[16-833] Homework 3 : Written Report

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1 Measurement function

1.1 Odometry

1.1.1 Measurement Function

Since the odometry results in a change in position, the measurement function is simply

$$h_o(\mathbf{r}^t, \mathbf{r}^{t+1}) = \mathbf{r}^{t+1} - \mathbf{r}^t$$

1.1.2 Jacobian

The Jacobian of measurement function is

$$H_o(\mathbf{r}^t, \mathbf{r}^{t+1}) = \begin{bmatrix} -1 & 0 & 1 & 0 \\ 0 & -1 & 0 & 1 \end{bmatrix}$$

1.2 Landmark

Since landmarks are measured using the relative position of the robot and landmark, the measurement function is simply

$$h_l(\mathbf{r}^t, \mathbf{l}^k) = \mathbf{l}^k - \mathbf{r}^t$$

1.2.1 Jacobian

The Jacobian of measurement function is

$$H_l(\mathbf{r}^t, \mathbf{l}^k) = \begin{bmatrix} -1 & 0 & 1 & 0 \\ 0 & -1 & 0 & 1 \end{bmatrix}$$