MPC-MAP Assignment No. 1 - Report

Author: Martin Procházka

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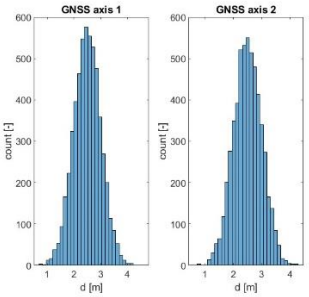
Task 2

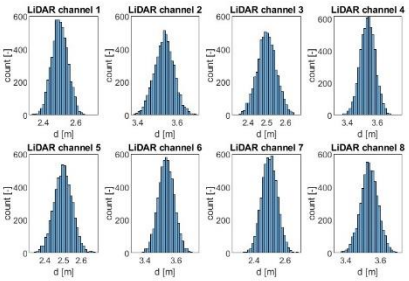
Based on calculated values, standard deviations across all LiDAR channels could be considered similar (Figure 2). The same conclusion can be made about both axis of GNSS measurements (Figure 1).




```
sigma_gnss =

    0.5035    0.4947
```

Figure 1 – GNSS measurements




```
sigma_lidar =

    0.0494    0.0498    0.0500    0.0498    0.0499    0.0505    0.0498    0.0494
```

Figure 2 – LiDAR measurements

Task 3

Values on the main diagonal of covariance matrix correspond to variance i.e. square of standard deviation.

```
cm_gnss =

    0.2535    0.0024
    0.0024    0.2447

>> sigma_gnss.^2

ans =

    0.2535    0.2447
```

Figure 3 – Covariance matrix and variance of GNSS measurements

```
cm_lidar =

    0.0024   -0.0000   -0.0000    0.0000    0.0000   -0.0000    0.0000   -0.0001
   -0.0000    0.0025    0.0000   -0.0000   -0.0000   -0.0000   -0.0000   -0.0000
   -0.0000    0.0000    0.0025   -0.0000   -0.0001   -0.0001   -0.0000   -0.0000
    0.0000   -0.0000   -0.0000    0.0025    0.0001    0.0000    0.0000   -0.0000
    0.0000   -0.0000   -0.0001    0.0001    0.0025   -0.0000    0.0000   -0.0000
   -0.0000   -0.0000   -0.0001    0.0000   -0.0000    0.0025   -0.0001   -0.0000
    0.0000   -0.0000   -0.0000    0.0000    0.0000   -0.0001    0.0025   -0.0000
   -0.0001   -0.0000   -0.0000   -0.0000   -0.0000   -0.0000   -0.0000    0.0024

>> sigma_lidar.^2

ans =

    0.0024    0.0025    0.0025    0.0025    0.0025    0.0025    0.0025    0.0024
```

Figure 4 – Covariance matrix and variance of LiDAR measurements

Task 4

Correctness of implementation of normal probability distribution function has been verified against measured data.

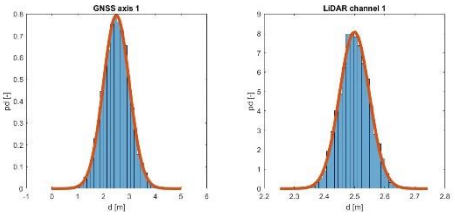


Figure 5 – pdf (red) and measured data (blue)

Task 5

An uncertainty of robot motion could be for example be caused by wheel slippage or by diameter difference of the wheels.

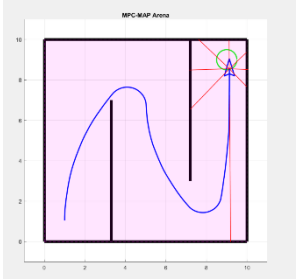


Figure 6 – Open loop control