CPE416

Winter 2025 – Diaz Alvarenga

Final Project

Due Date

Thursday March 20th, 11:59pm

For this final project we will be working and hacking our Gobilda Robots. You will define a project where you will implement an autonomous behavior for your robot. Your project will be graded using the following criteria:

- (30%) Creativity and utilization of algorithms studied in class

- You may implement other robot control or learning algorithms you may have experience with, or you find in other literature

- (50%) Detailed writeup of implementation and design

- (20%) Level of success achieved in your robot implementation

- Work in groups for the remainder of the lab sections

The Gobilda Robot comes with many spare parts to it you are welcome to add as many parts to the robot as you would like.

The main sensors on the robot that can be used for perception and decision making are the:

- A1 RP LiDAR
- Oak-Pro Camera

Possible ideas for a project include:

- Using the ROS2 Navigation Stack to have the robot autonomously navigate part of building 20. This would include mapping the area that you want to navigate.
- Using the camera to perform tracking of a person

- Implement your own [DWA planner](#) (local planner/controller) to have the robot avoid obstacles
- Train a small neural network to control the Gobilda robot
- Implement an exploration algorithm for the robot given a map of an environment or to build a map automatically
- Implement laser odometry through your own ICP algorithm and then perform some obstacle avoidance.

Note: that using the camera is optional in your final demo, but the LiDAR and ROS2 should be incorporated somehow into your final solution.

Testing

A note on testing, you should try to test your code as much as possible in a simulator before moving it to the actual robot. We'd like these kits to last us a long time and so be extra careful when running your code on the robot and be prepared to save the robot if you see it crashing into something.

Furthermore, you should use the teleop_gobilda node for the robot. This can help you with tuning the parameters in the driver code for your robot to run smoothly. And will be useful if you decide to perform some mapping operations in your project.

Deliverables

- A writeup of your project (**minimum 4 pages**). Single spaced, single column, and 12pt font. Be sure to include a small abstract of the overall report and visual cues for your ideas. (Good things to include: block diagrams, charts, pictures, future implementations given more time.)

- A video of your robot running (in real life)

- Hand-in your code (e.g. world file, source code...)