Project 2 May 2015

The objective is to carry out a mission using a wheeled robot, like the NEATO platform.

To deal with the mission several techniques have to be solved:

- Robot kinematics
- Movement control
- Environment description
- Robot Navigation
- Perception using NEATO on-board sensors
- Robot localization
- Path planning & obstacle avoidance
- Mission management & System-human interaction

Programming language and SDK is left to your choice.

Step 1. Basic functions

Develop software to carry out :

- Connect to the robot platform via WiFi and the available socket
- Move the robot along a predefined trajectory
- Read robot state and sensor information, during robot movement
- Experiment yourself to be confident with the use of the robot platform

Step 2. Checking robot odometry

Develop a software to carry out :

- Move the robot along a square (square side 1 m)
- Measure the difference between initial and final robot position
- Analyse & interpret the obtained results

Step 3. Building an Environment Map

Develop software to carry out :

- Move the robot along a predefined trajectory or a pseudo-random trajectory
- Read LRF data while the robot moves
- Build an (incremental) environment description from sensor data
- Determine the error present in the environment description
- Analyse & interpret the obtained results

Step 4. Robot Mission

Based on the previous experiences, develop software to carry out the following mission.

1. Given an initial pose (xi,yi,θi) in Zona 1 move the robot to a given final pose (destination) (xf,yf,θf). Plan a path from initial pose to final pose using the environment map. Along the computed path the robot can encounter some obstacles, so obstacle detection and obstacle avoidance algorithms have to be implemented.

Zone 1 and Zone 2 are shown in the Environment Map.

2. Starting at the final pose (xf,yf,θf), the robot has to explore the "Passadis" area looking for cylindrical objects (usually plastic bottles o plastic glass). When the exploration is completed, the robot has to move to the "Punt base".

3. From the "Punt Base", the robot has to touch in order, starting with the thin one, all the detected obstacles, and finally return again to the Punt Base.

Remember that

- You can take profit of the environment map
- Some obstacles can be present (even appear) in the environment
- The robot has to evolve without external assistance

Evaluation criterion include
- The quality of the path computed in navigation stage (safety, travelled distance and time, …)
- The pose accuracy once the robot reaches the final pose and the Punt Base (quality of robot localization)
- Obstacle detection and Obstacle avoidance (quality of sensor analysis)
- And in general, the project methodology, code quality, documentation, and …..