Group 53 – Finding Objects

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Lab 5: "Finding Objects" Report

Data analysis

Number of false positives = 0.

Number of false negatives = 0.

Time:

Localize (s)	Find Block (s)	Reach End (s)
18	43	68
23	52	N/A (only found non-block)
21	58	78
24	62	105
23	58`	N/A (only found non-block)

Error:

Localization (deg)	Final destination (cm)
8	5
5	N/A
10	5
3	10
4	N/A

The average time it took to localize was ~22s, which is significantly below the required time of 30s. The localization error can be reduced by improving the algorithm. The error in the final destination would be reduced if the localization error were reduced.

Observations and Conclusions

There were some slight differences in the behavior and performance of the earlier code when combined in a larger system. The odometry worked without any issues or further implementation. The localization had to be changed, however. In the previous lab, there were no objects on the grid to interfere with the localization. However, in this lab, performing falling-edge localization failed initially. This is because, without changes,

the ultrasonic sensor would read blocks on the grid as walls. Thus, instead, rising edge was used. For rising edge to work effectively, it is necessary to ensure the robot ignores all blocks until it starts facing the wall. Finally, the navigation did not have to be changed very much, but the motor acceleration and speed were lowered. This was because the robot was dragging the blue block, and it caused less error the slower it accelerated and traveled.

The object detection was very reliable. However, this was in the lab's lighting conditions. The main factor that influences the reliability of the object detection is the lighting. The object detection would not work as coded in different/inconsistent lighting conditions. It is expected that the code would break down especially in low-light conditions. In order to make it more robust, it would be beneficial to attach a strong white LED flashlight to ensure that the lighting conditions are consistent. Additionally, it would be better to change the detection from recognizing absolute color values to ratios.

The most difficult aspect of this lab was getting the robot to locate and travel to the blocks. There were many ways to do this, but it was felt that overcomplicating it would result in more issues. Thus, we used a simple algorithm, which was actually quite effective.

The aspect of the lab that was the most surprising was how easy it was to "capture" the block. This just required a couple of lines of code to rotate two motors to bring down arms.