## CLAIMS

1. A computer-implemented method for controlling an excavation task by an autonomous excavation vehicle comprising a scanning device, the excavation task being described by a target map, the method comprising using an excavation vehicle control system for:

a) according to data from the scanning device, maintaining a map representing current terrain;

b) moving a sensor-equipped digging implement for executing an excavation operation;

c) receiving data indicative of current terrain topography from the sensor;

d) updating the maintained map according to the data indicative of current terrain topography; and

e) calculating an excavation operation according to the difference between the maintained map and the target map.

2. The method of claim 1, additionally comprising:

repeating steps b) – e) until the maintained map is substantially identical to the target map.

3. The method of any one of claims 1-2, wherein the sensor is adapted to provide terrain topography data pertaining to a location that is inaccessible to the scanning device.

4. The method of claim 3, wherein the location that is inaccessible to the scanning device comprises an area that is beneath the vehicle.

5. The method of any one of claims 1-4, wherein the data indicative of current terrain topography comprises the location of the digging implement.

6. The method of any one of claims 1-5, wherein the data indicative of current terrain topography comprises data indicative of the quantity of material contained in the digging implement.

7. The method of any one of claims 1-6, wherein the data indicative of current terrain topography comprises data indicative of the composition of material contained in the digging implement.

8. The method of any one of claims 1-7, wherein the maintained terrain map is three-dimensional.

9. The method of any one of claims 1-8, wherein the maintained terrain map is 2.5-dimensional.

10. The method of any one of claims 1-9, wherein the autonomous excavation vehicle comprises an inertial navigation system (INS).

11. An unmanned ground vehicle (UGV), comprising:

a scanning device for scanning an area surrounding the UGV, to thereby provide scanning output data providing information about distances between objects in the area and the UGV in a multiplicity of directions;

an inertial navigation system (INS) providing data indicative of a current location and orientation of the UGV relative to a previous location and orientation;

a vehicle control sub-system configured to receive vehicle control instructions and control the UGV in accordance with the instructions;

a first processor configured to:

repeatedly operate the scanning device for executing a scanning operation, comprising: scanning an area surrounding the vehicle, the area having a predefined area dimensions, to thereby generate respective scanning output data;

for each scanning operation, based on the scanning output data, a map representing at least a part of the area, the map being relative to a location of the UGV, wherein the map comprises cells, each cell is classified to a class selected from the group consisting of traversable and non-traversable, and characterized by dimensions larger than an accumulated drift value of the INS over a predefined distance;

receive INS data indicative of a current location and orientation of the UGV relative to a previous location and orientation; and

for each INS data received, update a location of the UGV relative to non-traversable cells;

a second processor configured to:

according to data from the scanning device, maintaining a map representing current terrain;

moving a sensor-equipped digging implement for executing an excavation operation;

receiving data indicative of current terrain topography from the sensor;

updating the maintained map according to the data indicative of current terrain topography.

calculating an excavation operation according to the difference between the maintained map and the target map;

12. The UGV of claim 11, wherein the first processor and the second processor are the same processor.

13. A computer program product comprising a computer readable storage medium retaining program instructions, which program instructions when read by a processor, cause the processor to perform a method comprising:

according to data from the scanning device, maintaining a map representing current terrain;

moving a sensor-equipped digging implement for executing an excavation operation;

receiving data indicative of current terrain topography from the sensor;

updating the maintained map according to the data indicative of current terrain topography; and

calculating an excavation operation according to the difference between the maintained map and the target map.

**CLAIMS**

1. A computer-implemented method of performing an excavation task by an autonomous excavation vehicle, wherein a desired result of the excavation task being described by a target map, the computer-implemented method comprising:

operating a scanning device onboard the excavation vehicle for repeatedly scanning an area surrounding the vehicle, to thereby generate respective scanning output data;

maintaining, based on the scanning output data, a map representing at least a part of the area, the map being relative to a location of the vehicle and comprises cells that are characterized by a size equal or larger than an accumulated drift value of an INS onboard the vehicle over a predefined distance;

receiving from the INS, INS data indicative of a current location and orientation of the vehicle relative to a previous location and orientation; and

updating a location of the vehicle relative to the cells in the map based on the INS data;

executing an excavation sequence comprising:

moving a sensor-equipped digging implement for executing an excavation operation;

receiving data indicative of current terrain topography from the sensor-equipped digging implement;

updating the map according to the data indicative of current terrain topography; and

calculating an excavation operation according to a difference between the map and the target map.

