My SUPER Summer

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OpenLidar Project: Phase 1

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I have been very fortunate to have traveled a great deal in my young life. So far I have been on trips that have taken me to five of the world’s seven continents. So when I say that this summer has provided some of my most incredible experiences abroad, you know that I am not overstating things. This summer in Germany has been both more challenging and more rewarding than any trip I have ever been on. But first, let me tell you a little about my project at the Stuttgart Wind Energy Institute (SWE).

The primary goal of the OpenLidar project is to design a lidar system based on the open source concept. Lidar, which stands for Light Detection and Ranging, is the technique of using laser light to measure distance or wind speed and direction. Being open source means that OpenLidar’s design will be open and accessible to anyone who wishes to contribute to the project. This will allow for easy collaboration between researchers of different institutions. It will also lead to a design that can easily be modified to fit a specific user’s needs. Finally, OpenLidar will be a system that is easy to tinker with in order to come up with new ideas that may lead to breakthroughs in lidar design and performance.

The goal of Phase 1 of the OpenLidar project is to create an abstract definition and conceptual framework for the system. In order to do this, it was necessary to define the modules of OpenLidar and some basic requirements these modules need to meet. Furthermore, to facilitate easy design collaboration, a repository for all documentation related to the project needed to be created.

The first step in the abstract definition of OpenLidar was extensive background research into the existing lidar systems on the market. The purpose of this was to determine how the current systems functioned and what their components were. Using this research, it was then possible to define the modules that should be included in the OpenLidar system. These modules are as follows: Chassis, the physical base of the lidar; Communication, the mode of remote access to the system; Control, the module directing the rest of the system; Detector, responsible for receiving the reflected laser; Housing, the enclosure for all the other modules; Laser, the laser source for the system; Optics, the lenses for transmitting the beam; Power, the power supply for the system; Scanner, the mechanism for changing the direction of the beam; and Storage, the internal data repository. An important aspect of Phase 1 was to identify the dependencies of the OpenLidar system; how the modules interact with each other. The key focus of identifying these dependencies is to provide future designers of the modules with an idea of what inputs they have to work with and what outputs they must provide. Finally, all this information was documented.
following a universal format to make it easy for newcomers to the project to understand what is going on. It has also been collected in a single online location for easy access.

The objective of Phase 1 of the OpenLidar project was to create an abstract definition and conceptual framework of the lidar. This has been completed through the definition of the lidar’s ten modules and their interfaces. The documentation of these modules has also provided a convenient way to access all of this information going forward. Phase 1 has created the framework that can be easily built upon as the project progresses to design.

For me personally as an engineer, this project has been an amazing experience that has allowed me to learn and grow in so many ways. This experience has taught me so much, from insight into a new field to lessons in focusing on the big picture.

First, and most obviously, it exposed me to a new field and technology with which I had no previous experience. Lidar was a completely new concept to me. It was fascinating to learn about the technology itself as well as what its applications are and can be. This also reminded me that no matter how much I may learn and know, there are always new things out there for me to discover.

Not knowing much about Lidar also helped me to become better at listening to advice. Because I did not know much about Lidar, I found myself seeking the input and advice of my supervisors, even on what could be considered the most basic topics. I found that when I did this, I not only got my question answered, but also discovered many things I had not even thought to consider. The applications of this lesson in my studies are limitless, from seeking out the advice of my professors more often for a fresh perspective to getting input on my work from my peers.

One lesson that was reinforced for me this summer was the value of teamwork. I was not alone on this project but was working with three other undergraduate students. This reinforced for me the benefits of working in a team environment. Having multiple people to divide up the various modules amongst really helped reduce the overall workload on any one person. It also taught me how valuable input from team members on your work can be. Some of our best ideas for the project came out of meetings where we would sit down and look through each other’s modules. Individually and as a
group we brought a fresh perspective to each others’ modules. Also, having to explain and defend some of my decisions and definitions to my team helped me to understand better why I made them.

I also gained experience about what it is like starting a project from scratch. Unlike other situations I have been in, this project had almost nothing at the start. All we had to go on was a few paragraphs on OpenLidar’s overall goal. It was up to us to define the rest. This taught me to consider absolutely everything and to take nothing as given when creating the framework for a project.

