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Senior Design

Individual Reflection

The spring semester of senior design was jam packed with iteration and debugging of the Portal Box system. Contrary to the fall semester, the spring semester was hands-on and solely focused on design. I enjoyed this more than the research focused fall semester as there was physical proof of the teams progress towards the end goal of a high TRL Portal Box. However, as the SPE, I also felt that I had my foot in the door with every aspect of the project but didn’t have the opportunity to dive deeper into any one part. I guess this makes sense but I would have liked to get in the weeds of something a little bit more.

The spring semester started with unit tests. This was a very interesting time as I was trying to help out with each DE’s test and writing of the datasheet. It was a new process for me as I haven’t been in a managerial role where I oversaw peoples work. While this is true for the whole workload of the SPE, it really hit me at this point. The unit tests went well and it was a very satisfying milestone. It was the first check-in of the semester and it was exciting to get positive feedback on the progress we had made so far. Another important task that was completed around this time was organizing our locker in the MakerE. While this sounds very mundane, it helped me to take a step back and slow down. Searching through the different components and old versions of the Portal Box helped me to put things back into perspective. It helped me see the bigger picture and where we were going with the project which I believe helped me to realign myself and see the progress that we made. I found it so beneficial that throughout the rest of the semester I would go through the process of reorganizing the locker multiple times.

One of the biggest tasks I had this semester was preparing for and executing the integration test. As the SPE, I was responsible for putting together the datasheet that proved all the individual subsystems were working together properly. Coming up with meaningful performance metrics was the hardest part of this for me. While coming up with simple binary pass/fail tests was easy they didn’t provide any value. I wanted to define metrics that actually demonstrated how the system was performing. The actual testing of the metrics wasn’t too difficult once they were defined, but arriving at the right ones took some thought. I really wanted the datasheet to reflect the intricate design of the system. Eventually, I was able to define performance metrics and test them. While there were some difficulties during the integration test, like certain peripherals not responding due to the fact that we had to wire them on a breadboard while we fixed the PCB, we passed and were able to continue onto phase 5,

By this point in the project, everything felt like it was finally coming together. We weren’t just working on a bunch of disconnected pieces anymore, we had a (mostly) functional, integrated system. That was a major morale boost for me. It felt like the moment where all the planning, coordination, and late nights started to make sense. I could see the value in all the decisions we’d made along the way, and I think that really helped me stay motivated for the final push. Even though we weren’t done yet, having a working prototype made the finish line feel in sight.

From this point on, work on the project was a series of iteration, fixing bugs/mistakes, and designing the enclosure. I felt I worked very closely with Colton during this time, relaying information on what the updated version of the PCB needs to work with peripheral devices and code. For me, a large part of this was mapping out exactly what pins, GPIO, 3.3V, ground, etc. that each peripheral device needed and how to satisfy those requirements with the availability of pins on the ESP32. It was like a large puzzle and one part of the project I really enjoyed working on.

As we progressed towards our end goal, I felt my role really solidified on the team. As mentioned above, I would relay to Colton changes that needed to be made to the PCB in accordance with the peripherals and code requirements. But I also gave a lot of feedback on the enclosure design to ensure it would fit the PCB and peripherals devices securely but also look professional. While I am not much of a coder myself, I would help with testing the Portal Box functions, looking for any edge case failures that may have been missed. It really felt like I was the bridge between the DE’s working on different individual functions. Overall, I liked being in the role of the SPE. I think I have a good mindset and understanding of how to keep the entire end goal in view and suggest changes that will help get us there. While I think I warmed up to the role a little slowly, by not being vocal enough, I think I eventually got to a point where I was speaking my mind, communicating critical information, and assisting in any way I was able to.

This senior design project has been one of the most influential projects/courses I have taken at Bucknell. I felt that my soft skills have developed greatly over the course of this project which I really appreciate as I graduate and go into industry where these skills are essential for success. This was also the first time in my Bucknell career that I have gone beyond the prototype stage for a product, which was an extremely fun experience. It is amazing to see the intricate design considerations that go into making a high TRL product. Another part of this project that really had a positive impact on me is the fact that our Portal Box will go on to live at Bucknell when I am not here. It is very meaningful to me that something I worked on will be here and make an impact on the school.