

Demo 1 Instructions*

EENG350: Systems Exploration, Engineering, and Design Laboratory

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Fall 2022

1 Demonstration Period 1

Demo 1 is scheduled to be completed by October 21st. Teams that complete their runs on October 21st or before will receive 100% of their score. Teams that complete on October 24th will receive 90% of their performance score. Teams that complete on October 26st will receive 70% of their performance score. Teams that do not complete by October 26st will receive a zero for their performance score. To qualify for a particular demonstration day, the team must submit a video of their robot successfully performing one run of each of the critical tasks below, and this video must be submitted before midnight on the day before. By submitting a video that shows successful completion of the three tasks, you are guaranteed at least 50% of the max performance points available for that demo day.

In the first demo, the robot must be able to perform certain critical tasks. The tasks are

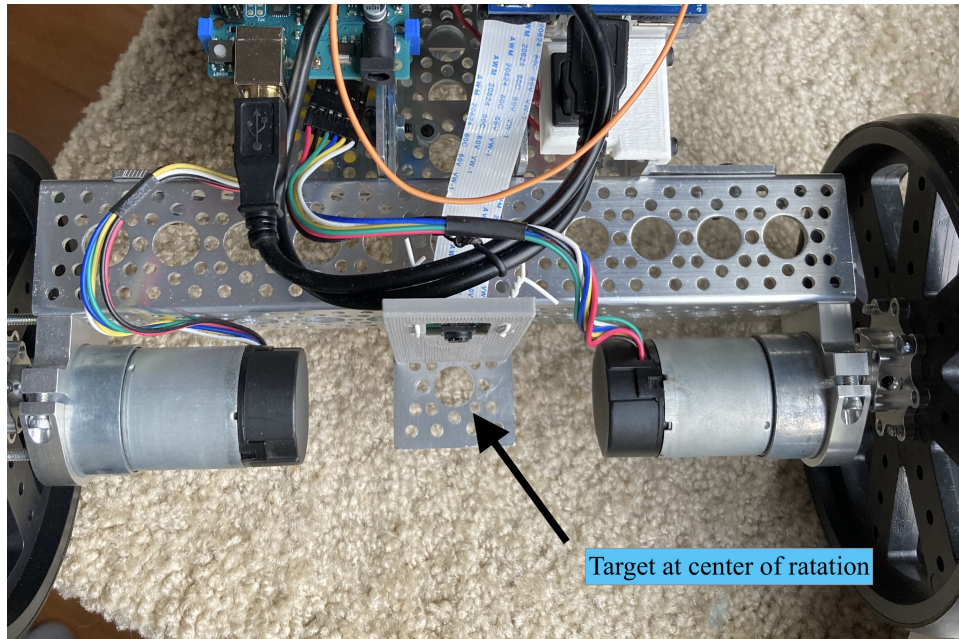
- Detect an Aruco marker, and report the angle in degrees between the camera axis (i.e. an arrow pointing out of the camera perpendicular to the camera face) and the marker. The angle is signed, with a positive angle when the marker is to the left of the camera axis.
- Move forward in a straight line and stop after a specified distance in feet (between 1 and 10 feet).
- Rotate the robot by a specified angle in degrees, and move forward a specified distance in feet.

The testing process is as follows.

- For the first task, the robot will be placed at a fixed point, and then markers will be uncovered at 5 different locations in front of the robot. The marker may be between 1 and 5 feet away from the robot. The robot should indicate that it detects the marker in the LCD screen within 10 seconds, and also display the angle to the marker away from the camera center. If the robot does not detect the marker, the robot can be re-set, but if the robot does not detect the marker 3 times, the test ends and the group must attempt again the next lab period.
- Three runs will be performed for each of the second and third tasks. For each run, a desired angle in radians (possibly 0) and a desired distance in feet will be provided. The team can then download code, but after this no other communication to the robot is allowed. The error between the desired movement and actual movement will be measured after each run. The robot must start within 10 seconds of the download, and complete the maneuver within 60 seconds after starting. 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.

All measurements of robot position will be made with respect to the center of rotation of your robot. Thus, all robots must be designed with a large hole located at the center of rotation, such as in the following image:

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2 Performance Scoring

The performance metrics for the robot are

- Average error in reported angle from the camera z-axis to the beacon.
- Average error between desired and achieved position (moving straight)
- Average error between desired and achieved position (rotating and moving)

The score for each category is determined as follows:

- Let B be the target metric, which is the third best score over all sections (for example: an angle error of 1 degree)
- Let S be your teams achieved performance metric (e.g. error of 2 degrees):
- Your numerical score in the category is $\frac{B}{S} \times 50$

The best score is determined on the first day that a team successfully completes a demo. Teams that complete their demos after the first day 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.

3 Documentation

- The presentation should be uploaded to the “Demo 1 Team Presentation” assignment link.
- The reflection logs should be uploaded to the “Demo 1 Reflection Log” assignment link.
- The weekly agenda/minutes should be uploaded to the Canvas “Demo 1 Team Minutes” assignment links for the appropriate week.
- All team members should complete the CATME ratings for Demo 1.

Your team should be organizing your code and other files in your common repository on github. Create a Demo 1 folder with a readme.md file that describes what is contained there, with further folder divisions as necessary to make everything easy to find. You should include

- Well organized record of all models created in Simulink.
- Well organized Arduino sketches with detailed comments.
- Well organized Python code with detailed comments.

(They don't necessarily have to be organized into folders by language - it could be by task if that makes more sense.) Your github should also have a project board that describes what tasks were assigned and who was responsible.

4 Design Presentation

After completing the demonstration, groups will submit a draft presentation on their project. You will update this presentation after the final demo. **The presentation should also be uploaded to the documentation assignment link.** The presentation should be aimed at an electrical engineering that has no prior knowledge of SEED lab. The presentation should include the following elements:

- An introduction to the project - what is the final project objectives
- An introduction to your concept to design a robot to meet that objective
- A discussion of the subsystems that will compose the robot and the design process to date
- Simulation and experiments that were performed to assist you in the design process. (For example, what overall requirements were you trying to meet, and how did this impact the required performance of your subsystems? How did your performance change as development continued?)

There are many possible formats to the video; for example, you can use software capture your team talking over a power-point presentation, film each other presenting as if at a presentation or Ted Talk, you can have off-camera speakers explaining something that is being written on a page being filmed, you may include clips with animations or example runs related to your design, and you may be more creative than your professors can imagine. If you use any clips or images from other sources, be sure to cite your source.

Submit your presentation as a movie, a link to a movie, or a powerpoint with sound embedded. The presentation should be no more than 5 minutes long.