DRAWINGS

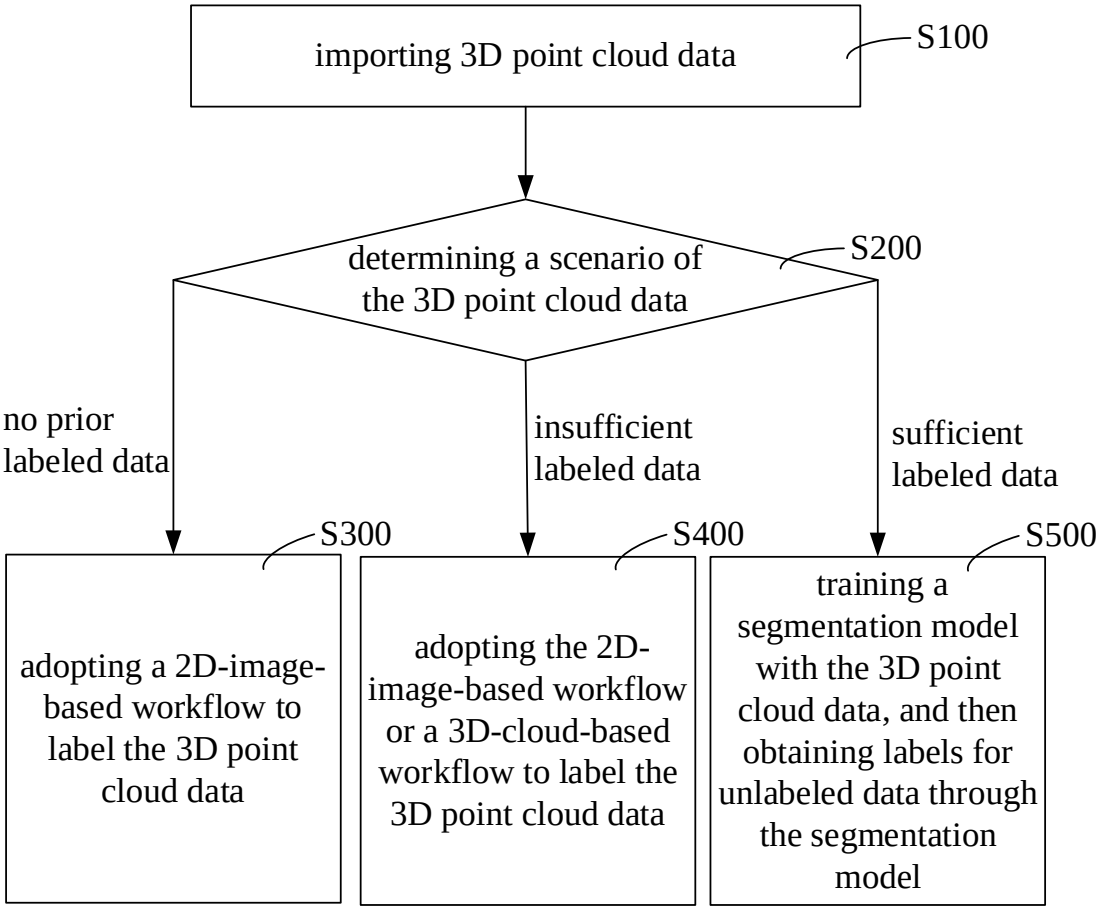


FIG. 1

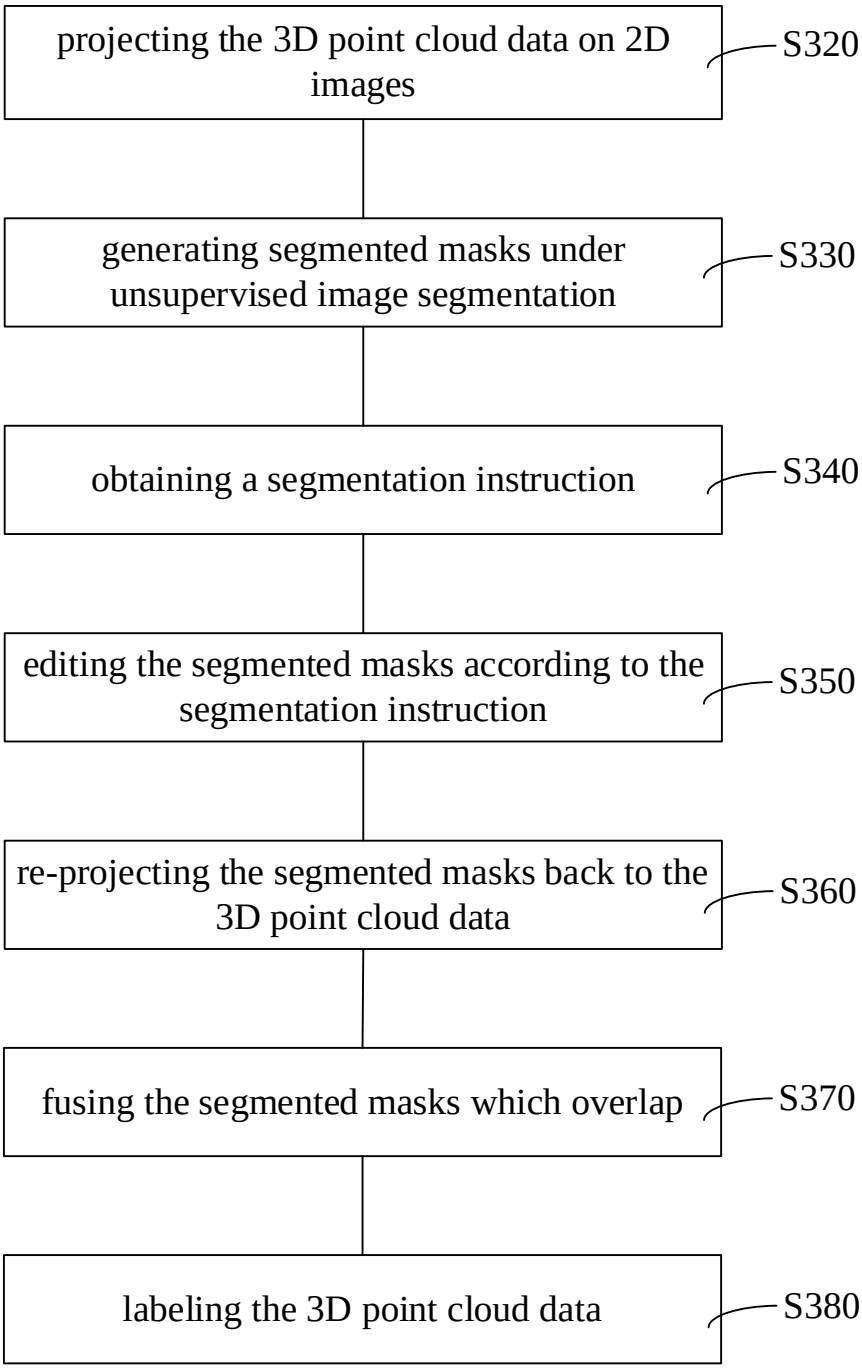

projecting the 3D point cloud data on 2D images
S320
generating segmented masks under unsupervised image segmentation
S330
obtaining a segmentation instruction
S340
editing the segmented masks according to the segmentation instruction
S350
re-projecting the segmented masks back to the 3D point cloud data
S360
fusing the segmented masks which overlap
S370
labeling the 3D point cloud data
S380

