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CS 4962

**Lifelong Learning and Career Goals Essay**

Over the course of my studies in computer science, I have had to learn many new concepts and programming languages, some much more difficult than others. Out of all of these, I believe that working on my senior design project has been one of my most formative learning experiences. For my project, my team and I are working on the ground system for a drone: an interface that connects to the drone and lets a user control it and see through its eyes. The project is currently in a highly preliminary stage, so our focus is on delivering a functional prototype that can serve as a good foundation for the teams that will work on this same project in the future. It has been a very new and educational experience for me, particularly when it comes to getting familiar with new systems/technologies.

There are two particular tools that have been most important to our project: Qt, a flexible open-source framework that we use to create the project’s user interface, and ROS (the Robot Operating System), which we use to connect to and receive data from hardware. Due to our lack of having an actual drone to communicate with, my team is using TCP sockets to connect to hardware via ROS references in our Qt interface, which allows us to demonstrate that we can still receive data based on real world factors despite limited resources. Due to my role in the project as the UI lead, I focused mainly on learning and working with Qt to develop our user interface, but making sure I understood ROS and its impact on the project as a whole was just as important.

Nobody on the team, including myself, had any experience with Qt prior to working on this project. As such, I, along with my teammates, had to teach it to myself on the fly. This was easily done through browsing Qt’s online documentation and built-in examples. Many of the examples that came with Qt’s installation were very useful in the development of an initial UI prototype, since they would clearly demonstrate layout principles that I could add to our project. Incorporating those principles into a preliminary version of the UI saved time while still allowing me to easily learn about the complexities of Qt. Indeed, as I delved into it, I realized that Qt had less of an initial learning curve than I expected. Aside from its unique markup language, QML, it mostly uses standard C++ source files to set up any events that can’t be managed within markup files. I actually found QML to be quite similar to CSS, which made it easier to adjust to QML’s different syntax and new features.

The other main tool involved in our project is, as previously mentioned, Robot Operating System, or ROS. ROS is a collection of software frameworks used for robotics software development. It has a wide variety of libraries with many features packed into them, but for the project, we narrowed down our use to two main libraries: RViz and Gazebo. Gazebo allows us to create a simulated three-dimensional world and place objects in them that can record simulated data. Meanwhile, RViz is a way to visualize environments created through methods like Gazebo, sort of like a virtual camera that sends a steady feed of its point of view to us. While ROS and its libraries that we used weren’t what I primarily worked with, I still found it important to learn it so that I knew all the workings of the project. Having had no experience with robotics or ROS itself, I found it interesting to learn the basics, and read over the available online documentation and code examples to give myself an idea of what was happening behind the scenes of our UI.

This project is an important final milestone in my time as an undergraduate. After graduating, I want to go to graduate school, potentially taking a gap year to accumulate more extracurricular work and practical experience depending on how my acceptances turn out. My work in the on-campus NASA DIRECT-STEM research program has helped me uncover my interest in the analysis of large data sets, particularly scientific data. While completing an M.S. in computer science, I will gain a better foundation of what I want as the focus of my future research, paving the way for a future Ph.D. Once I’ve gone through the formative experience of graduate school, I hope to apply my skills either in the industry or in research hubs like JPL, an environment I have worked in in the past and would be more than happy to be a part of again.