Individual Lab Report #3

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Team A / Team Avengers

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I. Individual Progress

I test the obstacle avoidance sensor system consisting of two ultrasonic and two SHARP IR sensors in various conditions. I test the sensors in sunlight, ultrasonic sensors near motors, found the minimum distance between sensors before they interfere with each other and the true minimum and maximum ranges of the sensors.

Experimental Results for Obstacle Avoidance Setup

As per team decision, I prepared a table consisting of parameters to be tested for two Sharp GP2Y0A02 IR sensors and two Maxbotics LV Maxsonar EZ ultrasonic sensors. I then carried out tests with Sean. Here are the results that we gathered.

Sensor	Minimum Horizontal range	Maximum Horizontal range (cm)	Detection width	Maximum Vertical range	Condition	Datasheet Horizontal Range
IR Sharp GP2Y0A02	20	250	Pencil size	7 above and 5 below at 30 cm horizontal distance	Indoor	20 - 150 cm
IR Sharp GP2Y0A02	20	250	Pencil size	same as indoor	Outdoor	
Ultrasonic LV Maxsonar EZ MB1010	20 (gives reading of 15 at 20 cm and then becomes constant at 15 for lesser distance)	600	60 cm at 70cm distance, 25 cm at 140 cm	15 cm above and 15 cm below at 50 cm horizontal distance	Indoor	15 cm - 6.45 m
Ultrasonic LV Maxsonar EZ MB1010	Same as indoor	Same as indoor	Same as indoor	Same as indoor	Outdoor	
Ultrasonic LV Maxsonar EZ MB1010	Noisy	Noisy	Noisy	Noisy	Near motor	
Ultrasonic LV Maxsonar EZ MB1040	20 (gives reading of 15 at 20 cm and then becomes constant at 15 for lesser distance)	600	10 cm at 70 cm distance, 10 cm at 100cm (and 140 cm) distance	15 cm above and 15 cm below at 50 cm horizontal distance	Indoor	15 cm - 6.45 m
Ultrasonic LV Maxsonar EZ MB1040	Same as indoor	Same as indoor	Same as indoor	Same as indoor	Outdoor	
Ultrasonic LV Maxsonar EZ MB1040	Noisy	Noisy	Noisy	Noisy	Near motor	

Sensor Unit	Min distance between sensors when they start to interfere
IR & IR_Horizontal	Not Applicable. Sensors physically touching.
IR & US_Horizontal	Not Applicable. Sensors physically touching.
US & US_Horizontal	40 cm apart (4 error reading after 15 samples), 0 cm apart - 8 error readings after 12/15 samples, 4 error samples always exit after 15/20 readings
IR & IR_Vertical	Not Applicable. Sensors physically touching.
IR & US_Vertical	Not Applicable. Sensors physically touching.
US & US_Vertical	same as horizontal test

Sensor Unit	Max distance between sensors to successfully detect obstacle of dimension 23 cm(width) X 20 cm (height)
IR & IR	23 cm
IR & US (MB1010)	35 cm
US & US	35 cm when obstacle is at 40cm distance from sensors, 45cm when obstacle is at 100 cm distance (at times to much noisy data of range 600 cm)

Summary of the findings of the sensor test

1. IR has very thin pencil size detection width
2. Ultrasonic sensors has wide detection width
3. IR can detect maximum upto 250 cm whereas ultrasonic can detect upto 600 cm
4. No difference in operation of IR indoors or outdoors
5. Ultrasonic sensors give inaccurate readings in presence of motors
6. No significant interference exists between two IR sensors, IR and Ultrasonic sensor or between two Ultrasonic sensors
7. Readings from ultrasonic sensors are noisy

II. Challenges

Understanding which different combinations of settings to test for sensors was a challenge. I put together an excel sheet with few fundamental essential test that were necessary. For testing ultrasonic sensors in presence of motor we put ultrasonic sensor next to motor and under the motor. Ultrasonic sensor gave more noisy readings when it was placed below the motor.

III. Teamwork

Sean and I together did the tests. Adam helped us by getting the brushless DC motor working to test with the sensor system.

IV. Future Work

Next week I will test different filters in the code, test lidar lite sensor, test sensors in digital mode instead of analog mode and finally decide acceptable ranges of sensor noise for our system