

Report on the Demamech Exchange  
Programme 2005/2006

Lieboud Van den Broeck

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# 1 Personal Data

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**Host institute:**

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Faculty of Science and Technology  
Department of System Design Engineering

Supervisor: prof. Hideki Aoyama

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Japan

## 2 Travel Schedule

### ***March 31:***

British Airways:

Brussels - London

London - Narita

### ***September 1:***

British Airways:

Narita - London

London - Brussels.

### 3 Executive Summary

Last year, I decided to go on a student-exchange. For this student-exchange, we have at our home university (KULeuven) normally the choice out of a lot of European universities as a part of the Erasmus program. My supervisor in Belgium told me that it was also possible for me to go to Japan instead of just going to a European university. I had to give some thoughts about this program, as it was something I didn't expect as a possibility. But after having it given some thoughts, I decided to join this program as it gave me a once-in-a-lifetime possibility to go to a country as Japan for such a long time, in the quite relaxed atmosphere of student exchange.

During this exchange, I was supposed to take some lectures. More specifically, I took 7 lectures (which are commented in more detail in paragraph 4 of this report). Besides that, I was also supposed to learn more about Japanese culture, to improve the mutual knowledge of European and Japanese studies and approaches of technology.

During my lectures, I learned about 7 different kinds of technology, as these lectures were supposed to be equivalents of my Belgian lectures, which are assumed to give me a broad background of technology.

To learn more about Japanese culture and history, I tried to travel a bit around Japan. Especially the travels to Kyoto, Osaka and Hiroshima (and of course to Tokyo) learned me about the way Japanese culture started, and is established now.

Another, and certainly as valuable experience, is everyday life in Japan. During everyday life, I started to get a feeling about Japanese lifestyle. This lifestyle is at first a bit frightening as everything is in Japanese, and most people don't speak English. Once you're settled though, and you know what to get where, life starts to get really comfortable.

Also the contacts (although not as much you would like sometimes) with Japanese are really valuable, as they bring you in contact with the real Japanese people. Once you get to know them, and they aren't afraid to speak English, you see that most Japanese are friendly people.

## 4 Lectures and Labwork

### 4.1 Lectures

During my time in Japan, I took the following courses:

1. Computer Architecture
2. Computational Structural Mechanics
3. Advanced Design and Production System
4. Technical English Writing
5. Aerospace Propulsion
6. Advanced Course on Digital Communication Theory
7. Information Optics and Optical Measurements

A short description about what's seen in these courses is given below:

#### Computer Architecture:

This lecture talks about memory-processor-input/output interaction. Hereby, we were focused on parallel computer architectures and parallel programming. This was discussed in topics like: synchronization, consistency models, packet transfer ... Each lecture, assignments were given, which in total counted for 50% of the final grade. In the final class, an assignment was given in the form of a contest (Parallel Programming Contest, language is C++, C or Fortran). This final assignment counted for 50% of the final grade.

#### Computational Structural Mechanics:

This course started with an overview of the mechanical behavior of materials and their mathematical expressions. Then, there was an introduction of linear and nonlinear finite element methods. Every class, an assignment was given (exercises or computer calculations using MARC), which determined the final grade.

#### Advanced Design and Production System:

This course was divided into two subsections. The first subsection was about tribology. In this lecture, we learned about the fundamentals of tribology, and we went in more detail about a new topic, developed at Keio University, namely ERG (electro rheological gel). For this first section, a presentation was required.

The second subsection was about Multivariate Analysis in the design of systems. Here, we studied multiple methods for analyzing systems, depending on the origin of the influencing parameters and the existence of goal-variables. For this second section, a report was required about the different methods described during the lectures.

#### Technical English Writing:

In this course, we learned about giving presentations. We also got some lectures about writing abstracts and summaries. During the lectures we got some points which we should pay attention to during a presentation. Afterwards, we had to practice them during practice sessions. Grades are based on the writing of an abstract and the giving of 2 presentations.

#### Aerospace Propulsion:

In this course, the main topics were: nozzle theory, chemical combustion, trajectory calculation ... During classes, we got an overview of the necessary aspects of physics, thermodynamics and mechanics, and of the applications of them in aerospace propulsion. Each class, we got an assignment, and in the last class, there was an examination.

#### Advanced Course on Digital Communication Theory:

This course focused merely on the use of digital technology in wireless communications. Besides the wireless communication, we also got some short overviews of wired communication. In the lectures, we got an overview of modulation techniques, error correcting techniques, spread spectrum techniques ...

For evaluation, we could choose: either make a presentation about a recent topic in digital wireless communication technology, or write a report about wireless communication. I choose to give a presentation. This presentation gave an overview of the 3 current standards used in digital broadcasting (ISDB, ACTS and DVB). In the presentation, I focused on the theoretical background of these 3 standards, and their advantages and disadvantages.

