**Lab 0. Building the F1/10 Robot Car**

Codes, Report and Peer Evaluation due on Wednesday Feb. 12, 2020 on Course Site

**Major Tasks:**

1. Assemble the hardware components into the car;
2. Install basic software on host computer and Jetson device;
3. Learn basics of Ubuntu 18.04 Linux operating system;
4. Learn basics of motor control via VESC Tool.

**Preparation before the lab:**

0.1 Go to <http://f1tenth.org> and scan the contents under the Build tab;

0.2 Get familiar with the instruments on your work bench and set up the extra set of monitor, keyboard, and mouse on your work bench;

0.3 Gather the hardware components and the hand tool set from the Instructor or TA. Figure out how to store your tools, parts, and robot car in your work space;

0.4 Review safety rules for lab operation. Get to know your teammate.

**Part 1. Hardware assembling:**

Follow the instructions provided on Course Site on how to assemble the hardware components into the F1/10 car. Take photos along the way and document difficult encounters and interesting findings.

* 1. Your report shall summarize the main steps in the building procedures. Make sure to answer the following questions in addition to presenting your results.

Q0.1. What is the type of battery used in the car? What voltage is good to use and what voltage indicates that the battery needs recharge?

Q0.2. What are the definitions of pitch, roll, and yaw? What is a differential drive? What is an Ackerman steering system?

Q0.3. What are the difference between a brushed and a brushless motor? How does the VESC 6 from Benjamin Vadder work? What features of VESC 6 are utilized in the F1/10 Robot car? What do you learn from the VESC Tool? Include the motor testing results from the VESC Tool. If you tried the VESC-Tool Mobile App, report your experience to get up to 10 bonus points.

Q0.4. What problems did you encounter working through assembling the hardware of the car? What did you learn or enjoy most in Part 1 of Lab 0? What suggestions do you have to improve the design or assembling procedures of the car?

Q0.5 What suggestions do you have for the replaced brushed motors, motor controllers and telemetry systems that were originally in the cars?

1.2 Your code submission shall include

File 1: the config xml file you create from the VESC Tool for your vehicle if it is different from the UPenn configuration;

File 2: any video or film you took that may help others with the assembling procedures.

**Part 2. Software Installation:**

Follow the instructions on Course Site to install basic software packages. If you installed software on your own computer or set up wireless router for your own test space, report your experience.

2.1. Your report shall include answers to the following questions:

Q0.6 How long did it take to install ROS, flash Orbitty, and set up wireless network, respectively? Give a rough estimate of time spent on those tasks. Show the results of the installations in your report.

Q0.7 If you tried other installation methods, then report your experience even if not successful.

Q0.8 What problems did you encounter working through software the installation? What did you learn or enjoy most in Part 2 of Lab 0? What suggestions do you have for improving the instructions or procedures?

2.2. Code submission for Part 2 of Lab 0:

If you took or made any videos that may help others with the software installation procedures, then submit them.

If you work out the shell script for installing ROS Melodic on Ubuntu 18.04, submit the script for 10 bonus points.

Otherwise, no need to submit any code for Part 2 of Lab 0.