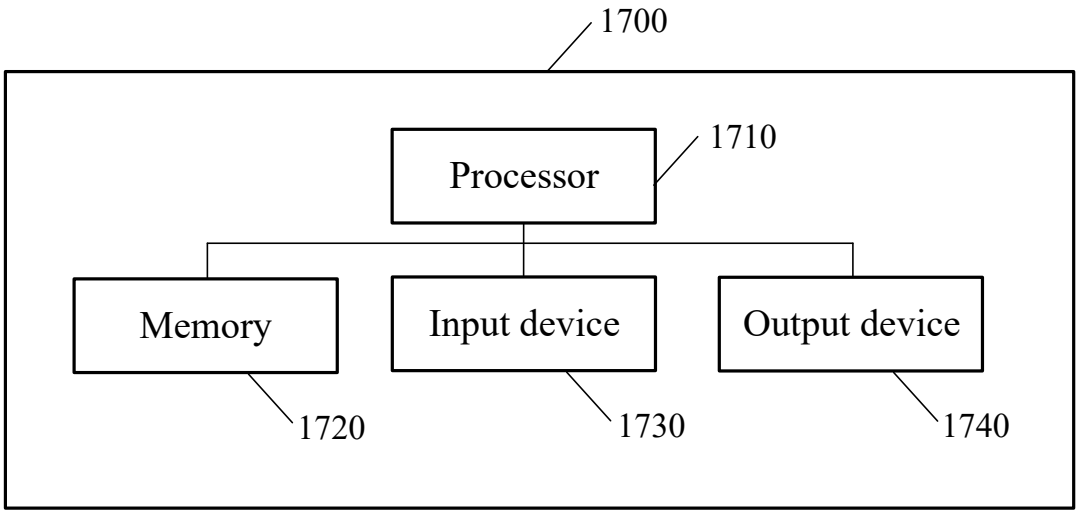
1700
Processor
1710
Memory
Input device
Output device
1720
1730
1740

FIG. 17