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WEEKLY REPORT VI

This week we continued to take sensor measurements. However, this time we could obtain the measurements within a known accuracy range and considering the accuracy a more correct version of the environment was obtained yet we could not take the exact distances at the joint points of the walls and edges of the object. Below we will explain these processes briefly.

By doing tests, we have observed that the values of the measurements are greater than the actual distances. We have concluded that this difference is about 10 to 12% of the actual distance. Meaning that, for example 30 cm distance gets measured around 33.5 cm. Hence, we have added a correction factor while storing the sensor data. Figure 1 shows an empty arena, without the correction factor, whereas Figure 2 shows the same arena with the same sensor data except this time the correction factor was added.

There are two main problems that we have encountered in these tests. The first one is related to getting measurements from the corners. Measurements obtained from the corners turn into a curve even though the walls around the corners are perpendicular to each other. The other problem is while sensor is getting measurements from an object, as the object gets out of the field of view of the sensor, the measurements start to increase continuously whereas they should increase immediately. This can be seen in Figures 3 and 4. The object in the middle of the arena gets sensed as if it had side edges with an angle. However, that is not the case. This problem can also be seen in Figure 5, where we have plotted the data as the sensor sweeps the object

from the middle of it to the right with respect to time. Similarly, as the object starts to get out of the field of view of the sensor, the readings continuously increase which is indicated by the red section in the figure. Actually, these two are problems are due to the sensor having about a 25-degree field of view. The sensor gets measurements in this FOV interval. Therefore, in the case of corners, as the sensor sweeps the average value of the measurements stay constant, it is like the diameter of the internal tangent circle. In the case of the edges of the objects, the same idea applies. As the sensor sweeps out of the edge of the object, the object gradually gets out of the FOV of the sensor, hence the continuous increase in distance.

This week, we were able to understand the root of the problem, which is 25-degree field of view, related to our sensor readings.

