

EE/CprE/SE 491 Weekly Report 3

Group: sddec19-14

Client & Advisor: Danfoss Power Solutions(Radek) / Dr. Alexzander

Team Members:

Omar Abbas - meeting scribe/report manager

Dennis Xu - chief engineer/meeting facilitator

Aaron Michael - chief architect

Jonah Bartz - continuous integration

User Information Augmentation

2/16 - 3/1

Weekly Summary:

Since we have acquired the Jetson TX2, our goal this week was to get more familiar with the Jetson TX2. First, we flashed the module with the appropriate operating system which proved to be a difficult task given the fact that we have not had all the materials that come in the box along with the actual module.

We have gone about building the kernel and installing the OpenCV package which is responsible for object detection with the camera. The camera features 4 different modes. One of these modes was edge detection which will be responsible for differentiating between objects and their environment. However, overlapping objects may appear to be one object, and so we believe a depth camera may be necessary in order to differentiate between objects in the same channel.

Another thing accomplished this week was getting familiar with the Tobii eye tracker. We have installed the Tobii software along with the SDK allowing us to start writing custom programs for it. We studied the device and became more familiar with its commands and how we might integrate into our design.

Past Week accomplishments:

Last week our goal was to research the equipment we would use for our project. This project will involve the use of various pieces of hardware and we want to make sure whatever hardware we use will be able to 1: connect to our computer and 2: provide the functions we need. One main piece of hardware we were researching was a vision tracking system. There are a few different

types of vision tracking systems out there involving wearable devices and non-wearable. After discussing it with our client, we found out they would prefer to not have a wearable device.

Another piece of equipment we were looking for was a system that is open source. Due to the fact that vision tracking is a relatively new technology, there were only a few non-wearable options. We have decided to go with the “Tobii eye tracking” since our advisor sent us a github repository for it. This is a sensor that will be placed in front of the operator that has capability to track eye movement. The client said he will order this hardware for us along with a few cameras to complete the system. A final goal of this week was to get the intellectual property and NDA signed which we have done.

Pending issues:

- Learning OpenCV library which will allow us to perform image detection using the TX2.
- Connect Tobii eye tracker to the Jetson in order to trade information.’
- Use OpenCV to detect objects in front of the TX2, and use Tobii Eye tracker to determine whether the person saw the object or not.
- The Tobii Eye tracker has libraries for x86 Windows and we are not sure if we can get ones for Linux ARM

Individual contributions:

Now that we have the hardware, it is time to execute part of our plan, which is configuration. We will continue to test this configuration until we find the one that suits us for object detection and communication protocols between all the systems involved. We’ve already assigned ourselves different tasks and here is what we did this week.

Omar Abbas: This week I worked on the TX2 with Dennis and managed to install openCV for object detection and tinkered with the Jetson a little bit. Built and installed the kernels on the Jetson and accidentally connected it to the internet. I also emailed VRAC again to ask a few questions about their set up and obtained a locker for us to store our belongings in. I also began following a youtube tutorial that teaches all I need to know about the NVidia Jetson TX2 and covers the OpenCV aspect, the youtuber is called “JetsonHacks” and has been cited in the references. In addition, I found an OpenCV youtube tutorial that will help me program for image detection, This youtuber is called “sentedex” and is also cited in the references.

Jonah Bartz: -- This week I meet with the client at work and got the intellectual property papers signed. I also received the Tobii eye tracker from the client. This will be another piece of hardware used in our system. I unboxed it and got all the software downloaded to start figuring out the different functionalities of the eye tracker. After downloading the SDK I found there are a

few functions I would like to incorporate into our project. One of those are detecting if the user is looking in a certain area. I wrote code in visual studio to test the tracker and it can detect where a user is looking. For our project instead of writing code in visual studio it will have to be incorporated with pyGaze and instead of looking at a box on a screen it will be the windshield. The idea is that we will notify the driver if they are looking away from the windshield or if they are distracted for too long. The next step will be to connect the Tobii to the jetson tx2.

Dennis Xu: -- For the past week Omar and I played around with cameras on the jetson tx2. We first got the onboard camera working and then we got a basic openCV program running. I also did some research on rangefinders and how useful they might be.

Aaron Michael: -- This week I read about making diagrams such as UML diagrams to help with the creation of the design document. I looked at past lectures from S E 339 and read part of the book *UML Distilled: A Brief Guide to the Object Modeling Language*, by Martin Flowers. I will be looking at another book used for S E 329 as a reference for the design document. Like Omar, I have been looking into the OpenCV tutorial by the sentdex on YouTube to gain knowledge and get a feel for how our project will progress throughout this semester.

Name	Individual Contribution	Hours this week	Hours Cumulative
Omar Abbas	TX2 configuration & OpenCV installation. Obtained locked for belongings. OpenCV training.	5	8
Jonah Bartz	Got the intellectual property document signed. Also researched the open source software for tobii and different programming languages compatible with the Nvidia jetson TX2.	4	8
Dennix Xu	Worked on TX2 cameras and did research on range finders.	4.5	7.5
Aaron Michael	Compared different projection styles (front projection vs back projection) and what projection film will work best for projecting on glass.	3	7

Plans for upcoming week:

We have two main goals for this upcoming week:

- 1.) We want to get object detection working on the Jetson. Now that we have the different camera modes and edge detection working, we need to use Open CV to get those cameras to detect different objects. The reason we need object detection is for eventually detecting lines on the road along with objects that may be in the drivers path to avoid collision.
- 2.) We want to get the Tobii eye tracker connected to the jetson. We have the Tobii eye tracker fully working; however, it is only working on Windows operating systems right now. We have to get the Tobii libraries incorporated into Linux so that they will work with PyGaze and the jetson. This will take the full Tobii functionality on the Jetson and allow us to write custom programs.

References:

“JetsonHacks.” *YouTube*,

YouTube, www.youtube.com/channel/UCQs0lwV6E4p7LQaGJ6fgy5Q.

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