CS561 Assignment 2 Report

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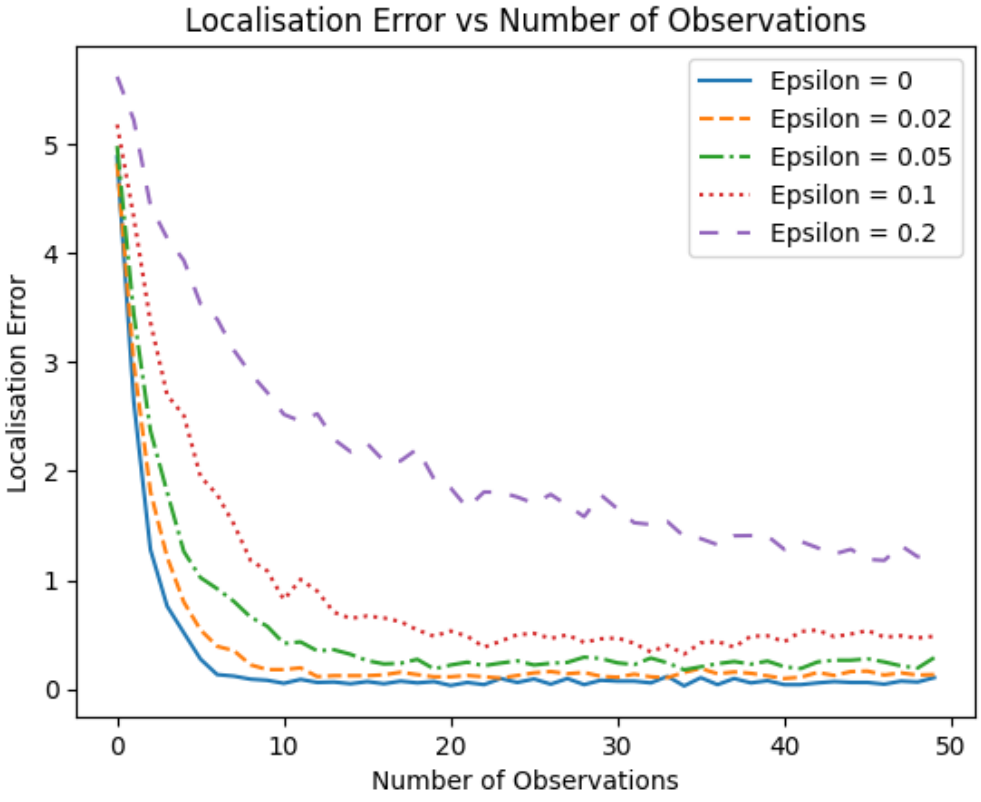
Exercise 1: Robot Localisation using HMM

A Hidden Markov Model (HMM) is a statistical model that can be used to describe the evolution of observable events that depend on internal factors, which are not observable directly.

Localisation Error:

The HMM algorithm is executed for different values of sensor error rate (*epsilon*) and localisation error is computed at each observation step. The findings are plotted in the graph below.

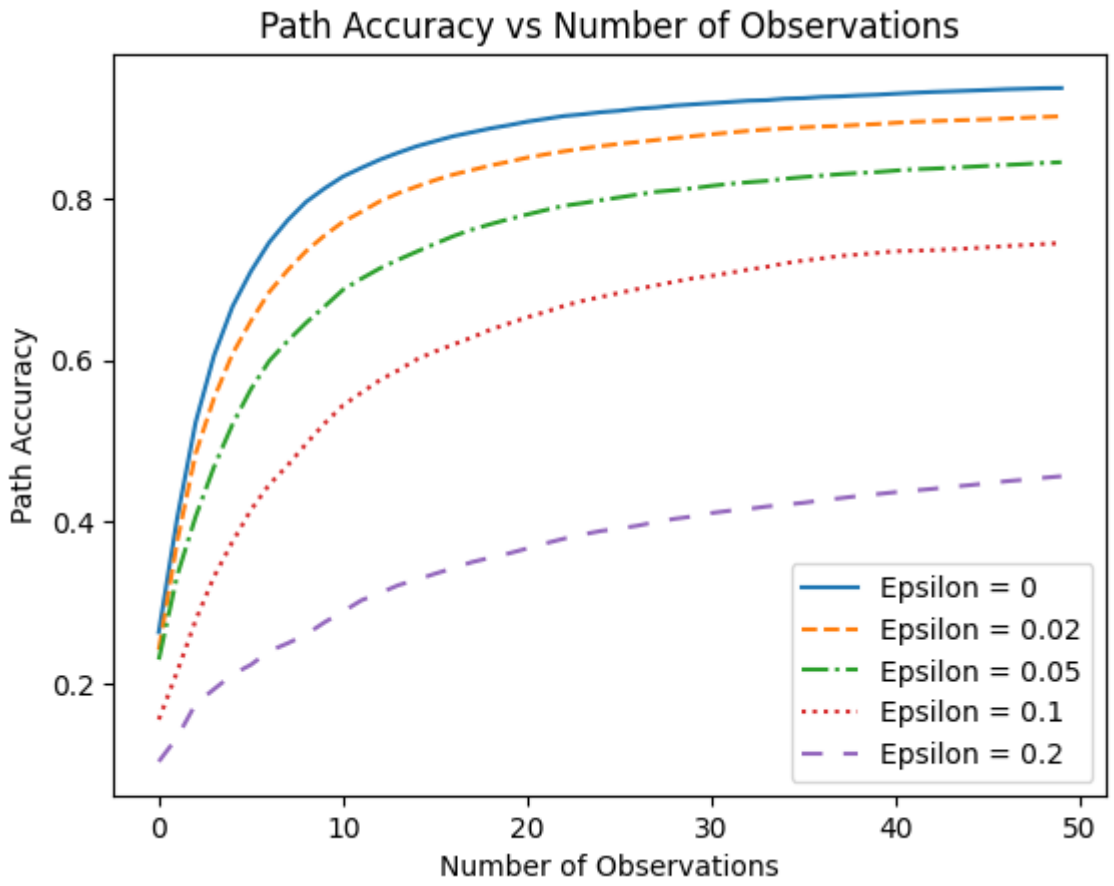


The correlation between localisation error and number of observations can be seen for different values of sensor error rate from the plot. Typically, as more observations are made, the localisation error tends to decrease for all values of *epsilon*.

Path Accuracy:

Plot for path accuracy, defined as fraction of correct states on Viterbi path is shown below.

The accuracy trend in the plot depicts the change in accuracy with number of observations made across various *epsilon* values, revealing the improvement on accuracy over time.



Impact of changing sensor error rate:

The choice of *epsilon* value significantly affects both localisation error and path accuracy. Higher error rate indicates more uncertainty and noise in senor measurements, leading to increase in localisation error and thus decreasing path accuracy of robot.

As error rate goes from 0.1 to 0.2, accuracy almost reduces to half, going from 75% to just 40%, which is a significant decrease. Hence, it's advisable to use good sensors with minimal error rate.