Technion – Israel Institute of Technology



HW5

Autonomous Navigation and Perception

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May 18, 2022

# Theoretical Questions – Q1

Monte Carlo planning is a search method based on sampling. It works well when we can represent the search space well enough with a small, discretized set, as sampling from it is easy, and the combination numbers are finite. When the search space cannot be granulated efficiently, as in continuous state spaces, we cannot guarantee that the sampling combinations will ever lead to a proper solution to the search problem in finite time.

# Hands-on – Q1+2

In our solution, we used the algorithm below:

Diagram

Description automatically generated

Figure : Block diagram of the algorithm we used

The main part of our implementation is shown in the picture below:

Text

Description automatically generated

Figure The main part of our implementation

In our solution, we start with choosing the action we want to perform using the belief and cost function. After choosing an action we calculate the ground truth and get an observation. Using that observation, we update our belief using the Kalman filter. We did those stages in each of the 10 steps define in the question.

After consecutive iterations we chose . Because of the long runtime operation, we chose a horizon equal to 4. Now, we will show our results for the 3 target points we chose:

Chart, scatter chart

Description automatically generated

Figure First target point

Chart, scatter chart

Description automatically generated

Figure Second target point

Chart, scatter chart

Description automatically generated

Figure Third target point

We can see in the results that because of the limitation over the number of steps and the size and direction of the motion we can't always converge to the target point.