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Team N: Automators Anonymous

Teammates: Zhiwei Zhang, Tianyu Zhao, Xuesu Xiao

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### A. Individual Progress

This week I worked on edge detection using ambient light sensors. I placed an order for different sensors which I will test on arrival.

Of the sensors we used in the sensor lab, the ambient light sensor was by far the most robust. Although the other sensors are designed to detect objects, we found the ambient light sensor to be most effective at detecting objects because nearby objects would cast a shadow that the sensor could detect. This is in part because the other sensors (ultrasonic and IR) are designed to detect objects that are further away than the distances we cared about.

To use the ambient light sensor to detect edges I needed to shield the sensor from the ceiling lights and amplify the sensor output. For amplification, I used a simple op-amp amplification circuit that is tunable via a potentiometer. I empirically determined that a gain around 50x was appropriate for the final iteration. This will change based on ambient light conditions. The final product can be seen in figure 1. The sensor is shielded from ambient light using a dowel.

### B. Challenges

Since we were able to determine distance very accurately during the sensor lab, I assumed that this would be a simple task. Unfortunately the conditions when detecting the wall are very different than in the sensor lab. During the sensor lab, the ambient light sensor was facing upward toward the ceiling lights. When trying to detect the edge of the wall, the sensor was perpendicular to the ceiling lights so the values coming from the sensor were very low. I was able to resolve this by adding an amplifier.

Adding an amplifier had it's own difficulties. Since the amplified values were still close to 0V, the opamp needed to be powered with a negative voltage. I generated this voltage by connecting a 9V source to the positive and negative op-amp terminals and leaving the positive terminal also connected to +5V of the arduino.

### C. Fellow Team Members

Zhiwei, Tianyu, and Xuesu collaborated on the physical model. This allowed them a way to test the coefficient of friction of the wheels. They also worked on designing the final chassis and suction mechanism.

### D. Plans and Goals

This week I will focus on writing the Arduino code. At this point we have a good idea of what the motors and sensor interfaces will be, so I can focus on designing the code to have a fast main loop. My plan is to create a very state-centric design where all operations in the loop and interrupts are simply reading and modifying the state of the robot. I will probably need to write my own code to handle analog to digital conversions and pwm so that I can control things effectively and prevent resource collisions between different tasks.

## E. Figures

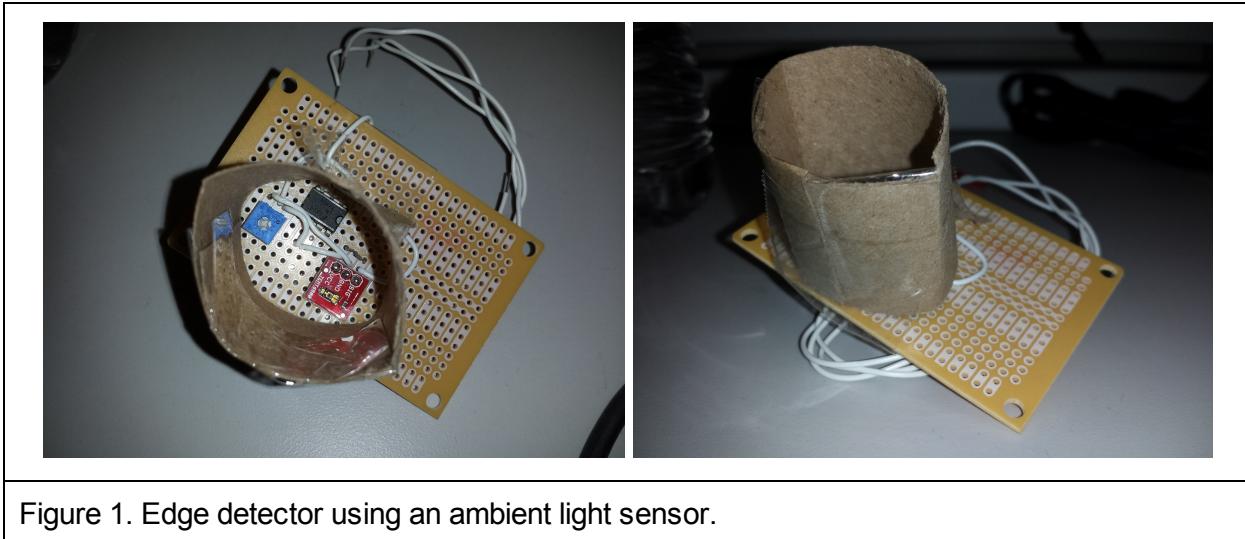


Figure 1. Edge detector using an ambient light sensor.