

7/11/21

Final product and testing

Things done:

- Helped ryan to fix his socket codes, using of UDP was too unstable and hence the changing to TCP. Helped to flush the packets but connection was too unstable, hence, I changed to using paramiko to send SSH command directly from server to Jetson Nano via microUSB cable (microUSB port act as ethernet port for jetson that sets up a virtual network with static addresses)
- Further tuned the parameters of IWR6843 to get even more point clouds and targets
- Tested the final product and obtain a confusion matrix alongside ROC curve. The system was found to perform the best with YoloV5 running on a host pc with RTX3060 GPU. Accuracy was found to be around 60 to 70 percent. Accuracy here refers to the average ratio of the number of true positive violations to total number of actual violations. In this accuracy measurement, we were only concern with the false negatives and not too much focus was placed on the false positive as false positive are not as critical in the main purpose of the cluster tracker.
- If false positives are taken into account, accuracy drops to approximately 40% as YOLO object detection is an aggressive model. Faster RCNN and other models were found to produce better overall accuracy, however, YOLO was still found to provide the fastest detection speed.
- Coded the multiprocessing to pipeline the L515 data to the main server script in order for the IWR6843 to interact with the L515.

Current state of project:

- Completed, but still needs to be tuned
- Features are completed, however, there are occasional bugs where the iwr6843 stops sending data to the server script. This could be due to the flushing of the serial port which needs to be debugged. However, this is not a frequent event
- Iwr6843 is performing much better than the first iteration, however, finer tunings can be done. Due to the numerous parameters and the limited time, I am not able to explore all the parameters, but the critical parameters such as the signal to noise ratio, idle frequency, and the finer motion mode have been explored.
- As an additional feature, even though this will not be done on time, we are currently exploring to map the point cloud data to the L515 point cloud data. At present, we are able to map the environment using the L515. If we are able to do the same on the IWR6843, we can possibly map over point data from IWR6843 to L515, thus, providing velocity and acceleration for each data point.

Problems faced:

- Socket were unstable and hence, mode of communication between the host PC and the Jetson Nano was changed to SSH using paramiko
- Our implementation of YOLO requires a relatively good computing power. When L515 was run purely on CPU, the frame rate drop to approximately 1 frame per 3 seconds, which severely undermined the performance of the system. However, another algorithm (still YOLOV5) is used alongside a more powerful GPU, which drastically improved performance.
- During a session of testing in the physics lab, there was a “ghost” reading which causes the IWR6843 to keep turning the L515 to that direction, hence, the testing results are affected.

Work to be done:

- Further tuning and last-minute debugging
- Consolidating of results
- Preparing for the final presentation