Internship Experience Report (If you participated in an overseas internship, describe your internship experience in English.)

I completed a domestic short-term internship in an industry. I did my internship almost 50% by working on-site and 50% working remotely due to the sudden increment in the number of Covid-19 patients in Japan.

Lessons learned and problems faced during the preparation period

To prepare for the internship and to learn about Cyber Physical Systems, I surveyed the research that works on problems regarding improving the efficiency of factory work. I was surprised to know that acoustic sensing is widely employed for context recognition in a factory setting. I also studied the fundamentals of audio signal processing and learned about how audio data is employed in context recognition. One problem I faced during the preparation period is that I had no prior experience in designing sensor devices at the component level. I have programmed android devices for collecting sensor data, but I have never made sensor devices specifically designed to achieve a given target. However, I read tutorials regarding this and prepared myself for the challenge.

Purpose of the internship and the knowledge gained through the internship experience

By completing this internship, I wanted to gain experience in working in a consumer electronics production company and learn about real-life research tasks to increase the efficiency of factory assembly lines. I also planned to get experience in designing and developing sensor data-collecting devices. I wanted to find out the differences between the research conducted in academia and industries. I also wanted to learn about the data processing techniques, and how the data is effectively employed to predict bottleneck scenarios in production lines in real-time. Most of the contemporary studies that employ distributed sensors for sensing purposes mention that the processing would be done in a server but the evaluations regarding the communication overhead and the delays related to it are often overlooked. Therefore, I wanted to get firsthand experience in how these aspects are handled in commercial applications.

What I learned and realized through the internship concerning communications with colleagues, supervisors and/or academic staff

Since I completed the internship both on-site and remotely, I think it was a good opportunity for me to learn about maintaining communication with colleagues in both situations. First and foremost, my supervisor Mr. Itoh Tomoaki was stationed in Tokyo during the entire internship period, so I did not get a chance to meet him in person and get advice. However, we were able to maintain good communication throughout the training over Microsoft Teams and we had two online progress meetings per week where I presented my progress report to my supervisor and colleagues. I also have to mention that they were very receptive to my ideas and concerns regarding my assignments. After several meetings, a researcher from a separate department who is specialized in acoustic sensing joined our meetings and I got valuable comments from him too.

Improvements I made and goals I failed to achieve, and how I will use the experience for your future career

This internship was completely a novel experience for me. As a foreign student, I did not have any prior experience or expectation as to how work is done or how the research is performed in a company environment. Furthermore, I did not have any prior experience in developing sensor data-collecting devices. At the end of the training period, I now have a clear understanding of the practices and the work environment of a company. Also, I could gain a clear perspective of the real-world research tasks in a factory assembly line setting. I believe that the knowledge I gained can be used to recognize improvable I now have the confidence that I can study a problem, design, and deploy a sensor data collecting device to solve it.

I had two major goals that I failed to achieve. The first goal is to connect an external microphone to the existing Multisensor device and integrate that data into the existing data analyzing and visualizing framework. I failed to achieve this due to the inherent architectural limitations of the device. However, I was able to contribute several ideas regarding how to make future versions of this device better. The second goal that I failed to achieve was visiting a factory and collecting data so that I could use the data and develop a system to recognize the locations of the factory workers. This was due to the worsening of the Covid-19 situation in Japan. However, I designed a wearable device that can be employed for this task, and I wish that Panasonic Corporation would put the device for future use.

As for my future career, I like to continue researching technologies regarding Industry 4.0. To do so, I have to have the knowledge to employ sensors to their fullest ability with efficient power consumption. I believe that during this internship training, I gained a considerable amount of that knowledge. Furthermore, I also had experience in the corporate culture of the Panasonic Corporation and how research is done. I believe that I can use this experience to find a workplace best suited to me.

Internship Experience Report (continued from the previous page)

What I learned from working in academia or industry outside of the laboratory

I did my internship in an industry. The purpose of choosing an industry for my internship was to learn the difference between research in academia and in industry. One difference that I found that really differentiates these two types of research is the practicality that must be in research conducted in an industry. Research that we conduct in academia could stay as an abstract concept until it is adapted for an application or replaced by a novel approach. The research in academia does not require to be immediately deployable or implementable in an existing platform. It rather can be a scientific discovery with certain limitations and suggestions to overcome them in the future. However, I believe that in an industry, the practicality of research is much more appreciated compared to academia. This is not a necessary nor a condition in industries because they certainly develop technologies for future uses. Even so, I feel that the practicality of such technologies is highly appreciated in an industry.

Daily life during the internship period

Panasonic Corporation was very flexible when I was designing my internship period. After some discussion with professor Maekawa, I asked Panasonic Corporation if I could work 4 days per week at Panasonic and 1 day per week at the lab. This is because I worked on several projects as a research assistant in the lab. However, due to this arrangement and the yearend vacation being in the middle of the training period, I had to extend the training period from two months to two and a half months. I am thankful to the supervisors at Panasonic for granting me approval for this arrangement.

I was assigned to work in the Panasonic Corporation complex in Kadoma-shi during the internship period. This place is close to the place where I live. I could take the monorail from Toyokawa station, which was within a walking distance to my place, to Dainichi station, and then walk to the office. The commute took about an hour one way.

I worked from 8.30 a.m. to 5 p.m. at Panasonic. After finishing my work, I sometimes went to the lab and conducted experiments related to my research. This is because I thought that it would be hard for me to recover if I left the research work unattended for several weeks. However, this took much effort and energy. Especially, as my training period was from 13th December to 25th February, and as a foreign student from a tropical country, it was hard for me to adjust to the cold weather.

As Panasonic had adapted work from home even when I began working there, there were very few people at the workplace. So, the interactions with colleagues were minimum. I wished the situation was different so I could have learned so much more by talking to them.

Regarding the meals, I had lunch at the cafeteria at the building where I worked. It was cheap, and the food tasted good as well. Furthermore, the food at the cafeteria was less oily and less salty. The calorie count of most of the food options was also low so it was an excellent place to eat for health-conscious diners.

After starting to work remotely, my daily life changed drastically. I could save commuting time and I used the extra time to get more rest. The weather was no more a concern, and I could concentrate more on the work. In that viewpoint, working from home is a merit but there are some obvious demerits as mentioned above.

Important lessons learned from the internship experience

The most important thing that I have learned from this internship is how to work in a group to achieve a singular target. For the first time, I was exposed to an industry working environment in Japan and the corporate culture of a large company. I learned that continuous discussions and adjustments are required to successfully deploy a commercial-level sensing device and the comments from each one of the group members are important in designing such things. Furthermore, I realized that when designing such devices, it is necessary to be ready for future alterations and improvements and unexpected limitations could occur if the design is not done carefully. I consider this opportunity to be a turning point in my life as it completely changed the way I look at research and development. Finally, I would like to thank everybody that granted me this opportunity and all the group members at the Panasonic Corporation for making this internship a success.