EE/CprE/SE 491 WEEKLY REPORT 03 02/05/2018 – 02/11/2018
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 had reduced meetings due to the career fair and to have a focus on technical work on our own. We had our weekly meetings with our client and advisor. We also met with a possible supplier, Omniradar. Kellen reviewed the 15 antenna Walabot kit and found several shortcomings with it, specifically the limited range supported by the Walabot SDK. He was able to modify a demo Python script found on Github to convert the radar image to a numpy array, which is suitable for use with deep learning. Despite the Walabot's shortcomings, this is a meaningful step in working with any radar kit, as real time detection is likely to be performed in a Python script with OpenCV.

o **Past week accomplishments**
  ● Meet with Omniradar to learn more about their offerings.
  ● Reviewed a MATLAB simulation for FMCW radar.
  ● Finished a first draft of our system requirements.
  ● Integrated Walabot demo script with numpy and OpenCV, making it usable with several deep learning APIs such as Keras, Tensorflow, Caffe, and Pytorch.
  ● Explored a Caffe implementation of a Single-Shot Detector for object detection, and modified it for use with real-time RGB imagery. This could be useful for collecting labeled training data.
  ● Decided Walabot may not be the best option for radar
    ○ Reschedule meeting with Vayyar to understand more about the radar unit itself

o **Pending issues**
The major pending issues are deciding and purchasing our radar and SOC units. We have a few options for both but we must decide on our final devices and order them. We also need to know which type of Python library we will be using to be paired with our SOC and radar.

o **Individual contributions**

Name	Accomplishments	Hours This Week	Hours Cumulative
Tucker Creger	Met with Omniradar, and researched basics of deep learning. Contacted autonomoustuff about a RADAR module. Worked on a budget to present to our client. Reviewed a MATLAB simulation for a FMCW RADAR system.	9.5	34.25
Eric Bishop	Reviewed the Walabot kits, and other kits. Saw that various radars such as the Walabot kits will not work at the range we need.	4.5	21
Kellen O'Connor	Reviewed the Walabot 15 antenna kit and determined that it is not suitable for our application due to its limited range. Modified a Caffe-based implementation of a single-shot detector (SSD) for real-time detection, which could help us collect labeled training data. Finished a first draft of system requirements.	10	23.5
Clayton White	Explored radar options in depth. Compared cost, difficulty in usage, specifications, and size. Researched the difficulties of building a	6	19

	radar system given that we have a radar chip and system of antennas.		
Mitch Hagar	Tried to determine different options after determining the walabot kit will not work. Reconsidered what our primary focus is after doing the design thinking homework.	4.5	23.5
Nihaal Sitaraman	Began working on understanding Keras and Tensorflow. Also ran test code and fed in a video to see how the neural net would react. Evaluated another option for radar called Dephi ESR 2.5	7.5	20

o **Plan for coming week**

This week we will be discussing a budget with our client to understand where we must cut costs, and where we will need to be mindful of our spending. Once the budget document is finalized and approved, we may begin purchasing our units. We will also be looking at finalizing a direction for our radar system to begin sourcing parts or a system.

o **Summary of weekly advisor meeting**

      Review of progress from last week

- Progress of Walabot Kit. Next Steps: Attempting to train a neural network over a short distance.
- Hardware selection of radar systems
- Challenges of mapping the radar output in polar coordinates to rectangular.