Individual Lab Report #7

Changsheng Shen (Bobby)
Team D (CuBi)

Teammates: Laavanye Bahl, Paulo Camasmie, Jorge
Anton Garcia, Nithin Meganathan

September 26, 2019

Individual Progress:

During the past two weeks, I mainly worked on:

1. Refactor the existing code base.
2. Clean up the hardware system and wiring.
3. Fix various left-over issues in the software system.

In terms of the refactoring of existing code base, I re-write a few C++ and Python nodes to make the design more modular and easier to maintain. Classes and configuration files are utilized more, while global variables and hardcoded parameters are less. We also cleaned up our Github repository of the project, and discussed about a better collaboration and project management work style by utilizing git more than before, from the experience we gained during internships.

I have been in charge of designing, constructing and maintaining the hardware and electronic system of our robot. During the past two weeks, I did a clean up of the major electronic components and wirings on the upper level of the robot. Major improvement is that connectors are easier accessible, wires are marked with labels such that other teammates are less likely to make mistakes while testing. Moreover, I make extension cables and one-to-multiple splitting cables for batteries, such that other teammates can charge the batteries more easily, as well as keep working with the robot with external power supply by plugging into the additional port reserved for this while charing the battery at the same time.

I also worked together with Jorge to fix various left-over issues regarding the mobility control, state-machine robustness, frame transformation and odometry drifts. A number of small bugs were fixed, and some issues need to be resolved by working together with other teammates, by adding extra functionalities or modules, which requires more integration and testing.

Challenges:

The major challenge we have is regarding the odometer reset, and the consistency of odometer measurement while the mechanical configuration of the system being changed.

Since we have been working on adding the additional caster wheel to the chassis, the tolerance of 3D printed parts introduces some error in the z-axis alignment of the new caster wheel, with respect to the previous configuration. Therefore, the rotation portion of the odometry measurement from the IMU attached to the chassis is affected by this additional tilting angle, with error in the yaw measurement being introduced, due to the slightly misaligned coordinate frames. We did some tests and evaluated that the error is not significant. However, we are also planning to resolve this issue by looking deeper into a method of IMU calibration every time the system initializes.

Teamwork:

As described above, I worked with Jorge to fix various left-over issues from the previous semester, and discussed about how to improve the design of the current software stack.

I also worked with Paulo regarding the placement of the new caster wheel, as well as potential risks and mitigation plan for adding extra components to the existing system.

I discussed with Laavanye and Nithin regarding the design and work plan of applying data fusion in the localization and mapping module to improve accuracy and reliability. We will continue to collaborate on this from now on.

Future Plans:

Our plan for the next two weeks is mainly about defining, categorizing and dividing work packages as individual tasks and assign them to each member.

As my individual goal, I am planning to start on doing a literature review of exploration algorithms and packages that can be used on our system, plus implementing a initial exploration module. In addition, I will start to learn about techniques of multi-sensor based fusion methods, such as extended kalman filter, etc.