#### Information Optics and Optical Measurements:

In this course, we started with a very brief overview of geometric and wave optics. Then we continued with a more profound study of wave optics. Hereby, we always kept practical use (for optical measurements) in mind. In the last lectures, we focused on measurements of biological tissue. The last class, an examination was held.

In general, most of the lectures gave an introduction about some topics. These topics had to be further studied by self study in the library, on the internet ... to make the assignments, and writing reports.

## **4.2 Labwork**

When I arrived in Japan, it was not completely clear I also had to do some research. This had as a consequence, that I was not assigned to a lab which did research on topics I'm usually working at. This resulted in some problems with getting to know what to do, and understanding the programs I had to use. This, combined with the fact that I also had to spend time at my lectures, resulted in the fact that I merely focused on doing some literature survey, and on understanding the programs I had to use.

During my research, I had to write an application for the Phantomdevice. This is a device with forcefeedback, which can be considered as a joystick with multiple degrees of freedom. This device is used by example for simulations of surgery, games with forcefeedback, simulations with touching something in general ...



**Figure 1: The Phantom Device**

For my research, there was asked to write an application, like b.e. a game. To do this, I started with studying C++. As I never learned this language at my home university, this took quite a lot of time, as I had to study this together with taking lectures and doing some selfstudy. During a couple of months, I spent most of my free time on studying C++. This was also useful for one of my lectures, as I had to write a programme in this language for ‘Computer Architecture’ (see also paragraph 4.1).

Afterwards, I started with analyzing the available examples of the software which came together with the Phantom Device. While studying these examples, I realized that I also needed a more profound knowledge of Open GL, to write a program which would be capable to have some visual effects.

After spending some time in trying to understand all this, I started with writing some basicprograms to see if I understood the basics of the program. I arrived in doing so, but due to the fact that the university was unexpectedly (for me) closed for 1 week, and I didn’t have any prior knowledge about the programmes I had to use, I didn’t arrive on writing a real application for the Phantom Device.

As a conclusion, I can say that I did a research on the Phantom Device. I started with studying C++, did a literature survey about this device and I also learned some basics about forcefeedback in general, and the Phantom Device more specifically. I arrived on understanding, modifying and writing some basicprograms for it, but due to a shortage of time, I didn’t arrive on really writing a big application for it.



## 5 Exchange Student Life

During the first days/weeks I spent here in Japan, I mostly consecrated my time on getting to know the place where I was living, and getting to know where everything could be got and could be done. This gave some problems in the beginning, as everything was new and in Japanese. Luckily, we were helped by a tutor (assigned by the lab), to resolve the first practical problems concerning administration and getting a bank account. Afterwards, I started to get to know the neighbourhood, and I was helped by the people of the international house, who could help me with telling what to get where.

Life in Japan is off course in Japanese, and normal people had a surprisingly low knowledge of English. This posed some problems in the beginning, but after some problems in the first days, I started to live with it, and I knew what I could do and ask, and certainty what not. Luckily Japanese people were mostly friendly, so even if they didn't understood me completely, they would try to help me as much as possible.

If you want to sport on a regular base, it's worth joining a circle. The problem in my case was that most people in my circle almost didn't speak English, so this was very hard to join them sometimes, especially in the aftersport-events, which are often equally important as the sporting itself.

Besides sporting ..., Tokyo is of course a great place where I could almost do whatever I wanted. It was a very convenient place to go shopping, visiting places, going out, ... and this all on just 30 minutes to 1 hour. Besides going to Tokyo, I also tried to travel a bit around Japan. During the normal weeks, I visited Tokyo (or the surroundings) in the weekends. During Golden Week, I went on travelling to other parts of Japan, like Kansai, Hiroshima, and the northern part of Kyushu.

Daily life at university was usually quite the same during the normal academic year. This usually resulted in the following rhythm: Waking up and going for the first lecture in the morning. After these lectures, I went to the cafeteria for lunch. After lunch, depending on the day, I went for a second lecture or I went to the laboratory. If going to the laboratory, I spent my time on making homework's or revising lectures, or I spent my time on doing some research for my labwork. In the lab, I usually stayed till 6-7 o'clock, when I went back to my apartment. Depending on the day, I went to diner then in local restaurant with some friends, or ate something at my apartment.

## 6 Summary

I decided last year in March to come to Japan as an exchange student. This meant that instead of a whole year of exchange, I only went for half a year. I nevertheless never regretted this decision, as I had one of the best times of my life here in Japan.

During my half year here in Japan, I took 7 lectures. During these lectures, I learned about various aspects of technology.

Considering normal life, Japan was challenging for me as most people speak very little English. It nevertheless was very fun, as I had the possibility, to meet a lot of new people, and to have a lot of new experiences.

As a conclusion, it was an experience, I will not easily forget.