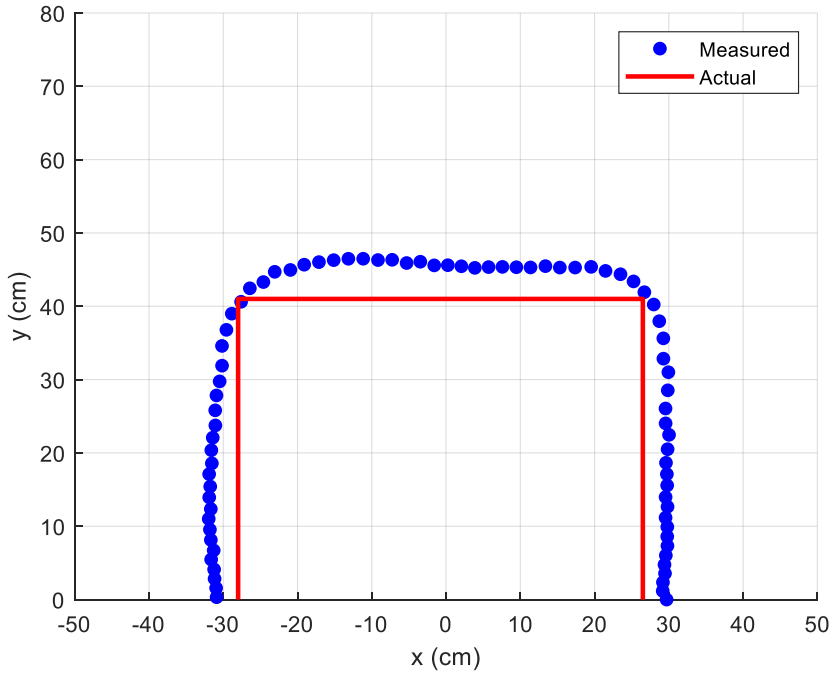

Figure 1: Measurements of the empty arena without the correction factor

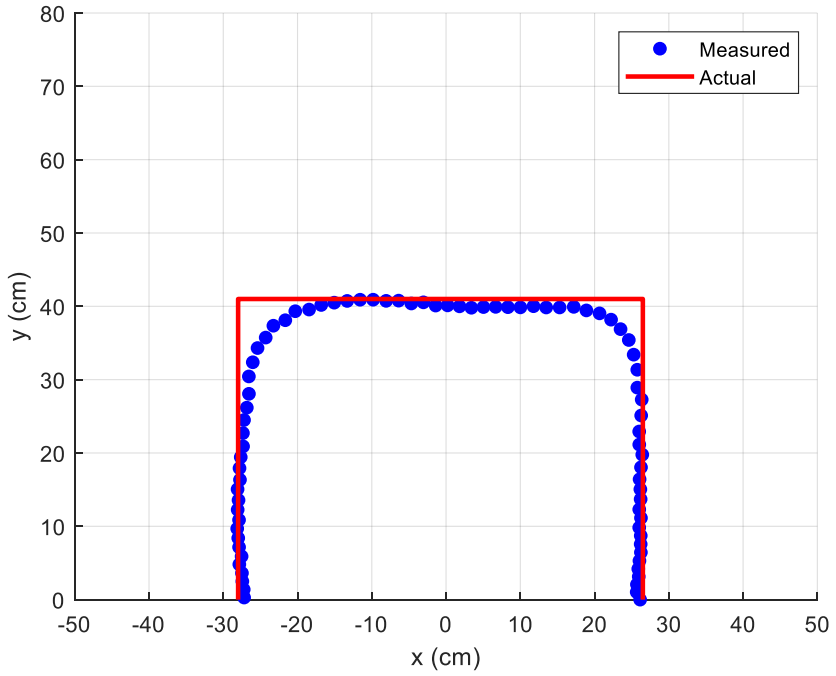

Figure 2: Measurements of the empty arena with the correction factor

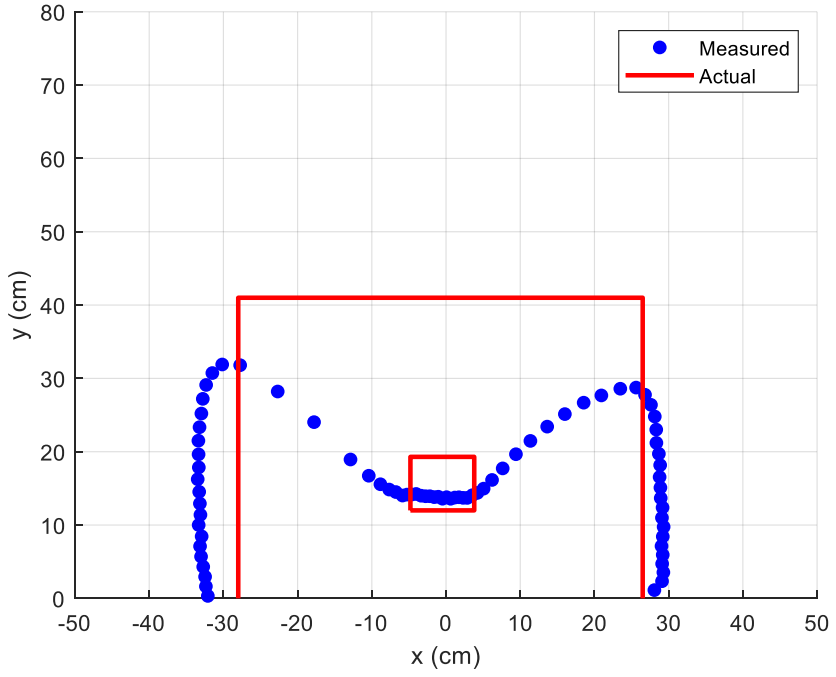

Figure 3: Measurements of a rectangular object within the arena without the correction factor

