***Localization and mapping with autonomous robot, based on LIDAR sensor***

Keyword – SLAM; localization; mapping; obstacle detection; LIDAR-SLAM; autonomous mobile robots; real-world autonomous navigation; local map; global map; odometry.

Mapping and localization

Robotic mapping is a discipline related to computer vision and cartography. Mapping robots can now be found in several areas like industry, military, home appliances, exploration and self-driving cars [1]. In most of the cases, these robots are used where humans cannot reach or is very hard for a human to reach those areas.

The goal of this robot is to be able to construct and use a map (indoor or outdoor) and to localize its position in this map. [2]

“*Robotic mapping is that branch which deals with the study and application of ability to localize itself in a map/plan and sometimes to construct the map or floor plan by the autonomous robot*”. [2]

The problem of robot mapping is to acquire information about the robot environment based on a set of data received from a set of sensors. To acquire a map, robots must use a set of multiple sensors, which will allow them to perceive the outside world. Most of the sensors used in this task are cameras, distance sensors (using sonar, laser, and infrared technology), radar, compasses, and GPS. However, all these sensors are subject to errors, like measurement errors or noises, but also some limitations (range limitation, sensor position limitation). [3]

When creating a map, it is very important, the robot localization in the map. “Localization is the problem of using sensor measurements to estimate the robot’s pose relative to some map”. [4]

[1] - LIDAR Application for Mapping and Robot Navigation on Closed Environment – PDF

[2] - <https://en.wikipedia.org/wiki/Robotic_mapping>

[3] - <http://robots.stanford.edu/papers/thrun.mapping-tr.pdf>

[4] - <https://ri.cmu.edu/pub_files/2009/1/thesis_revision_2009_02_13.pdf>