CPE521-A Autonomous Mobile Robotic Systems (Fall 2022)

Final Project Assignment

In the final project, you are expected to use ROS (Robot Operating System) (http://www.ros.org/wiki/) to demonstrate a SLAM algorithm using existing datasets. Please read the instruction carefully.

SLAM Algorithm:
Please implement one of the SLAM algorithms (such as Extended Kalman Filter, Particle Filter, or other existing SLAM algorithms published in literature), and demonstrate the performance using existing datasets (instruction below) in the robot simulator ROS.

You do not have to program from scratch. You can use any of the open source software available on the web with your own debugging and integration work. Please include all the references in the report including paper(s) of the algorithm implemented, source of codes if you use open-source codes.

SLAM Datasets:
Please use one of the datasets available from the Rawseed project, downloadable from the textbook webpage http://www.mobilerobots.ethz.ch/ , clicking "Links", and selecting:

"17. Rawseeds: a large collection of benchmarked datasets for SLAM"

Particularly, try to work with the datasets: Benchmark Problem "Laser SLAM - Bicocca_2009-02-25b".

Final Project Presentation on Dec. 13:
During the class on Dec. 13, each student needs to present their final project results. For each presentation, 5 minutes is allowed to present the main results obtained. Powerpoint slides should be prepared.

There is one week before the final report is due. You can still work on the project until the due date of the final report. But it is expected that you have obtained the main results by Dec. 13, and work on the final report writing and small modification during the last week.

Final Report Due on Dec. 20:
A final report is expected from each student. The following information must be included:
- ➢ Title of the report
- ➢ SLAM algorithm details (methodology, implementation)
- ➢ Dataset chosen
- ➢ GUI interface
- ➢ Implementation details (how different parts are integrated together)
- ➢ Simulation results, performance discussion

➢ Discussion that you may want to add on reflection on lessons learned, and anything else about the topic.

In the report, it should have a clear description on how the results are obtained. No code submission is needed unless requested separately by the instructor.

On *Dec. 20*, each student needs to submit an electronic copy of the report, in the format of "pdf" files, in Canvas by 9:00pm server time.

No code submission. The instructor may request codes later. Optionally, you may submit a video to illustrate the mapping process in ROS.

Note that the Canvas server automatically shuts down the submission link at 9:00pm on Dec. 20. Late submission within one day will have 20 points deduction (over a 100 scale) as a penalty. Late submission beyond 1 day will not be accepted.

Each student needs to complete his/her final report independently. However, you may discuss with your classmates on coding and learning ROS.

Grading for Final Report:
You will be graded by the following aspects of the final project:
➢ Following the instruction
➢ Correctness of the technique/method
➢ Completeness, thoroughness of results, success of simulations
➢ Quality of the final report (organization, clarity, presentation)

Good luck!