

## 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  $\sigma$
- 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  $x=100\text{m}$  and  $\sigma=0.001\text{m}$   $c=0.001$ ,  $d = 200\text{m}$  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 ( $\mu=\text{obstacle\_distance}$ ,  $\sigma=\text{sensor\_std\_div}$ ).

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  $P(m^o|z)$  distribution using the sensor model and update the probability distribution of the obstacles in the map  $P(m^o)$ .

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](mailto:adam.ligocki@vutbr.cz).

MATLAB script must be executable without errors and has to generate all graphical outputs that are in the report.

Deadline: 13<sup>th</sup> Feb 2022, 23:59.