

EE/CprE/SE 491 WEEKLY REPORT 05 02/19/2018 – 02/25/2018

Group number: 18

Project title: *Deep Learning with Radar for Object Recognition and Tracking*

Client & Advisor: Michael Olson (Danfoss) and Dr. Wang

Team Members/Role:

Tucker Creger - Project Manager

Eric Bishop - Software Developer

Kellen O'Connor - Deep Learning Architect

Clayton White - Hardware Design Engineer

Mitch Hagar - Radar System Lead

Nihaal Sitaraman - Hardware Developer

o Weekly Summary

This week we worked a lot on progressing as a team on our project. We have been learning more about radars, signals, processing these radar signals, how to interpret the data, and have been learning more about our radar systems. We have been working on trying to get the Jetson TX2 SOC ordered as well. We should have that completed by early next week. We have a document in our Google Drive which we will use to help us narrow down our final radar choice. We have been trying to acquire and process sample data as well, which we have been getting from potential radar suppliers. We hope to have a good grasp on processing this data and we hope to have a properly working script.

o Past week accomplishments

- Kellen spoke to Vayyar and was able to get a lot of questions answered, and scheduled a follow up call to discuss more technical information
- We received some documentation from Vayyar and Omnicor which will help us progress to a final choice for radar
- Discussed using our own You Only Look Once (YOLO) script for object detection
- Received information from client regarding the machine they will be using to perform their own deep learning development.
 - Our client is using a rugged version of the Nvidia Jetson TX2; our team will be getting a full version to ensure we can output data and have increased functionality.
- Nihaal made a block diagram for a prototype of the system.
- Tucker started working on processing sample radar data from a supplier
- Kellen researched the Keras Functional API, which enables more complex models to be built

o Pending issues

- Ordering a System-on-a-chip
 - We were in a holding pattern to determine if the NVIDIA Jetson TX2 would be compatible with one of our proposed radar systems. We have learned it is compatible and now we are trying to get the correct information to ETG to order the system.
- Tucker is working with a supplier to understand their raw ADC output and how to process that data to create a time domain waveform and manipulate that to identify objects.

o Individual contributions

Name	Accomplishments	Hours This Week	Hours Cumulative
Tucker Creger	I worked with Kellen to modified the single object detector python script to detect two objects in a possibly scalable export. I worked with suppliers to get sample radar data to being trying to process it in MATLAB. I started trying to process the first sample data we received. I began a radar system comparison document for further discussions with our client and advisor.	11	59.25
Eric Bishop	I continued to work on developing the interpolation in between our radar data and our camera input. Looked at more situations that could be problematic while implementing our design on to our project, as well as did some more requirements gathering for our system. I also looked at the test data we received and tried to understand and see how the raw data is gathered and streamed from the radar.	7	35
Kellen O'Connor	I worked primarily on getting a better understanding of how Keras can be used to create complex models with multiple inputs and multiple outputs of different types. The Keras Functional API seems to be our solution, and should allow us to implement a custom version of YOLO, or at least a custom object detection network. I spoke with Vayyar about scheduling a call (to be held on 2-27) for more technical information regarding the use of their system with Python and Ubuntu. I spent some time trying to figure out the IQ data from Omnicaradar, but determined that more information was needed to be effective, and	6	41.5

	decided to shelf it personally for the week.		
Clayton White	Similarly to last week I have continued with exploring the software we will be using to implement the system. I am ready to test and troubleshoot the script that the team has been working on over the past couple of weeks.	5	29
Mitch Hagar	From the data that Tucker obtained from the supplier, I tried to further the script that he showed for processing the data. We managed to achieve a plot of the magnitude of the IQ modulated data. Though we are not at the point of understanding what the plot is telling us or if we are correctly processing the data, it is one step in the right direction. I researched further to try and understand what the plot is telling us, and other ways of plotting the data that may give us better insights. I added a few items to the radar comparison document that Tucker started. I watched a few videos that Nihaal suggested on deep learning.	8	37.5
Nihaal Sitaraman	Troubleshooted getting the script that Kellen provided to work properly. Downloaded PyCharm, VS Code, Conda, and Open CV. I ran into issues with connecting Conda to PyCharm and getting the script to compile and run on my desktop. This issue should be figured out by early next week. I have also been trying to understand more about RGB sensors and have been reading up more on the CAN bus for signal I/O between the vehicle and the SOC. Also began looking into GPS modules to see if that would be a viable hardware option for our project (assisting with location and movement correction)	10.5	40

O Plan for coming week

This week the whole team will be working on finishing up the first version of our design document and revising our project plan. We also need to edit and repost our design document.

Eric will be working on getting the website to look better. He will be making cosmetic corrections to it by the end of this week.

Tucker will be working on finishing up the radar system comparison. He will also be working on processing sample radar data and modifying Kellen's Keras deep learning model to support two objects per image.

Kellen will be in contact with Vayyar to gather sample data and more technical details.

Eric and Kellen will be working on a test deep learning model to identify and localize two objects per image using the functional API of Keras.

Nihaal will be working find a camera to use with our system. The camera will need good performance in low light and a focus on infinity.

Mitch will be working on radar signal processing with sample data. He will also be looking into thermal imaging and radar signal processing/representation.

Clayton to work on selecting hardware connectors for our wiring harness.

o Summary of weekly advisor meeting

We did not meet with our advisor this week.