

## 2012\_Japan\_AIW\_Golebiewski

My internship at Tokyo University was three months in duration and started the 22<sup>nd</sup> of June and ended the 20<sup>th</sup> of September. I was supposed to work at the Medical Image processing and engineering laboratory of Prof. Nakajima. The description on the form from IAESTE led me to expect to work on a medical imaging or virtual reality project, which really motivated me because I had no experience in the field but I wanted to create something in these fields as they are amongst the most interesting for Biomedical Engineers.

The laboratory of Prof. Nakajima has around 15 students, most of which are Master's students. Some Ph.D. students also work at the Nakajima lab. The Nakajima lab has several main research venues, namely Augmented Reality Surgery Systems, Robotic Surgery Appliances, Advanced Imaging Modalities for laparoscopic medical devices, Image Processing for Computed Tomography and Brain Computer Interfaces. After what I would call an "Orientation Week" in the laboratory, during which I settled into the lab and the situation, I was asked to find a research venue that I was interested in. I spoke to several of the students but everyone in the lab was so extremely busy as Master's and Ph.D. defenses neared that they couldn't with me very much so I only caught glimpses of their work. A big problem was the language – the majority of students here could understand English if I spoke slowly, but replying beyond a basic level was virtually impossible for many. That was a pity because the work in augmented reality brain surgery was really interesting but it was in its early stages and efficient communication would have been quite difficult – so I opted out of those subject areas. Some students were also implying that they do not see how they can help me get into their subject because of the language barrier.

After two weeks of Japanese study and attempts to communicate I found one of the Ph.D. students was actually feeling sorry for my waste of time and offered to help me after I asked him about the Brain Computer Interfaces and told him about my interest in Neurology. So he gave me some guidance on how to get into the subject, understand the medical theory, the physics behind it and talked with me about my ideas how to improve a P300 based spelling BCI. I then went about reading several research papers that were given to me by Yaming-san so that I could communicate with him on the same level which did not take as long as he expected as I was already familiar with some aspects of BCI systems.

After researching for about two weeks I asked if it were possible for me to use the BCI system so that I can experience the problems of communicating through one's brain signals first hand. Yaming-san subjected me to several spelling tasks which he had designed and, all in all, the trails took over two hours to complete. After that session I had to install and configure and compile the source of BC12000 on the lab's computer but those computers were so painfully slow that I decided to do all on my notebook because that speeded things up considerably. I then learned how to visualize and statistically evaluate my data.

The next weeks I spent furthering my understanding of the physical workings behind the data I acquired and looked into a presentation from Penn State University covering some ideas about improving the BCI signal processing using a method named Signal Fraction Analysis. The aim of this method is not so much to remove noise but to remove features not correlated with the phenomenon that is actually observed. While this is a form of noise, the way it is treated differs from the traditional frequentist interpretation of noise. PCA or Principal Component Analysis has the same aim and is commonly used to filter out contributions of undesired sources. I made an implementation of a much simplified Signal Fraction Analysis approach using only a small part of the full Signal Matrix because I ran out of memory again and again.

After that I wanted to do the procedure called "Offline replay" – seeing the spelling application on the screen and watching as the classification decides what the user wanted to say. This proved a challenge and I had to use Yaming-san's help because the custom spelling applications he created were incompatible with the existing standard OfflineReplay application.

After successfully replaying spelling sessions using old data recorded by Yaming-san in May he and I convened to develop a schedule for my stay so that I have something to adhere to and thus actually

be able to feel a small sense of accomplishment as I progressed in my studies. We set a schedule for me to try and study the CNV component that appears during tasks that carry a certain degree of predictability and thus allow the brain to have “expectation”, of which the CNV is an indicator. I had to prove statistical significance of the CNV signal in my own data and plot graphs showing its existence and meaningfulness in terms of an online spelling environment.

Between all the research there were many activities with other IAESTE interns, most not organized by the less-than-effective Local Committee, that deterred me from focusing on the work sometimes. It was a pity that all the events planned by the Local Committee were so stringently planned that they simply could not be fun, except for the very expensive ones and even there it was very difficult to enjoy oneself because the Local Committee members would continually remind us of what to do and interfere in anything we did or thought. It usually felt like being in a prison. The unofficial events, which of course also involved TLSC students were much better.

There were many visits to cultural sites in Tokyo and introductions to specific parts of the city. What I missed was a more coherent, strategic effort to show us Japan – all the events seemed to be isolated from everything else and so many interns were forced to do exploration of their own – this was also helped by the fact that almost all interns at Tokyo Daigaku had very very little to do and thus couldn't develop any discipline in their work ethic. That should be addressed –most IAESTE trainees that come here do not want a constant feeling of vacation, they want a challenge – that is why I chose Tokyo University and that is why many of my fellow internship students chose Tokyo University. Many are disappointed by the lack of goals to accomplish and the lack of professional guidance. Interns who work at a private company have fared much better in this regard.

I lived in a male only dormitory in Higashikoigakubo, 20 minutes away from the nearest train station, Kokubunji. This was a very big deterrent for all the interns at the dormitory: around 100 minutes of travel, one way, to go to University. It could be argued that finding a dormitory closer to University was possible as the University housing office itself offers cheaper and closer accommodation for international students in dedicated student halls. Maybe in the future a deal for IAESTE could be struck.

Another episode was the Obon period in August that I was aware of but nobody in our lab could tell us if we get a free week or something like that, unlike other laboratories at Tokyo University that had internship students. If this could be communicated better and if this could be coordinated between all laboratories that have internship students it would make the experience much better here.

I can recommend an internship at Tokyo University in any field mainly for the opportunity to visit a very strange country and to see and verify your preconceptions about Japan. If you do not expect to work very hard, you will be satisfied. But remember: you have to take care of being given a purpose yourself, at least at Uni. I recommend going to Japan on an IAESTE internship at a private company WITHOUT ANY RESERVATIONS. I met enough IAESTE intern at corporations to know that such is the best way to grow personally and professionally!

All in all it was great time here in Japan but I would have hoped to learn more practical skills and have more supervision to see my development go further.

同も有難う for the experience and chance to come here

Dawid Horacy Golebiewski