RaLaZaBa Electronics 7th Week Report

November 26, 2018

Activities completed this week

Solid Shape Finding

Procedure

Three image process algorithm that identify solid shapes were tested. We work both MATLAB and Python environments. The reasons why we work on both MATLAB and Python environments are;

- The robot do data processing in Linux environment (most probably Raspbian) which does not support MATLAB environment. However, it has C Coder tool which has capability to converts its language to C,C++ compiled file. This make MATLAB to ideal tool for image processing.

- Python can be directly used in Linux environment, also have OpenCV library which quite useful
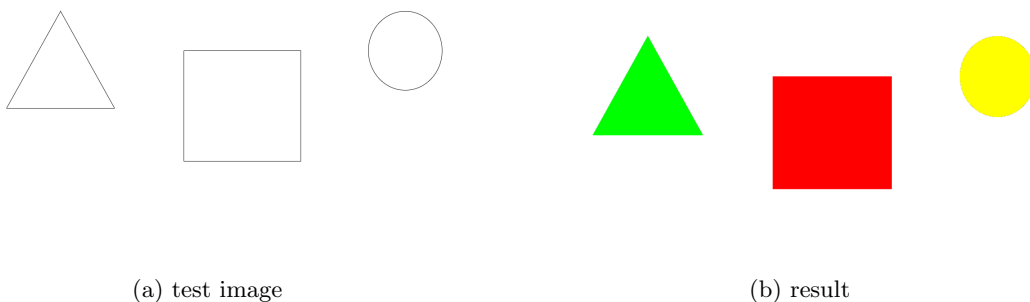
Results

(a) test image   (b) result

Figure 1: Algorithm test with perfect solid shape

(a) test image   (b) result
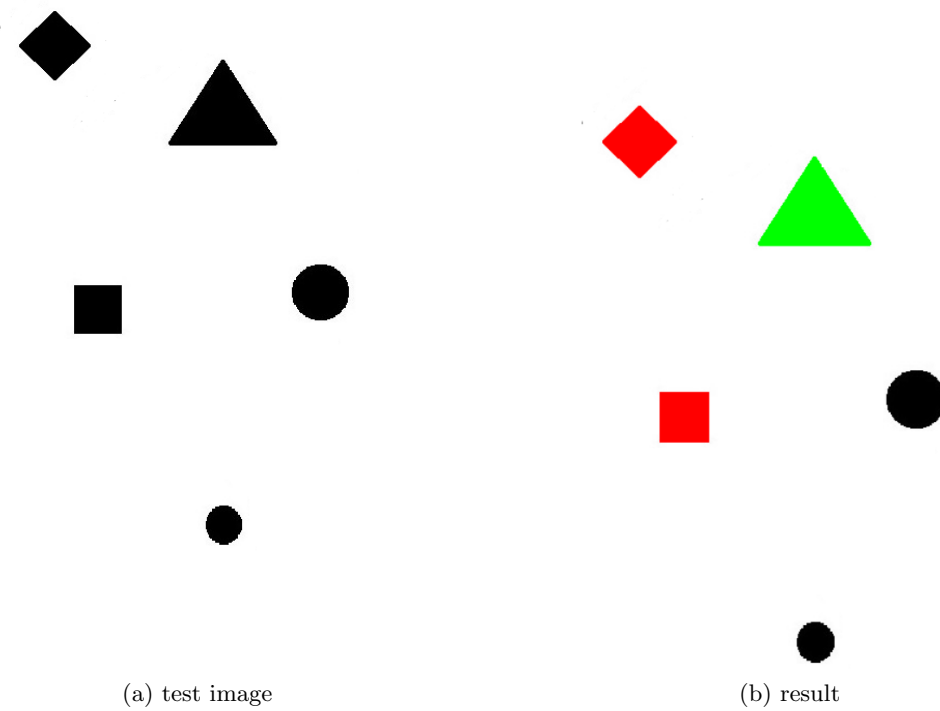
Figure 2: Algorithm test with some rotated square distorted circles

