

Demo 1 Instructions*

EENG450AB: Systems Exploration, Engineering, and Design Laboratory

Vibhuti Dave and Tyrone Vincent

Department of Electrical Engineering
Colorado School of Mines

Spring 2018

1 Demonstration Period 1

Demo period will start March 12th and end March 19th. Teams that complete their runs on March 12th will receive 100% of their score. Teams that complete on March 14th will receive 90% of their performance score. Teams that complete on March 19th will receive 70% of their performance score. Teams that do not complete by March 19th will receive a zero for their performance score.

In the first demo, the robot must be able to perform certain critical tasks. Multiple runs are taken to compute the performance metrics. The tasks are

- Detect and recognize a beacon. Calculate the angle required to rotate the robot in order to reach the beacon by moving forward, and display the angle using the LCD.
- Rotate the robot by a specified angle, move forward and stop after a specified distance.

Each team will have 4 trials for each task. For the first task, the robot will be centered on a marker, and then a beacon (of the teams choosing) will be placed at 4 different locations in front of the robot. If no beacon is detected, the group can try to reset the Pi or make other adjustments. If no beacon is detected 3 attempts in a row, the test ends and the group must attempt again at the next lab period. For the second task, 4 runs will be performed. For each run, a desired angle in radians and distance in meters will be provided, and the robot will perform this maneuver, stopping after the desired distance. The distance of the robot from the desired stopping location will be measured after each run. If the robot fails to stop, the run does not count. If the robot fails to start or stop 3 attempts in a row, the test ends and the group must attempt again at the next lab period.

2 Design Presentation

In order to qualify for a demo, a team must have all of their documentation submitted (see Section 4), and give a 5 minute presentation on their design. This presentation must be completed before the demo, but can be given the same day as the demo. This presentation is given to the instructors in the lab. The presentation should also be uploaded to the documentation assignment link. The presentation should include the following elements:

- An outline of the robots subsystems and how they work together.
- Quantification of the the expected performance of the design. Both design optimization and expected performance should be determined using well documented simulation and experiments. The presentation must specifically predict the expected performance of the robot, using convincing arguments.

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3 Performance Scoring

The performance metrics for the robot are

- Number of failures to detect the beacon.
- Average error in reported angle to beacon.
- Average error between desired position and actual position.

The score for each category is determined as follows:

- Best score in category (B): 55 points
- Other scores (S):
 - Time and distance: $\frac{B}{S} \times 50$
 - Failures: $50 - (S - B) \times 10$

The best score is determined on the first day that a team successfully completes a demo, and only teams that achieve this score on that day receive 55 points. Teams that complete their demos later have a max of 50 points in each category. Teams earn the sum over all available categories, up to a max of 100 points. The final score is then multiplied by the relevant percentage for the day that the team completes the demo.

4 Documentation

Team should provide documentation relevant to their design and implementation, along with a discussion of expected performance.

The reflection logs should be uploaded to the “Demo 1 Reflection Log” assignment link before the due date.

The following documentation should be uploaded to the Canvas “Demo 1 Team Documentation” assignment link.

- Team contract
- Weekly work log
- Well organized record of all models created in Simulink.
- Well organized Arduino sketches with detailed comments.
- Well organized Python code with detailed comments.