FIG. 2

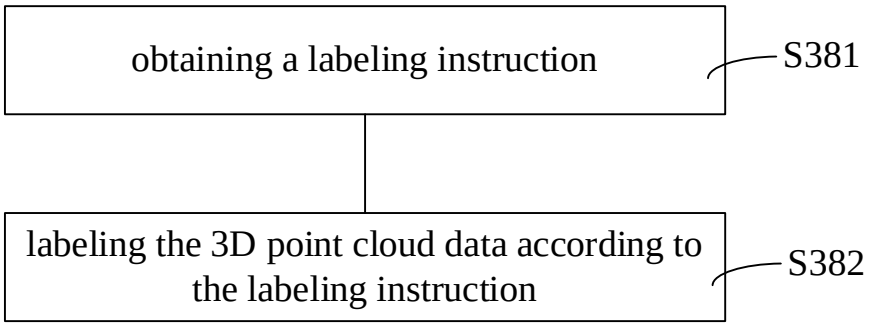

obtaining a labeling instruction
S381
labeling the 3D point cloud data according to the labeling instruction
S382

FIG. 2a

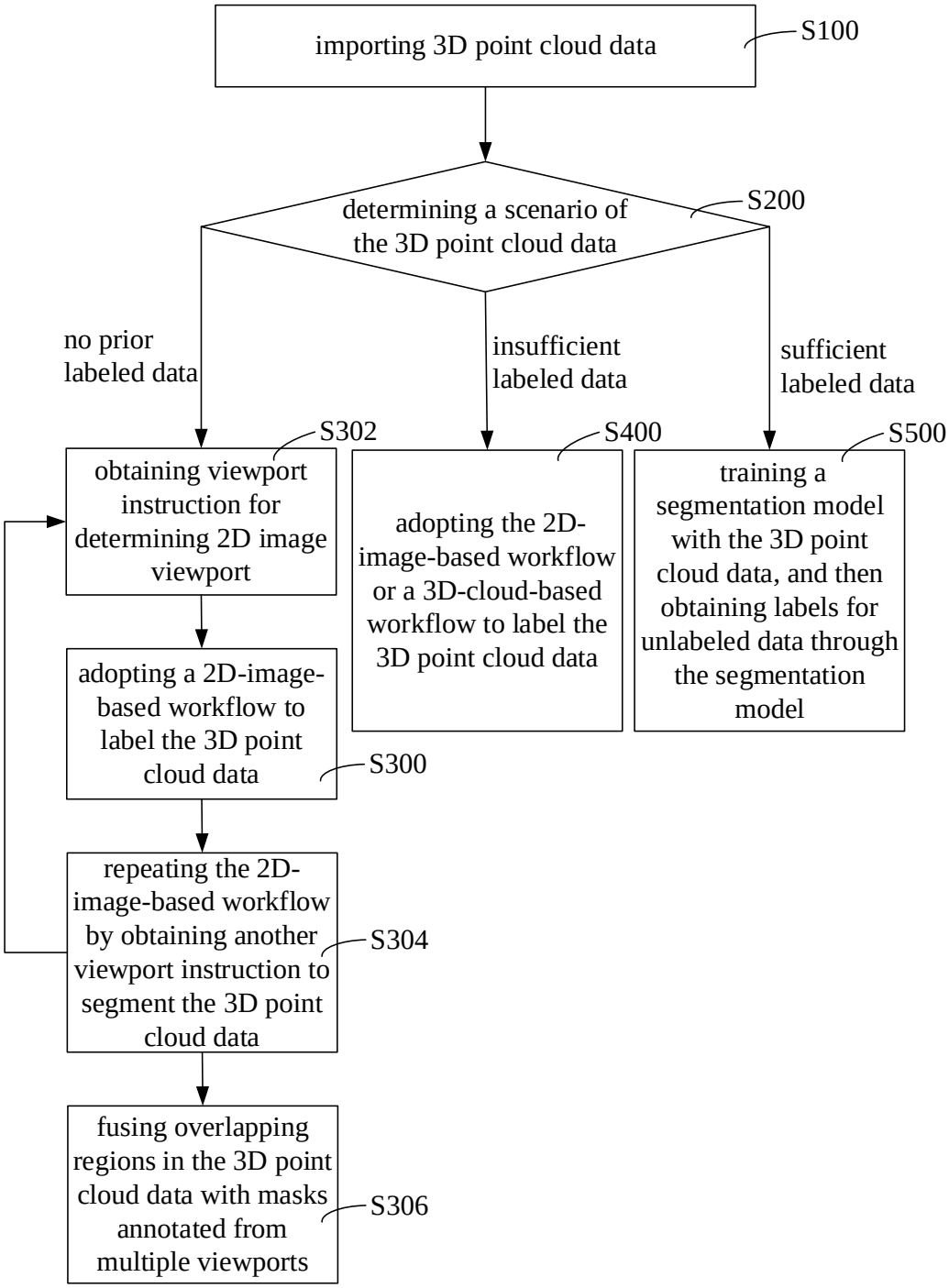

importing 3D point cloud data
S100
determining a scenario of the 3D point cloud data
S200
no prior labeled data
insufficient labeled data
sufficient labeled data
S302
S400
S500
obtaining viewport instruction for determining 2D image viewport
adopting the 2D-image-based workflow or a 3D-cloud-based workflow to label the 3D point cloud data
training a segmentation model with the 3D point cloud data, and then obtaining labels for unlabeled data through the segmentation model
adopting a 2D-image-based workflow to label the 3D point cloud data
S300
repeating the 2D-image-based workflow by obtaining another viewport instruction to segment the 3D point cloud data
S304
fusing overlapping regions in the 3D point cloud data with masks annotated from multiple viewports
S306

