

EE/CprE/SE 491 WEEKLY REPORT 06 02/26/2018 – 03/04/2018

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 on better choosing our RADAR and better understanding what our system is going to need to function.

o Past week accomplishments

- We gained a better understanding of which RADAR will be feasible and which one we will chose.
- We decided that we will need a camera for testing at least and we are fairly certain as a secondary sensor as our input for the system.
- Tucker progressed with ETG to order our SoC, which will help in the future for ordering the RADAR that we choose
- Mitch came up with better testing procedures for our system once it is developed
- Kellen was able to explore the use of VGG16 as a feature extractor for our neural network, as well as understand how to use Keras callbacks to better understand model performance.
- Nihaal looked into LiDAR solutions as another solution to detect objects

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.

O Individual contributions

Name	Accomplishments	Hours This Week	Hours Cumulative
Tucker Creger	This week I worked with Ominradar to get a better understanding of their sample RADAR data. I used this to start writing a new MATLAB script to process the data. I did hit a roadblock of my understanding of Delta Sigma modulation with raw ADC values. I also worked on preparing my sections of the Design Document. I also helped prepare a proposal for our client to help them decide on which RADAR system they should fund. Additionally, I worked with ETG to start the ordering process for our SOC, the NVIDIA Jetson TX2. I also started a document regarding which parts of our system will interface over hardware connections.	10.25	69.50
Eric Bishop	Looked into the various edge cases and corner cases that our system could run into. Also looked into how we can house our system and looked up resources available to create our radar and chip box to make the system look prettier. Started to use and look into the Functional API, and its various uses.	6	41
Kellen O'Connor	I worked on developing an understanding of using transfer learning to utilize the convolutional layers of VGG16 for feature extraction and building our custom detection net on top of that. This should help us speed up training on our computers by a large factor because we don't have to retrain the convolutional layers,	6	47.5

	<p>as well as increase object detection accuracy. Use of VGG16 for feature extraction is dependent on the Keras Functional API, so I'm glad to make progress there.</p> <p>I modified our sample data collection script again in order to collect an unlimited number of samples rather than wiping collected data each time, and also changed the format to allow the labeling of an unlimited number of objects in the camera.</p> <p>I also helped write the design document design analysis section.</p>		
Clayton White	<p>Began research on the setup for the complete system. What type of connecting cables, enclosure, and protection needs the system may require. Also looked into any PCB design possibilities that could improve the function/size of the system.</p>	7	36
Mitch Hagar	<p>Came up with testing procedures - Define, design, and develop the actual test cases. Determined what the results of the tests need to be for us to consider the test as passed. I learned about different types of enclosures to use for our final product. Learned how to go about creating a PCB.</p>	5.5	43
Nihaal Sitaraman	<p>This week, I looked for LiDAR solutions and will be working with Kellen on the LiDARs he acquired from SICK. I have been focusing on alternative sensors we can use that will work well with our SOC and our RADAR, whether we go with Delphi or with Vayyar. So far, I have been able to rule out a handful of solutions from a list of 15. By the end of week 9, I hope to</p>	11	51

	narrow down out options to one or two.		
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o Plan for coming week

Tucker will be following up with ETG on ordering the NVIDIA Jetson TX2. He will also be coordinating with our client on finishing a RADAR system. Tucker also plans on researching hardware connector options and the Keras functional API.

Kellen will work on mapping an arbitrary area from one webcam's image to another webcam's image in order to simulate data collection with radar. He will also continue researching methods to perform detection of multiple objects through the use of a modified YOLO network or something similar. He will follow up with Vayyar for sample data to get sent along as well.

Eric will work on looking into using and seeing the various uses for the function API, with the goal of identifying two objects with the camera stream.

Clayton will work on locating wiring harness parts such as connectors and wire.

o Summary of weekly advisor meeting

We did not meet with our advisor this week