

WHAT IS CLAIMED IS:

1. A method of combining spatial property information with three-dimensional (3D) information, the method comprising:

setting an occupied region in a grid region, which is a set of a plurality of shells, by determining shells occupied by a 3D object in the grid region wherein each of the plurality of shells may has a unique shell index; generating a plurality of semantic regions in the grid region by assigning one or more spatial properties to each of the plurality of shells on the basis of the occupied region;

assigning the unique number for each of the plurality of semantic regions based on the same criteria; and

generating a spatial property map on the basis of the plurality of semantic regions.

wherein the assigning the unique number includes assigning one of the shell indices of the shells included in the semantic region as the unique number thereof for each of the plurality of semantic regions.

2. The method of claim 1, wherein the generating of the plurality of semantic regions includes generating the plurality of semantic regions by assigning the spatial property including the shell index of an adjacent shell to each of the plurality of shells.

3. The method of claim 1, wherein the setting of the occupied region further includes: obtaining an outer boundary of the 3D object; and setting a set of the shells including a closed region of the outer boundary among the one or more shells as the occupied region.

4. The method of claim 1, wherein

the setting of the occupied region further includes setting one or more unoccupied regions in the grid region by determining shell region in which the 3D object does not occupy, and

the generating of the plurality of semantic regions further includes generating the plurality of semantic regions on the basis of the occupied region and the unoccupied regions.

5. The method of claim 1, wherein
the generating of the plurality of semantic regions includes:
determining a weight on the basis of a characteristic of the 3D object; and
generating the plurality of semantic regions by assigning the spatial property including the weight to each of the plurality of shells.

6. The method of claim 1, wherein the generating of the plurality of semantic regions further includes assigning a weight to a link, which is a connection relationship between adjacent shells, on the basis of the spatial property, for the plurality of shells in the grid region.

7. The method of claim 1, wherein the plurality of semantic regions include a spread region that is a predetermined region adjacent to the occupied region.

8. The method of claim 8, wherein
the generating of the plurality of semantic regions further includes:
classifying a movable region and a non-movable region on the basis of a characteristic of the 3D object;
determining a weight such that a shell belonging to the movable region has a higher movement weight than a shell belonging to the non-movable region; and
generating the plurality of semantic regions on the basis of the weight.

9. The method of claim 9, wherein the determining of the weight further includes determining the weight such that the shell belonging to the spread region has a higher movement weight than the shell that does not belong to the spread region.

10. The method of claim 1, wherein the spatial property map is obtained by matching the grid region and the 3D object by assigning information about the 3D object to each of the plurality of shells as the spatial property.

11. An apparatus for combining spatial property information and three-dimensional (3D) information, the apparatus comprising:

a memory in which one or more programs are stored; and

a processor configured to perform an operation by executing the one or more programs,

wherein the processor is further configured to:

set an occupied region in a grid region, which is a set of a plurality of shells, by determining shells occupied by a 3D object in the grid region wherein each of the plurality of shells may have a unique shell index;

generate a plurality of semantic regions in the grid region by assigning one or more spatial properties to each of the plurality of shells on the basis of the occupied region;

assign the unique number for each of the plurality of semantic regions based on the same criteria; and

generate a spatial property map on the basis of the plurality of semantic regions.

wherein one of the shell indices of the shells included in the semantic region assigned for each of the plurality of semantic regions as the unique number thereof.

12. A computer-readable recording medium having recorded thereon a program for executing the method of claim 1 in a computer.