FIG. 3

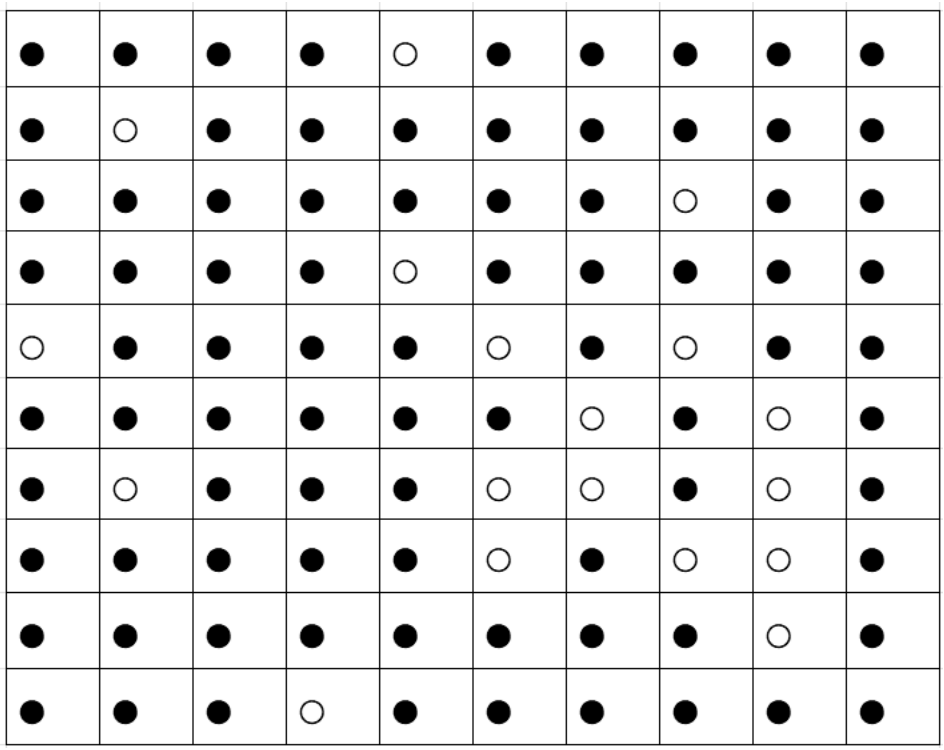


FIG. 3A

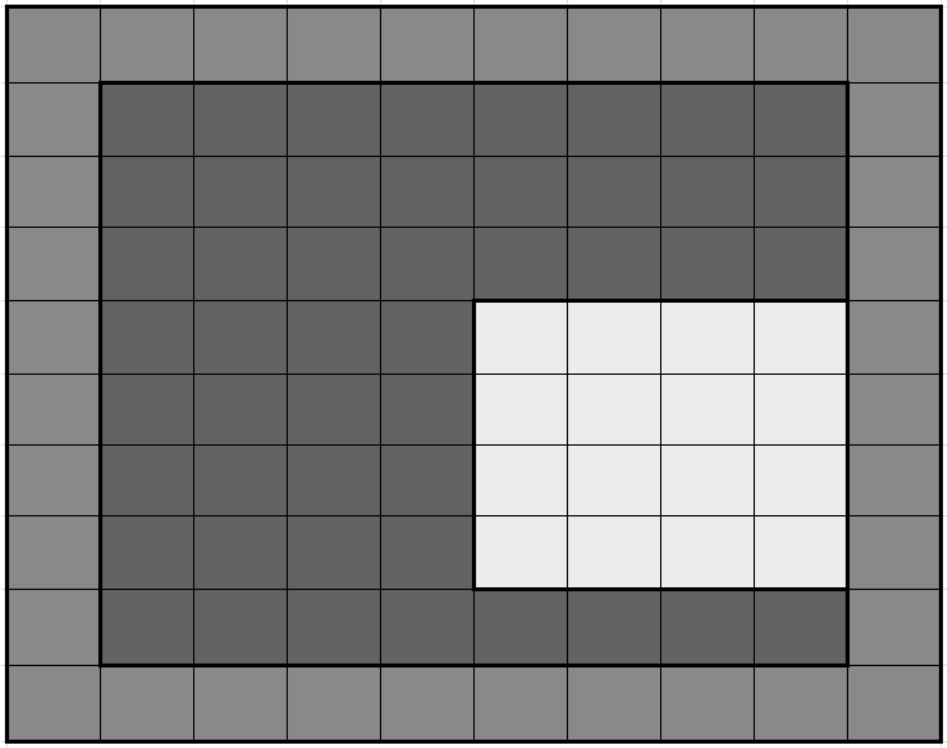


FIG. 3B

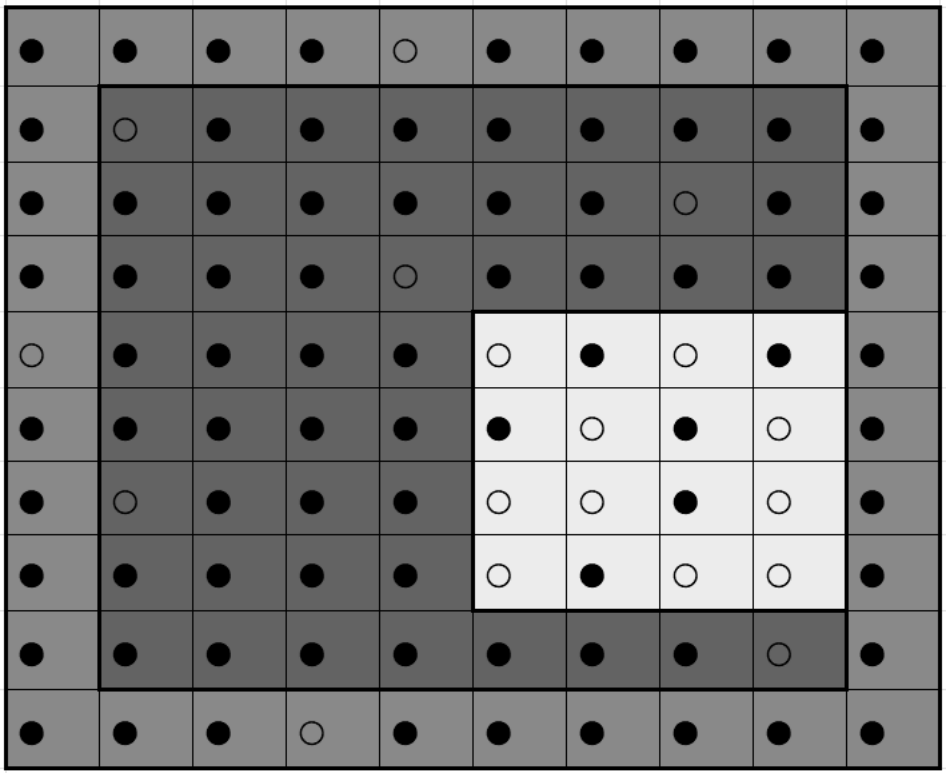


FIG. 3C

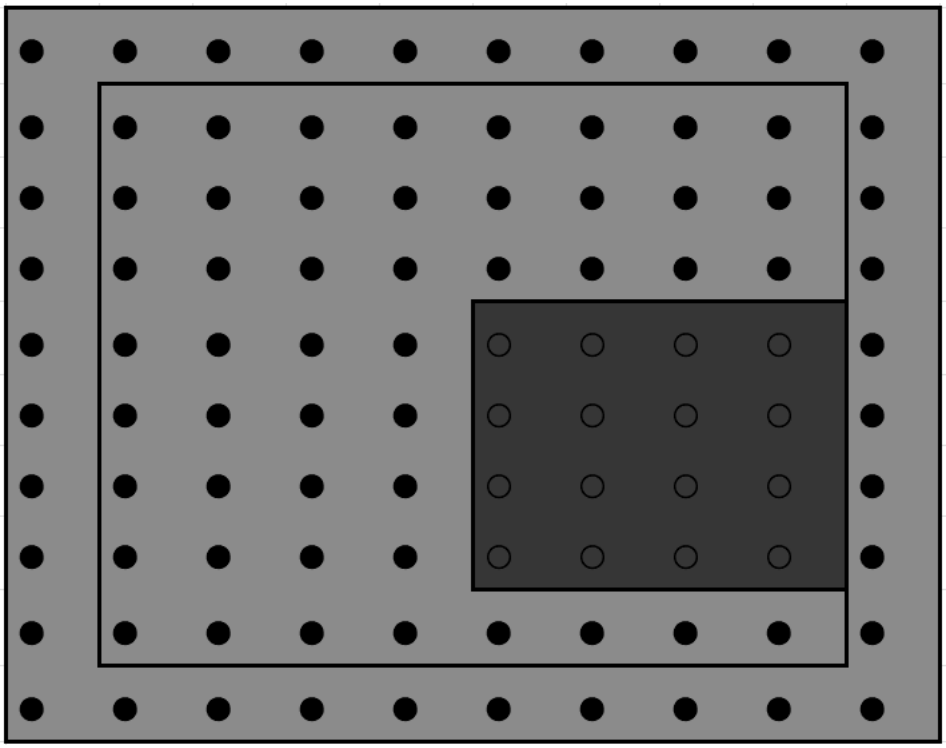


