MPC-MAP Assignment No. 1

Using MATLAB script, simulate the simple 1D map building process using the simulated measurement and self-proposed Sensor Model.

Create a single A4 report that will describe your approach to the exercise (3-6 sentences for each task and picture, if makes sense).

Task 1

Define parameters of your simulation

- Distance of the obstacle *x*
- Standard deviation of your sensor σ
- Discrete map parameters (cell size *c* and covered area *d*)

Note: Choose these values with the idea of visualizing your simulation. The visual outputs simulated for parameters of x=100m and σ=0.001m c=0.001m, d=200m will be useless.

Task 2

In the script file, implement the following functions

The “measure” function will return a single measurement sample with a normal distribution of (μ=obstacle_distance, σ=sensor_std_dev).

The “get_forward_sensor_model” function will return an gaussian-based obstacle probability distribution function for the entire map space with respect to the currently measured distance. Complementary implement also the “get_neg_forward_sensor_model”.

Task 3

Create a simulation of the mapping process. Generate 5-10 measurement samples and for each of them generate $\mathrm{P}(m^O|z)$ distribution using the sensor model and update the probability distribution of the obstacles in the map $\mathrm{P}(m^O)$.

Document the simulation of the map building process with several images, especially the final state of the map model.

Submission

Send the report and all related MATLAB scripts at adam.ligocki@vutbr.cz.
MATLAB script must be executable without errors and has to generate all graphical outputs that are in the report.
Deadline: 20th Feb 2022, 23:59.