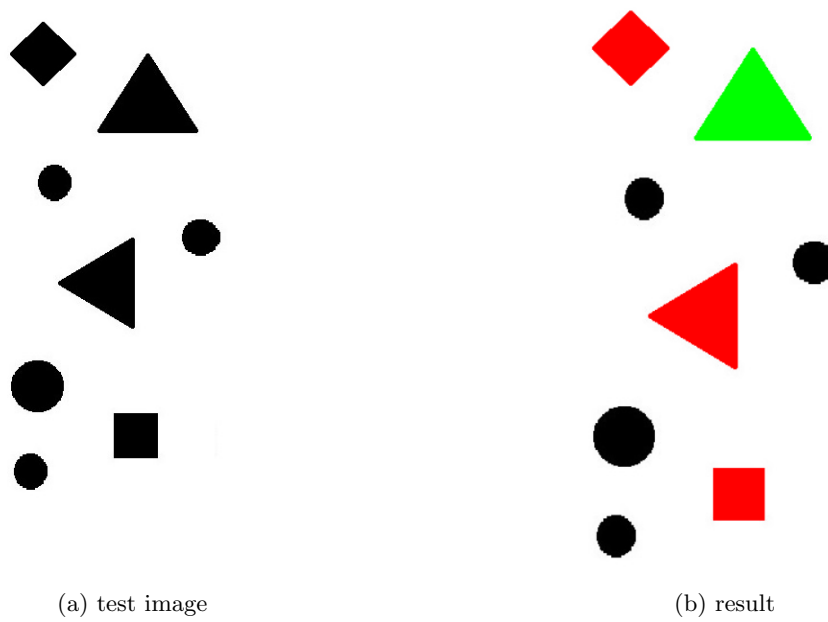(a) test image   (b) result

Figure 3: Algorithm test with some rotated distorted solid shapes

Conclusions

The algorithm that we used work quite well with regular shapes but it is very **sensitive to the noise**. Our algorithm has best performance at circular and least performance triangular. Our confusion matrix has maximum value on false square (actual value triangular.) Therefore;

- We should focus on preprocessing of the image especially **sharpening edges and lines**

- We should focus identify triangular and square shape under heavy noise.

Distance Measurement

Procedure

We used vl53l0x as a measurement device which position controlled by servo motor. Servo motor controlled by micro-controller (Arduino) and measurement processed MATLAB environment. After several trials with different objects we determined the most critical one is **classification of triangular and cylindrical objects**. We also observed that the affects of beam width of the sensor. All measurement are taken with fixed position of the servo motor. Therefore the data we obtain is limited.
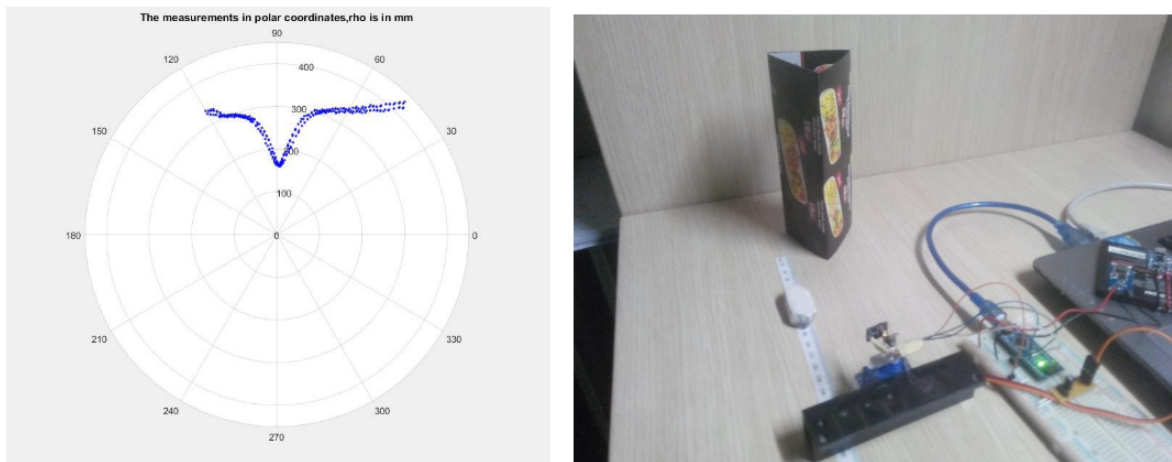
Results

