MEAM520 Final Project Proposal

Topics: Localization problems based on probability model -- Particle Filter & Kalman Filter

This final project will take an insight into the fundamentals of Particle Filter & Kalman Filter working principles, demonstrate their theory and provide a few numerical examples based on these localization model. For the later part, comparison between these two methods will be presented (hopefully as well as Markov Localization problems) and the connection of those methodologies, especially focus on the real implementation scenarios, will be briefly discussed and a combined method using these two filtering methods may be implemented to seek out a better and balanced performance(referred to the following papers). Two different filtering methods will be evaluated and implemented together under the scenario of localization. The results of this final project will potentially lead to the usage in MEAM510 final project where a known map is given with some types of sensing measurement provided and vehicles (mobile robots) are required to perform some autonomous function within 60 seconds. It is believed under appropriate implementation the kalman filter or particle filter can be successfully deployed in the vehicle for solving the localization problems within the limited computational resources.

Reference papers that we found maybe helpful:

1. https://www.sciencedirect.com/science/article/pii/S0141118718300373
2. https://ieeexplore.ieee.org/document/4407086
3. https://www.spiedigitallibrary.org/journals/Journal-of-Electronic-Imaging/volume-23/issue-1/013029/Real-time-camera-tracking-using-a-particle-filter-combined-with/10.1117/1.JEI.23.1.013029.full?SSO=1
4. https://reader.elsevier.com/reader/sd/pii/S0168169918315230?token=56DEE33402D0523D386114380A0F1446F78850036D610700C1F770E65FD64F049F7036374F9E1AE5CFE9FAF9A8C128DC