WHAT IS CLAIMED IS:

1. A detection system of a building space state, comprising:

a point cloud filtering and segmentation module, receiving LiDAR point cloud data of a building space relative to an autonomous mobile robot (AMR) for filtering, merging and segmenting the LiDAR point cloud data to obtain LiDAR point cloud features;

a building space feature analysis module connected to the point cloud filtering and segmentation module, and configured to extract the LiDAR point cloud features and analyze reference coordinates and an interior space size relative to the AMR based on the point cloud features;

an obstacle detection module connected to the building space feature analysis module and configured to detect at least one obstacle in the building space relative to the AMR based on the point cloud features extracted and analyzed through the building space feature analysis module, and obtain a speed and a direction of the at least one obstacle relative to the AMR; and

a building space state recognition module connected to the building space feature analysis module and the obstacle detection module, and configured to recognize space states of the building space based on the reference coordinates, the interior space size, and the at least one obstacle detected, wherein the point cloud data include an entrance open feature, wherein the building space feature analysis module is further configured to perform a continuous point cloud gap search to extract the entrance open feature with several gaps, wherein the entrance open feature is compared with a known entrance width to find the reference coordinates.

2. The detection system according to claim 1, wherein the building space comprises a bordered space with an entrance, and the AMR and the at least one obstacle are allowed to enter or leave the bordered space through the

entrance, wherein the point cloud data are obtained from LiDAR sensors on the AMR, the LiDAR point cloud data comprises a plurality of point clouds, and a portion of the point clouds that diffract at object edges are filtered out.

3. The detection system according to claim 2, wherein adjacent ones of the point clouds are merged into one point, wherein the plurality of point clouds are arranged in order based on an original sensor return order, and wherein the plurality of point clouds are segmented into several groups by using a clustering algorithm.

4. The detection system according to claim 2, wherein the point cloud data includes an entrance close feature.

5. The detection system according to claim 2, wherein the building space feature analysis module is further configured to perform an interior corner search based on the reference coordinates to find the interior space size of the bordered space.

6. The detection system according to claim 4, wherein the building space feature analysis module is further configured to perform a right-angle vertex search to extract the entrance close feature with a regular geometric line segments and several right-angle vertices.

7. The detection system according to claim 2, wherein the entrance close feature is compared with a known entrance width to find the reference coordinates.

8. A detection method of a building space state, comprising steps of:

(a) receiving LiDAR point cloud data of a building space relative to an autonomous mobile robot (AMR);

(b) filtering, merging and segmenting a plurality of point clouds of the LiDAR point cloud data to obtain point cloud features;

(c) extracting an entrance open feature or an entrance close feature based

on the point cloud features;

(d) obtaining reference coordinates; and

(e) recognizing space states of the building space upon the entrance open feature being determined,

wherein the step (c) further comprises steps of:

(c1) performing a continuous point cloud gap search to extract the entrance open feature with several gaps; and

(c2) performing a right-angle vertex search to extract the entrance close feature with a regular geometric line segments and several right-angle vertices,

wherein the step (d) further comprises a step of: (d1) comparing the entrance open feature or the entrance close feature with a known entrance width to find the reference coordinates.

9. The detection method according to claim 8, wherein the step (b) further comprises steps of:

(b1) filtering out a portion of the point clouds that diffract at object edges; and

(b2) merging adjacent ones of the point clouds into one point;

(b3) arranging the plurality of point clouds in order based on an original sensor return order; and

(b4) segmenting the plurality of point clouds into several groups by using a clustering algorithm.

10. The detection method according to claim 8, wherein the building space includes a bordered space with an entrance, and the AMR is allowed to enter or leave the bordered space through the entrance, wherein the step (e) further comprises steps of:

(e1) performing an interior corner search based on the reference

coordinates to find four internal corners of the bordered space upon the entrance open feature being determined; and

(e2) calculating an interior space size according to the four internal corners.

11. The detection method according to claim 10, wherein the plurality of point clouds are divided into a first portion of the bordered space area and a second portion of an entrance area, and the step (e) comprises a step of (e3) determining an available space state of the bordered space area and the entrance area.

12. The detection method according to claim 11, wherein the AMR is configured to decide whether to move into the bordered space according to the available space state.

13. The detection method according to claim 10, further comprising a step of (f) determining a number of obstacles in the entrance area and the bordered space area.

14. The detection method according to claim 13, wherein the step of (f) further comprises steps of:

(f1) calculating a direction and a speed of each one of the obstacles;

(f2) using the space state of the entrance area to estimate an entrance state; and

(f3) using obstacle information to determine whether the entrance area is blocked by the obstacles.