CLAIMS

1. A method of navigating a robot in a designated environment, comprising:
   (i) selectively identifying reference features including a plurality of nodes from a scale plan of the designated environment;
   (ii) generating a topometric map of the designated environment, the topometric map being associated with the identified reference features, wherein the topometric map comprises a plurality of local regions;
   (iii) generating a potential navigation path comprising an initial navigation path for each of the plurality of local regions from the topometric map, the potential navigation path further comprises a logical path of the plurality of nodes;
   (iv) as the robot navigates along the potential navigation path from one node to another, detecting on-site reference features of each local region that correspond to the identified reference features of the scale plan;
   (v) updating the topometric map based on the correspondence to generate a regional path plan to guide the robot's direction in each local region;
   (vi) identifying one or more structure nodes from the plurality of nodes, wherein each structure node has a structural feature that is matched between the selectively identified reference features and the detected on-site reference features; and
   (vii) relocating the robot based on information of the one or more structure nodes, if the robot does not reach a next node based on the logical path within a time constraint.

2. The method according to claim 1, further comprises controlling the robot to travel to the next node based on the logical path, after relocating the robot based on the information of the one or more structure nodes.

3. The method according to claim 1 or 2, wherein the reference features comprise a plurality of free spaces identified from the scale plan that are potentially available for the robot to traverse in the designated environment.

4. The method according to claim 3, wherein generating the topometric map of the designated environment comprises generating a topological map by using the plurality of identified free spaces to find a path between any neighbouring two of the plurality of local regions.

5. The method according to claim 4, wherein generating the topometric map further comprises generating the potential navigation path by associating the topological map to the identified reference features.

6. The method according to claim 5, further comprising, at the path between neighbouring two regions of the plurality of local regions, navigating the robot is based on the generated topological map or the generated potential navigation path.

7. The method according to any preceding claim, wherein the designated environment is an indoor environment of a building and the scale plan is a floor plan of the building.

8. The method according to claim 7, wherein the reference features comprise a plurality of junctions identified from the floor plan, and the method further comprises segmenting the floor plan into a plurality of regions based on the plurality of identified junctions.

9. The method according to claim 8, wherein the reference features further comprise categories of the plurality of segmented regions, and the method further comprises determining the categories of the plurality of segmented regions by identifying a plurality of structures of the building from the floor plan.

10. The method according to any of claims 7 to 9, wherein the reference features comprise locations and directions of a plurality of doors identified from the floor plan.

11. A system for navigating a robot in a designated environment, comprising:
i. a sensor module, configured to detect on-site reference features; and

ii. a processor, configured to:

a) selectively identify reference features including a plurality of nodes from a scale plan of the designated environment;

b) generate a topometric map of the designated environment, the topometric map being associated with the identified reference features, wherein the topometric map comprises a plurality of local regions;

c) generate a potential navigation path comprising an initial navigation path for each of the plurality of local regions from the topometric map, the potential navigation path further comprises a logical path of the plurality of nodes;

d) receive on-site reference features of each local region that correspond to the identified reference features of the scale plan from the sensor module as the robot navigates along the potential navigation path from one node to another;

e) update the topometric map based on the correspondence to generate a regional path plan to guide the robot's direction in each local region;

f) identify one or more structure nodes from the plurality of nodes, wherein each structure node has a structural feature that is matched between the selectively identified reference features and the detected on-site reference features; and

g) relocate the robot based on information of the one or more structure nodes, if the robot does not reach a next node based on the logical path within a time constraint.

12. The system according to claim 11, the processor is further configured to control the robot to travel to the next node based on the logical path, after relocating the robot based on the information of the one or more structure nodes.

13. The system according to claim 11 or 12, wherein the reference features comprise a plurality of free spaces identified from the scale plan that are potentially available for the robot to traverse in the designated environment.

14. The system according to claim 13, wherein, the processor is further configured to generate a topological map by using the plurality of identified free spaces to find a path between any neighbouring two of the plurality of local regions in order to generate the topometric map of the designated environment.

15. The system according to claim 14, wherein the processor is further configured to generate the potential navigation path by associating the topological map to the identified reference features in order to generate the topometric map of the designated environment,

16. The system according to claim 15, wherein, at the path between the neighbouring two regions of the plurality of local regions, the processor is further configured to navigate the robot based on the generated topological map or the generated potential navigation path.

17. The system according any of claims 11 to 16, wherein the designated environment is an indoor environment of a building and the scale plan is a floor plan of the building.

18. The system according to claim 17, wherein the reference features comprise a plurality of junctions identified from the floor plan, and the processor is further configured to segment the floor plan into a plurality of regions based on the plurality of identified junctions.

19. The system according to claim 18, wherein the reference features further comprise categories of the plurality of segmented regions, and the processor is further configured to identify a plurality of structures of the building from the floor plan to determine the categories of the plurality of segmented regions.

20. The system according to any of claims 17 to 19, wherein the reference features comprise locations and directions of a plurality of doors identified from the floor plan.

21. A robot, comprising:

(i) a system according to any of claims 11 to 20; and

(ii) a controller configured to control an operation of the robot in a designated environment based on a direction received from the system.

22. A non-transitory computer-readable storage medium for storing a computer program, when executed by a processor, performs a method of navigating a robot in a designated environment according to any of claims 1 to 10.