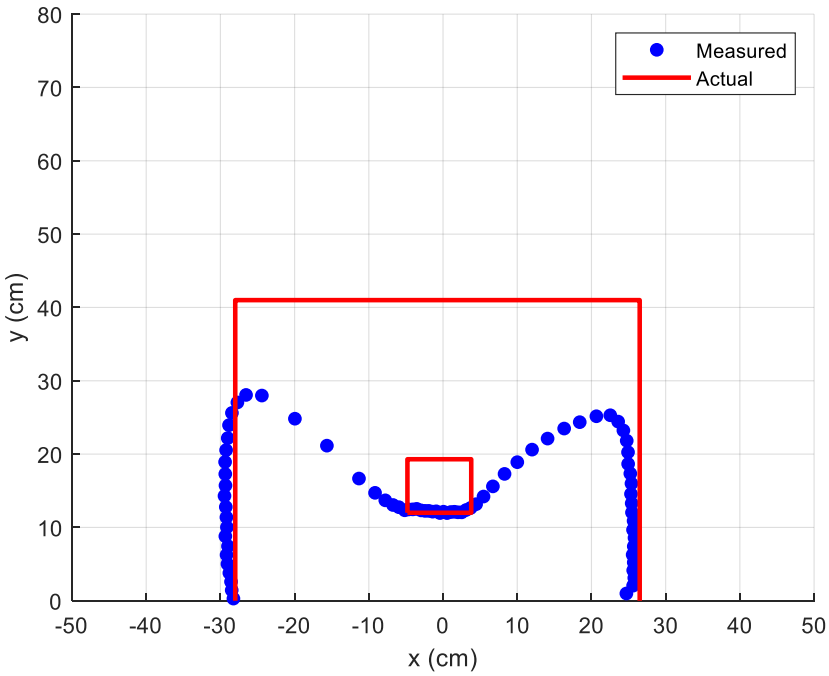

Figure 4: Measurements of a rectangular object within the arena with the correction factor

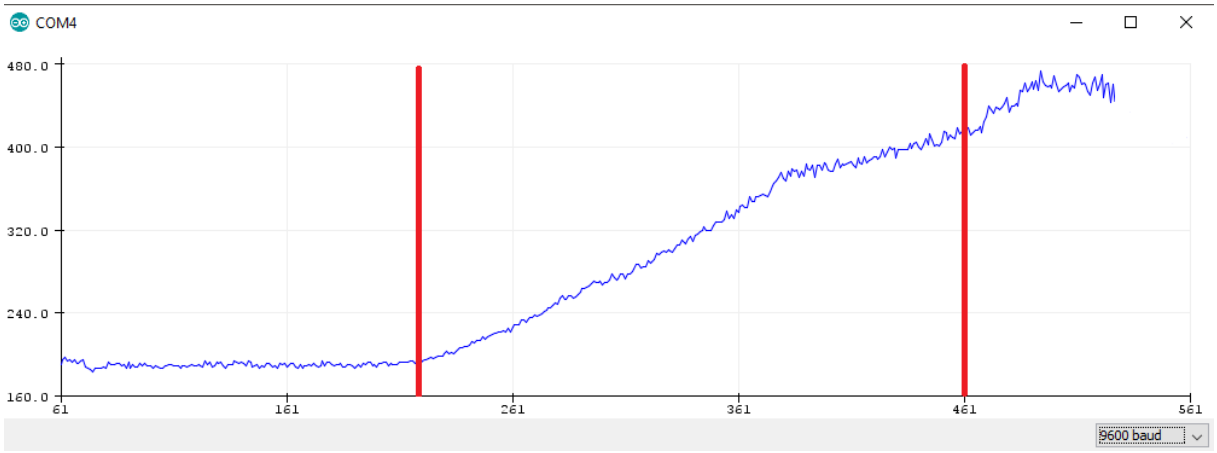

Figure 5: Sensor reading as it slowly sweeps out of the object with respect to time