EE 491 Senior Design May 2018 Group Meeting

September 2017~May 2018
Client: Vishal Mahulkar
Advisor: Dr. Hegdey Chinmay

Safe Communication Between Lead and Following Vehicle

Week 11~12 Bi-Weekly 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

Past Week Accomplishments:

During this week we got the antennas for the XBee to extend the reach that they have. We had a smaller reach with the antennas that came with the first model of XBee that we got so we looked into a better model. We found a 900MHz antenna that when attached to the XBee is advertised to transmit up to nine miles with line of sight. We tested the antennas once they got here with simple messages inside coover. We measured the amount of information going through several walls worth of impedance and were able to have more walls in between and still get the information that we needed compared to our earlier version of the XBee. We now need to do some of the same experiments that we earlier did to test how well they do in moving vehicles. We plan on doing this within the next two days.

Distance and speed between our cars will be our main focus of variables and we will see how efficiently the data is transmitted between the vehicles.

We have planned all the connectors needed for the components in the golf car. We concluded that most of the wire parts and some connectors are here at the ETG but have ordered switches to add as an extra precaution when controlling the car. The choice for switches is to be able to turn off any sensor that may be putting up any faulty information that the passenger may see.

For the lead vehicle, we decided to go with the Adafruit Ultimate GPS Breakout - Version 3 GPS unit due to the price and all it offered. The only data we need from the lead vehicle is its latitude and longitude. We also needed to know when these positions were recorded. For this reason, the Adafruit GPS unit offered everything that was necessary. We implemented the python-gps library which is able to give us the following information: time, latitude, longitude, altitude, speed, heading, climb, and status. This is more data than we need but could be useful to have in the future if we need more data transmitted.

Without the GPS antenna, we were only able to see the timestamps from the GPS unit, but the antenna is on the way. We have set up the code so we should be able to plug it in and everything should work once it arrives. All the current code that we're using for the end product has been pushed up to a Github repository.

Soldering the Wires

The PX2 using the PCI-E cable for its power supply has 9 nodes where it uses the default 4 positive and 4 ground pins. There is an extra ground pin which means we will have to create a specialized wire where the extra ground pin is attached to the default 8pin male PCI-E cable.

Furthermore, once we ordered the secondary GPS, we soldered the wire nodes that will be needed when attaching it to the PX2 and other devices. The secondary GPS had 9 pins with the default power, RX, TX pins which gave us the general idea of how the wiring should be set up. The Adafruit GPS also had its own power supply using a CR 1220 wrist watch battery that is used to keep the fix of satellites. The GPS had a belly battery holder which we also soldered on that way the GPS has the ability to store satellite locations.

Individual Contributions (3/24~4/6)

Team Member	Contribution	Weekly Hours	Total Hours
Brad Stiff	Installed Raspbian on raspberry pi along with the GPS packages for lead vehicle. Started learning about the Adafruit GPS implementations with Justin.	8	103
Jose Candelario	Ordered last parts needed as well as soldered the gps parts when they got here. Also tested the new XBee antennas when they got here inside coover.	9	98
Junho Chun	Helped to plan testing with PX2. Discussed how we connect sensors ; radar, lidar to supply power.	5	69
Justin Wheeler	Started learning about the Adafruit GPS unit and implemented a Python script to extract the data from it with Brad.	10	74
Sang Uk Park	Helped with soldering pins to the new GPS. Started to work on a prototype for the PX2 wire.	7	79
Yifan Lu	Planned performance & range testings for the new GPS and antenna and compatibility with the original Xbees.	5	69
Zhize Ma	Help soldering the GPS for test. Make plan for power test, search for power connector.	7	74

Plans for the Next Two Weeks

Software

During the next two weeks, we plan to test the range, accuracy, and efficiency of our system once all antennas arrive. This will include taking two vehicles travelling at varying distances and speeds while transmitting actual data from the new GPS over the Xbee's using the new antennas. Our goal during these tests is to reach a minimum distance of 100 meters between the two vehicles while having a 95% or higher successful transmission rate. At first we will use a simple approach to determining packet loss, but later we will implement a Cyclic Redundancy

Check (CRC) through Python. This will ensure we don't receive invalid latitude and longitude coordinates which could be dangerous.

Hardware

- Have a final wire design for the PX2 and have it successfully powered through the RigRunner
- Test out the distance between the new XBee models with the extended antenna. Our testing method will be the same as the initial test we did earlier this semester.
- Have all the necessary wires connected to the new GPS