

# FY2022 MERIT Course Corporate Internship report

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## Outline of the Internship program

Hosting organization: Kyocera Corporation (Shiga Yasu Plant)

Department: Medical Development Center; Sensing Development Department

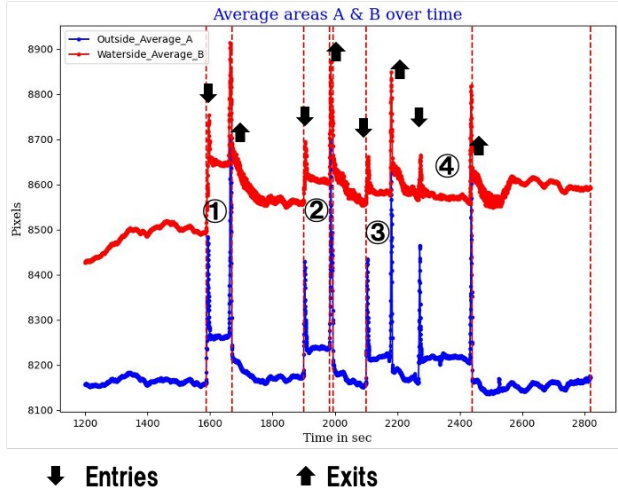
Period: From November 17<sup>th</sup> to December 22<sup>nd</sup>, 2022 (1 month)

Research topic: Development of measurement algorithms for biometric sensing devices: design and implementation of entry/exit detection algorithms

## Content of research activities

*(Please, note that details cannot be provided due to the confidentiality of the research)*

It is reported that the number of deaths during water baths at home in Japan is increasing. However, the reason why there are many cases of death is not clear, and therefore, it is difficult to solve this problem. In this research, the company wants to make a product that can allow preventing death during the water bath based on customer requirements. There are different tasks under investigation to achieve this goal. One of them is to “make a product that can allow detecting entry and exit”. For this task, a thermal sensor is used to record events during the bath. In this internship, I was responsible for developing a software that can convert raw data from the thermal sensor into images and automatically detect the entry phase and the exit phase based on these data. In my work, I (a) reviewed the existing methods that allow the detection of entry and exit, (b) made the requirement specification document, (c) the product design and architecture, (d) coding, and (e) tested and validation of the software. By the end of this internship, the software was developed by making a python program and using a detection algorithm. It was able to automatically output a summary graph where the entry and exit phases can be seen and distinguished (fig. 1).



①, ②, ③, ④ represent the 4 times the entry/exit was performed.

Fig. 1 Output of the developed software implemented on raw data from the thermal sensor

But due to time constraints, the developed software needs to be updated in the future to improve the accuracy of the change point detection. It was found that there are some other parameters that can be efficiently used for the detection of the entry/exit such as the water level (before and after entering) but this parameter was difficult to be considered because the current system does not allow to clearly identify the level of water before and after.

## My impressions

It was a wonderful time not only learning but also getting a deep understanding of the Japanese work environment.

I met many people (Drs, engineers, etc..) who are kind, dedicated, work hard, and who love their work. It was a great pleasure and honor for me to work with all these people. I quickly got familiarized with the team and the environment because of their continuous support, their availability to always teach me, and their desire to know more about my small country (Togo) and my future plans. I am really satisfied for spending this month with them.

## What did I learn?

Before joining the company for this internship, I always asked myself how it happens that new medical products or devices get developed for improving quality of life. But it was difficult to get a good understanding unless I experienced the reality of research at a company.

Joining the R&D of the medical department during this internship allowed me to get a good understanding of the huge and serious work that is behind all newly developed products.

I had the opportunity to learn many new things relating to their ongoing research that I never heard of before somewhere. They are fascinating, innovative ideas and projects. These projects aim at improving the QOL through remote healthcare. Some of these projects are:

Diet monitoring, water bath monitoring systems, monitoring of vital parameters such as heart rate beat, and development of POCT devices for the detection of biomarkers. I wish them good success in these projects and may good results be achieved soon.

Also, before joining the company, I didn't have any idea or any skill related to the project on which I was supposed to work. However, when I started the internship, I took this work seriously, and today, I am very happy that I successfully completed my assignment which was to develop software that would allow determining the entry and exit time based on data from the thermal sensor. Particularly, I can now use Python and write some lines of code that can allow me to:

- Sort my personnel files on my computer automatically,
- Automate some graph plotting that uses data with a similar structure,

I also get skills working with V-model that is an important tool for developing software or a product in engineering.

### **Acknowledgments:**

First of all, I want to thank my supervisors Prof. Takai and Prof. Okamoto, the MERIT office, the MP-CoMS office, and the University of Tokyo for giving me this opportunity to do the internship at Kyocera. This would not be possible without their help and support during the application process.

I would like to express my sincere gratitude to members of the laboratory, especially our group leaders Drs Enrin, Kyomoto, Ikeda Yutaka and Ikeda Junji who put all their efforts together in order to support me in getting the necessary skills during this internship and spend good time at the Kyocera Yasu Plant.

I would also like to thank Mr. Kanda, Mr. Asai and Ms. Kunimune, who worked with me during this period and were responsible for my overall project.

I will never forget the time I spent with Dr. Nishizono, Mr. Mano, Mr. Sawada, Mr. Tani, Mr. Mori, and Mr. Morita, listening to their talk about their ongoing innovative research projects.

Finally, I would like to express my deepest gratitude to my mentors, Junji Ikeda and Toi Kanda, who guided me through every step of this internship and constantly monitored my progress. Without their assistance, none of this would have been possible.

## Some Internship pictures:

- Explanation of the water bath project



- Discussion with my mentors (Kanda san and Asai-san) and review of outputs



- During free time: Left (visit Kyoto with Dr. Ikeda, my internship supervisor); Right (Dinner with Drs Enrin, Ikeda, and Asai-san)