Another thing this experience taught me was how to step back and look at the big picture. I am a very detail oriented person and want to focus on working out every last feature of something. However, that was not the goal of phase 1 of OpenLidar. The goal was create an abstract definition for the project. While defining the modules, I got bogged down in the details of a component at one point. When I brought my concerns up in a meeting, my supervisors told me not to spend extra time on it. He instead advised me to shift my focus up a level and start looking into the interactions between modules, something we still needed to define. This big picture view was more in line with what our goals were for this phase. It was more important to complete the high level view of the system, rather than getting bogged down in the details.

This summer has taught me so much, from new skills and techniques in project work to old lessons like the value of teamwork that I needed to have reinforced. These skills and lesson have helped me to grow so much over the past three months. They are things that I can carry back with me and apply to my studies and eventually my career. Now let me share some of the challenges and rewards this experience provided.

Probably the biggest challenge I faced all summer was the first week. There were a lot of administrative details to be taken care of, and they did not always go smoothly. One that was particularly difficult was the resident permit. The university requires that all students register with the local government and obtain a resident permit from the town hall.

So on Tuesday a group of us went downtown with a host
student. Unfortunately, we were delayed getting down there, and the office was closed by the time we arrived. So the next morning we tried again. Now, in order to get this resident permit we were told you needed to prove you had the financial resources to support yourself while in Germany. What we did not know was that a US bank statement was not accepted as proof; you needed to show a German bank statement with the required amount. Thus, when I attempted to register for the permit I was told I needed to obtain proper proof of finances by transferring a certain amount to my German bank account. Upon returning the next day after making the transfer, I discovered, to my frustration, that the office was closed and would remain that way for the rest of the week. While this was going on, I had also been trying to get a local SIM card for my phone. This was a trying experience that had me getting lost wandering around downtown Stuttgart looking for a phone store with the right plan. When I finally did find one, I was unable to get the service activated, even after two days and multiple visits to the store.

The combination of the difficulties I was having accomplishing what I thought were simple tasks, combined with being in an unfamiliar place where I did not speak the language was starting to get to me. I began to wonder if I had made a mistake in choosing this program and how long it would be before the summer was over and I could head home. The weekend changed all that.

On Friday I was finally able to get my phone activated and working. Even this little victory was a huge boost for me. Then I spent the weekend enjoying Stuttgart with my new friends. We went to a park, the Mercedes Museum and had a great time. The following Monday I was finally able to get my resident permit. The trials of my first week taught me a valuable lesson: always to look for the bright side of a situation (I was in Germany!) and not to let the little difficulties get you down.
Another important lesson I learned this summer is always to take advantage of your surroundings. The first few weekends of the summer I was content to explore Stuttgart and the surrounding area. Then one of my friends suggested we go to Heidelberg, a town a few hours away. A group of us spent a day there exploring a beautiful ruined castle. After that I started traveling more. I visited the German towns of Konstanz and Tubingen, Zurich and Basel, Switzerland and even the great city of Rome. All of these trips, whether they were just for a day or lasted a long weekend, were amazing. I learned so much about the history and culture of these places, while taking in their beautiful sights. Additionally, all of this travel was made incredibly easy by the impressive train network in Europe. There is so much that I would have missed out on seeing if I had just stayed around Stuttgart.

Travelling around Europe may have been fun, but the most important takeaway from this experience for me is an understanding of what it is like to be an international student. Up to this point, my attitude toward international students has been one of indifference. I knew they came from different backgrounds and even cultures, but I figured that at Purdue we were all having more or less the same experience, facing the same difficulties and struggles. I was so very wrong about that. My experiences here in Stuttgart have showed me, on a small scale, how difficult the life of an international student can be. Being somewhere where they speak a different language and have different social norms can at times be an exhausting experience. My challenge with the residence permit is a simple example of the struggles international students face. My experiences have helped me to empathize with these students, and I am committed to making a better effort to connect with them and make them feel more at home when I return to Purdue.

This summer abroad has been a wonderful and rewarding experience. I have learned new ways to deal with adversity, traveled to amazing places, and come to understand better what those who study away from their home country can sometimes struggle with. This summer has been all that I could have hoped for and more. I am extremely grateful to have had this amazing opportunity to learn and to grow.