2. The computer-implemented method of claim 1, wherein the excavation sequence is repeated until the map is substantially identical to the target map.

3. The computer-implemented method of claim 1 or 2, wherein the sensor-equipped digging implement is adapted to provide terrain topography data pertaining to a location that is inaccessible to the scanning device.

4. The computer-implemented method of claim 3, wherein the location that is inaccessible to the scanning device includes an area that is beneath the vehicle.

5. The computer-implemented method of any of claims 1-4, wherein the data indicative of current terrain topography includes the location of the digging implement relative to the map.

6. The computer-implemented method of any of claims 1-5, wherein the data indicative of current terrain topography includes data indicative of a quantity of material contained in the digging implement.

7. The computer-implemented method of any of claims 1-6, wherein the data indicative of current terrain topography includes data indicative of a composition of material contained in the digging implement.

8. The computer-implemented method of any of claims 1-7, wherein the map is three-dimensional.

9. The computer-implemented method of any of claims 1-8, wherein the map is 2.5-dimensional.

10. The computer-implemented method of any of claims 1-9, wherein the predefined distance is derived from one or more dimension of the map.

11. The computer-implemented method of any of claims 1-8, wherein the updating of the map according to the data indicative of current terrain topography includes updating a three-dimensional map of topography.

12. A system mountable on an unmanned ground vehicle (UGV) for controlling execution of an excavation task, comprising:

a scanning device configured to repeatedly scan an area surrounding the UGV, to thereby provide scanning output data providing information about distances between objects in the area and the UGV in a multiplicity of directions;

an inertial navigation system (INS) providing INS-data indicative of a current location and orientation of the UGV relative to a previous location and orientation;

at least one processor configured to:

obtain scanning output data generated by the scanning device;

generate based on the scanning output data, a map representing at least a part of the area, the map being relative to a location of the UGV, and comprises cells, each cell is classified to a class selected from a group comprising traversable and non-traversable, and characterized by dimensions equal or larger than an accumulated drift value of the INS over a predefined distance related to the size of the map;

receive INS data from the INS; and

update a location of the UGV relative to the cells based on the INS-data;

execute an excavation sequence comprising:

moving a sensor-equipped digging implement for executing an excavation operation;

receiving data indicative of current terrain topography from the sensor;

updating the map according to the data indicative of current terrain topography.

calculating an excavation operation according to a difference between the map and a target map indicative of a desired result of the excavation task.

13. The system of claim 12, wherein the excavation sequence is executed by a second processor different than the at least one processor.

14. The system of claim 12 or 13, being configured to repeat the excavation sequence until the map is substantially identical to the target map.

15. The system of any of claims 12-14, wherein the sensor-equipped digging implement is adapted to provide terrain topography data pertaining to a location that is inaccessible to the scanning device.

16. The system of any of claims 12-15, wherein the data indicative of current terrain topography includes one or more of:

data indicative of a location of the digging implement;

data indicative of a quantity of material contained in the digging implement; or

data indicative of current terrain topography includes data indicative of a composition of material contained in the digging implement.

17. The system of any of claims 12-16, wherein the map is three-dimensional.

18. The system of any of claims 12-16, wherein the map is 2.5-dimensional.

19. The system of any of claims 12-18, wherein the predefined distance is derived from one or more dimension of the map.

20. The system of any of claims 12-16, wherein the update of the map according to the data indicative of current terrain topography includes updating a three-dimensional map of topography.

21. A computer program product comprising a non-transitory computer readable storage medium retaining program instructions, which program instructions when read by a processor, cause the processor to perform a method executing an excavation task by an excavation vehicle, comprising:

obtaining scanning output data generated by a scanning device operating onboard the excavation vehicle for repeatedly scanning an area surrounding the vehicle, to thereby generate the scanning output data;

maintaining, based on the scanning output data, a map representing at least a part of the area, the map being relative to a location of the vehicle and comprises cells characterized by a size larger than an accumulated drift value of an INS onboard the vehicle over a predefined distance;

receiving from the INS, INS data indicative of a current location and orientation of the vehicle relative to a previous location and orientation; and

updating a location of the vehicle relative to the cells in the map based on the INS data;

according to data from the scanning device, maintaining a map representing current terrain;

executing an excavation sequence comprising:

moving a sensor-equipped digging implement for executing an excavation operation;

receiving data indicative of current terrain topography from the sensor;

updating the map according to the data indicative of current terrain topography; and

calculating an excavation operation according to a difference between the map and a target map indicative of a desired result of the excavation.

22. An unmanned ground vehicle comprises and operable the system of claim 12.