FIG. 3D

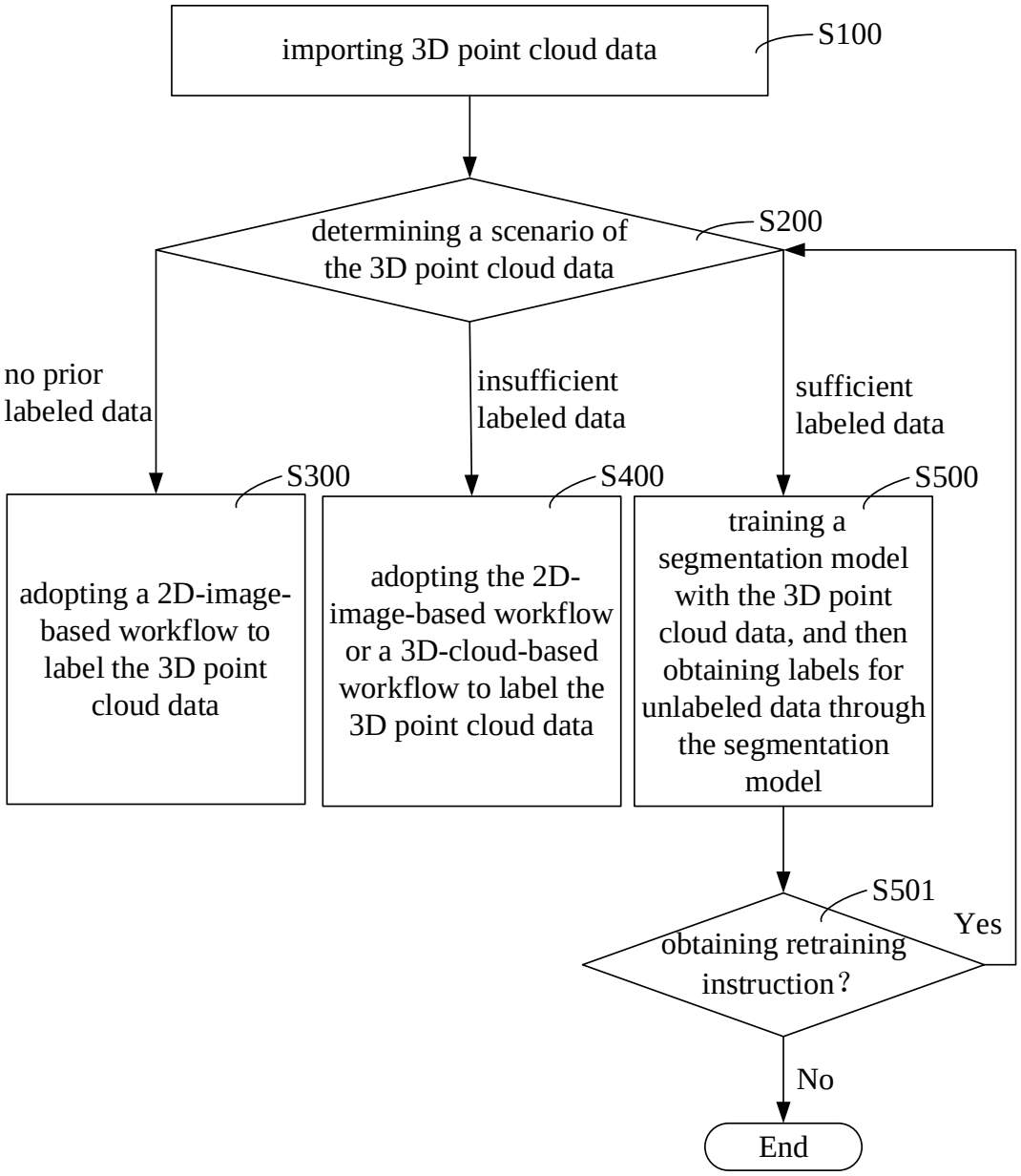

importing 3D point cloud data
S100
determining a scenario of the 3D point cloud data
S200
no prior labeled data
insufficient labeled data
sufficient labeled data
S300
S400
S500
adopting a 2D-image-based workflow to label the 3D point cloud data
adopting the 2D-image-based workflow or a 3D-cloud-based workflow to label the 3D point cloud data
training a segmentation model with the 3D point cloud data, and then obtaining labels for unlabeled data through the segmentation model
S501
obtaining retraining instruction?
Yes
No
End

