## **EE 491 Senior Design Group Meeting**

# Safe Communication Between Lead and Following Vehicle

## Week 5 Report

#### **Team Members:**

Bradley Stiff- Software Lead, Project Lead Justin Wheeler- Software Lead Sanguk Park- Scribe Lead, Communication Lead Zhize Ma- Scribe Lead, Hardware Lead Junho Chun- Hardware Lead Yifan Lu- Hardware Lead Jose Candelario- Project Lead, Communication Lead

#### **This Week Accomplishments:**

For this week, we met with Vishal and the rest of the teams to get a good briefing of what each team is working on and update their current progress. The meeting briefed on what each group needs to accomplish and set up milestones on when each group should accomplish them. The briefing consisted of the Mechanical Engineering Group, Controls Group, Robotics Group and our ECPE group. This briefing on Wednesday was very important because it gave us a clear idea of what our group was supposed to do and it gave us information on what the other groups were doing.

Mechanical Engineering Group:

- · Created a Cad Model of car, internal components
- · Collected data on ranges and field of view of sensors
- · Currently getting all models together
- · Still waiting on cameras as they don't have cameras

Knowing their roles, we knew that if we were having a hard time with calibrating the sensors we could contact them to help us adapt our software and ROS based on their measurements.

Controls Group:

· Responsible for the trajectory planning

· Implementing python for the particle filter, tracking and finding the measurement between lead and following

- · Currently running these simulations on a bicycle
- · Needs more controls members that know how to code

Luckily for us, our group was not the only ones responsible for the coding portion of the project. Knowing that this group was also using python, we already had a basis for in which the software team can get guidance for how to implement and transfer the data collected by the sensors onto python.

Robotics Group:

- Focusing on learning ROS by the end of the week.
- · Start implement lidar and gps on the ROS stystem.
- Currently passing on obstacle avoidance to controls: controls group is now also responsible for object detection
- · Start using GPS for localization

The robotics group is responsible for implementing the major sensors onto the ROS system which gives us a basic understanding on how to implement the X, Y position onto the radar and lidar sensors. Technically we should be building up on the foundation that the Robotics team sets up.

ECPE (Our Group)

- · Analyze the specs and requirements of the hardware
- Update our milestone (will elaborate after)
- · Need to find a way of having wireless communication between devices
- Find a way to power each component
- · Plan on getting all the data between the sensors onto the ROS
- Figure out highest priority device
- Main role for our group is the X,Y grid position of the lead vehicle

#### ECPE TEAM ROLE:

From this meeting, we got a better idea of how we should approach and utilize the hardware that was given to us. Knowing that our main role was to find the grid position of the lead vehicle, we had to change our milestones a bit so that our set goals were on path to our roles.

ECPE Senior Design Project	Design and Research	What we Know	What we need to Know
Hardware	*Lidar *GPS *radar	Used to measure distance of lead car and obstacles. Used to find X,Y grid position of lead vehicle	How do we get data into ROS
Software	*Ubuntu 16.04 *Install ROS on top of Ubuntu	* Will have to work on the formatting of lidar data *Currently in MKV format	What is a suitable data format for the ROS?
Communication	Communication between the hardware	Lidar has its own IP address and the rest is serial numbers	How many IP connections are present?

	Everyday Workers	Businesses	Research
Commuting	Have a lead vehicle have many other following vehicles for workers that are commuting to a company. A company can do this for all of its workers who have cars.	Car businesses can save on shipping when shipping new cars to the dealerships by having a lead car lead the following new vehicles.	A following vehicle can then be modified for fully autonomous capabilities based on the sensors equipped
Accommodating	Individuals with handicaps or injuries can have a lead car drive to their homes and can help them commute to their workplace. Lost cars can also contact a car to help them find their destination.	If a business has to transport material to a dangerous or remote place having autonomous cars can help cut down dangers and costs.	The research team would want to have the ability of an autonomous car that can be used for testing road conditions or even crashes. For them we would have to make sure our equipment doesn't get damaged.
Miscellaneous	The workers may have tasks that involve many loads but only one person. It would make things easier if one person could be in charge of the whole driving.	Businesses want to cut down on costs such as paying a driver.	Researchers may want autonomous cars for safer tests.

### **Creative Matrix**

For this week, we utilized the data we gathered from each component (we did this in the previous week) and then had a long meeting with each of the other teams to discuss what their current progress was and what they needed to accomplish for the upcoming week. Doing this gave us a better idea of what we should be doing in the upcoming months and then to our next milestones. Our software team of the ECPE group (Brad and Justin) have installed Ubuntu 16.04 and the ROS and are currently playing around with the program in order to get used to using it.

#### **Pending Issues**

- We currently have been in the stage of testing the equipment and gathering data. Compared to the previous two weeks, we have made a lot of progress; however, we still need to know how we will power each device. We currently have the data for the gps, lidar and radar and know how much volts are needed to power them, but we currently don't know if they will use a separate power source for each or if we will need a central power source.

## Individual Contributions (9/23~9/30)

Team Member	Contribution	Weekly Hours	Total Hours
Brad Stiff	Installed Ubuntu and ROS on personal machine. Set up a meeting with Zhisheng to help get us started with ROS. Read some tutorials on ROS to find problem areas and questions for our meeting with Zhisheng. I also helped get our web page started.	4	19
Jose Candelario	Helped write weekly report and worked on gps input cable. Attended the meetings with Vishal and got in contact with the rest of the teams.	12	24
Junho Chun	Worked on Radar to analyze and attended the meetings with clients and other teams. Visiting the lab where project`s materials are located.	3	16
Justin Wheeler	Installed Ubuntu on my computer with ROS. I've also been going through some tutorials and we currently have a meeting set up on Monday to discuss further how ROS can be used effectively.	3	12
Sang Uk Park	Wrote up the weekly report. Worked on GPS input cable, attended IASTATE automotive research center. Discussed with Vishal about what	4	19
Yifan Lu	Attended the Intrans and gathered information on the car specs which we observed at the warehouse. Also	6	18
Zhize Ma	Understanding the basic data information about camera . Attended the meeting in our group and other groups. Meet with clients and visited lab.	3	17