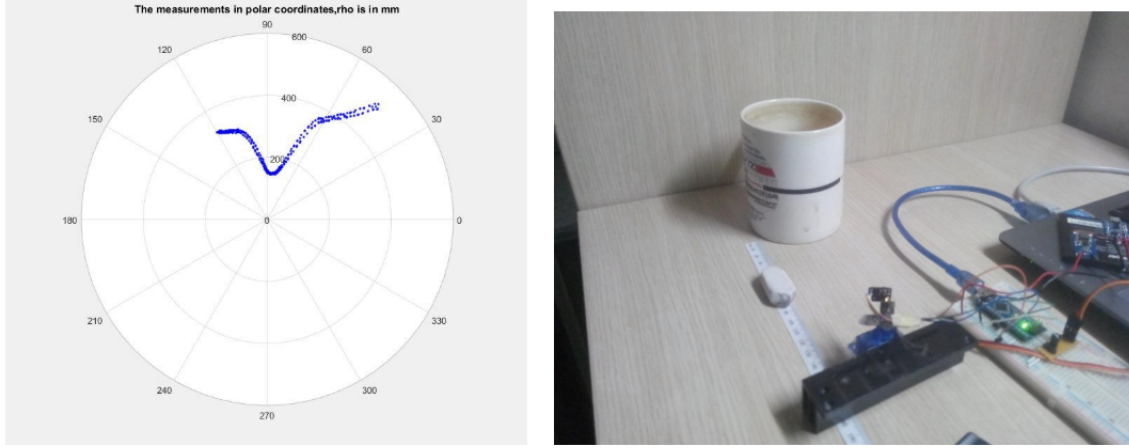Figure 4: Measurement results of triangular shape object

Figure 5: Measurement results of cylindrical object

Conclusions

After our experiment these are the conclusions;

- Considering fixed position measurement we think that our sensor is actually not quite bad for our purposes. Especially with square object it worked well. However, for the next iterations, we will try upper version (vl6810x).

- We should both find both mechanical and software solutions to for minimize the affect of beam width.

Probabilistic road map

Procedure

Firstly we create different map configuration synthetically. Then we carry these map to MATLAB environment to build probabilistic road-map. We used PRM(probabilisticroadmap) class under robotic library. In this simulation we saw that how our robot move with giving start end point by SLAM algorithm.
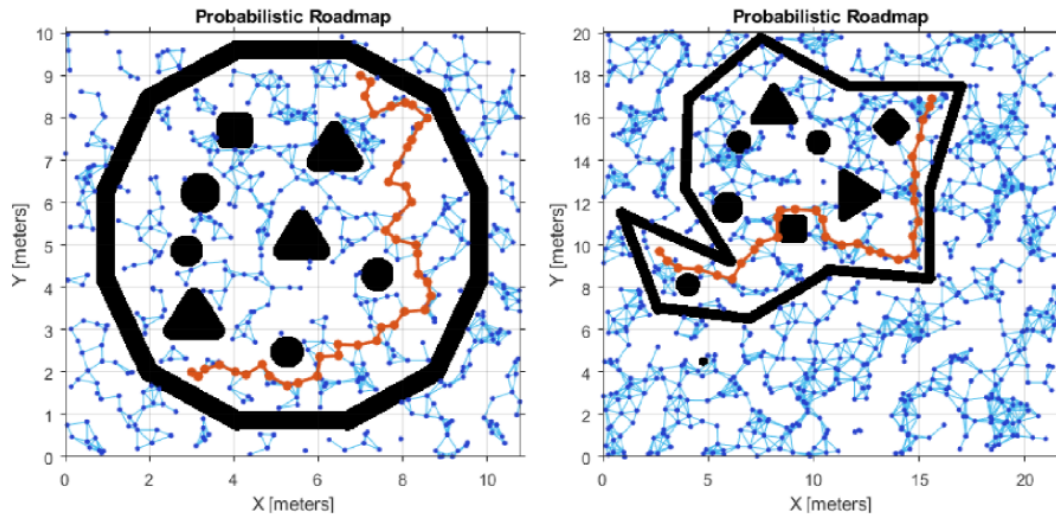
Results

Figure 6: Possible road-map using SLAM

Conclusions

We saw promising results. With next iteration we will simulate the system which has LIDAR scan on unknown map without giving start and end points.

To Do

- SLAM algorithm simulation with the system that has LIDAR scan on unknown map.

- Template matching, learning tools will tested and will be compared our first algorithm

- New sensor vl6810x will be tested with same setup. Moreover, we will work on problems due to beam width and test the possible solutions.