

Individual Lab Report #4

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Wholesome Robotics (Team E)

Teammates: Aman Agarwal, Dung Han Lee, John MacDonald, Aaditya Saraiya

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Individual Progress

In the past few weeks I have worked on a number of larger tasks related to our project.

I continued my work as the on the third and fourth parts of the Printed Circuit Board Assignment. After updating my previous schematic (replaced SMD resistors with through-hole versions) which will control the robot's cooling system, I generated and laid out the corresponding board, and checked it's design for manufacturability. The robot has two separate compartments for electronics each with two fans, so we will make two thermostats, each controlling the two fans in its compartment.

The board is laid out such that the input and output connectors are on opposite sides and are clearly labeled, to prevent miswiring (see figure 1). The heavier components are placed along the edges and the mounting holes are on the board's corners to minimize any stress loading. Since the boards will be in the computer compartments, the thermistor can be mounted directly onto the board, making for a more sturdy design.

The next step was to generate a Bill of Materials, with cost and sourcing information for each additional component needed for the board. Our total costs, for 2 boards will be under \$30, most of which is for the transistors, thermistors and connectors.

Finally, I generated gerber files using EAGLE's CAM Processor and submitted those files to FreeDFM.com to confirm that the board is manufacturable and receive a quote.

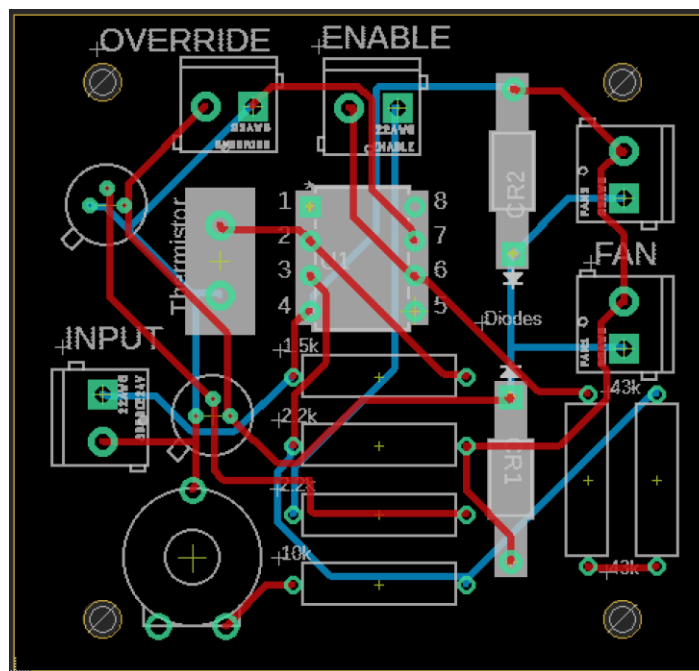


Figure 1 Board Layout for Cooling System Thermostats

My next order of business was to begin work on the robot's electronics subsystem. Our plan is based on the design of the previous Robotanist model, which we intend to roughly duplicate, with modifications for our own applications. We were given a high level electrical schematic as well as a CAD

model of the original robot. However, we do not have a complete Bill of Materials for the robotanist, on top of which our documentation does not list the individual parts by part name or number, so I have been researching the parts needed. My research began by familiarizing myself with terminal blocks, their usage and associated vernacular. We have a number of terminal block parts already in inventory, my job is to determine which are needed and what additional parts we will need to order.

I have also done a bit of research into fuses. Fuses are important for circuit protection, but the specifications listed in our schematics are fairly unclear, listing only a shutoff current. My goal is to find suitable fuses that ideally fit into a terminal block fuseholder, or at the very least require minimal other mounting hardware.

Finally, I put the tires on their rims. This was a labor intensive process, that involves first stretching the tire's beads over the edge of the rim and then manipulating the tire while inflating it in order to "pop" the tire beads into position. This took a few hours and the help of the machine shop staff, but was overall an instructive experience.

I also was the point person for purchasing and receiving supplies and parts. I am also in communication with Phipp's Conservatory about doing a field test next week.

Challenges

A major challenge I had in the past few weeks was determining the correct parts for the robot's electrical system. I do not have a strong electronics background, so I have needed to spend a lot of time researching terminology, so that I can begin to reverse engineer the existing robot. As a result this has taken more time than expected. To address this I have been in constant contact with the designer of the original robotanist.

Teamwork

Aman has ordered the robot's structural parts and is now working on developing the robot's turning planner.

Aaditya has been working on the SLAM algorithms and integrating the Zed camera.

Dung Han has been working on the perception algorithm for recognizing holes and disease in the plants' leaves. He is adjusting the measurement metrics so that they more closely resemble the farmers' interests.

John has been working on developing the navigation subsystem He has already succeeded, moderately, in trajectory following along a row.

Together we have worked on our business course assignments.

Future Plans

Wholesome Robotics

In the coming weeks my plan is to order the missing parts and begin assembling the robot's electrical system. This is comprised of multiple voltage regulators, fuses and connectors, assembled on "terminal blocks" I plan to build first a benchtop circuit then shift to the robot's battery so that we can power all of the robot components in a portable way. By necessity, my approach has shifted from ordering everything first and then assembling, to ordering parts as I discover I need them; this is necessitate by the gaps in previous documentation.