FIG. 4

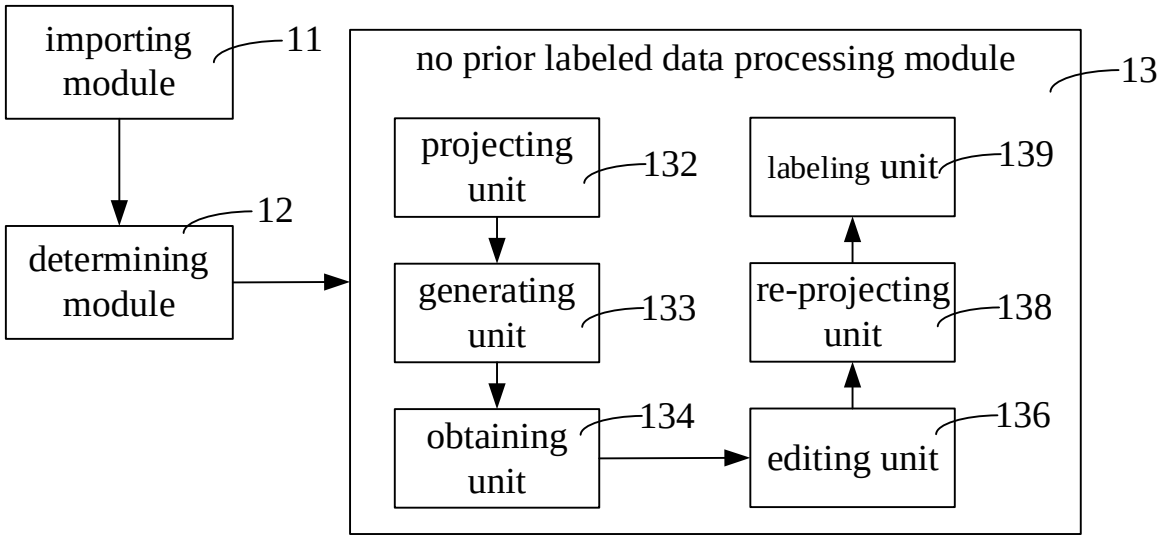

importing module
11
determining module
12
no prior labeled data processing module
13
projecting unit
132
generating unit
133
obtaining unit
134
labeling unit
139
re-projecting unit
138
editing unit
136

FIG. 5

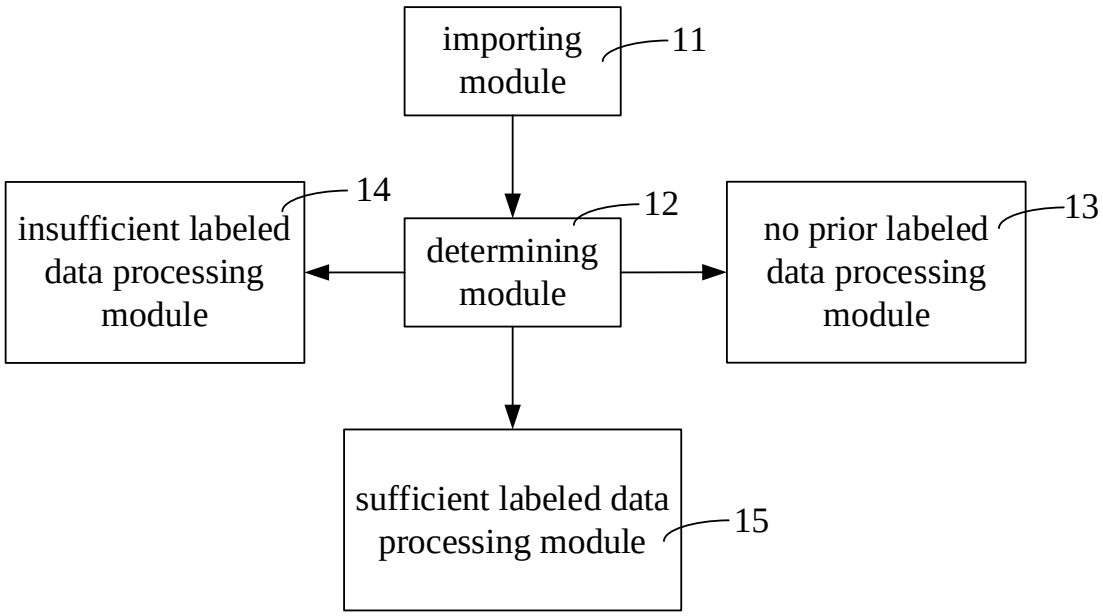

importing module
11
insufficient labeled data processing module
14
determining module
12
no prior labeled data processing module
13
sufficient labeled data processing module
15

FIG. 6