DeMaMech exchange project in Technical University of Berlin

Hokkaido University　So Horiuchi

1　Personal Data

- Name: So Horiuchi
- Home Institute:

University:	Hokkaido University Graduate School of Information Science and Technology
Division:	System Science and Informatics
Research Group:	Informatics for System Creation
Lab:	System design and modeling
Address:	North14 West9 Kita-ku Sapporo-shi Hokkaido 060-0814 Japan
Tel:	+81-11-706-6449
Supervisor:	Associate Prof. Dr. Satoshi Kanai, Prof. Dr. Takeshi Kishinami

- Host Institute:

University:	Technical University of Berlin
Department:	Mechanical Engineering and Transport Systems
Lab:	Engineering Design and Methodology
Address:	Secretariat H10 Strasse des 17. Juni 135 D-10623 Berlin, Germany
Tel:	+49 30/ 314- 23341
Supervisor:	Dipl. Ing. Bruno Gries, Prof. Dr. Lucienne Blessing,

2 Executive Summary

- Period

September 2004 – February 2005 (6 months)

- Research and Laboratory life

I had belonged to Engineering Design and Methodology laboratory (Department of Mechanical Engineering and Transport Systems) and had researched. The theme of my research is “The research on user interface specification by using XIML and a state chart for usability assessment” and I’d researched about usability in product development process. In the laboratory, Dipl. -Ing. Bruno Gries had given me advices for the research and had taken care of me. Basically, I had a meeting for the research with Dipl. Gries a week and I wrote a report at the end.

- Lecture

I had two lectures. One is Systematic Product Design and the other is German course. Systematic Product Design contains structure and life-cycle phases of technical product; product development process; methods for product planning, task clarification, concept generation and evaluation; development size ranges and modular products. Especially, the lectures about product planning, task clarification and evaluation are interested for me because they are related to my research area.

As for a German course, I had a beginner course of SKB (Die Sprach - und Kulturbörse der TU Berlin) in November and December. It was efficient for surviving in Germany. I still have big trouble in German but I could study its foundation and I got interested in it. Therefore I’d like to continue to learn German after going back to Japan.

- Exchange life in Berlin

At first, I had many troubles because I couldn’t speak German at all. But there is buddy system in TU Berlin and my buddy helped me so much. The dormitory is near from TU and a kitchen and bath are shared. I met many students from many countries there and they also gave me a big help. I still keep in contact with some of them.

There are many attractive places and events in Berlin. While I had stayed there, there are Christmas market, New Year’s Day, Berlin Film Festival and so on. And more, there is world heritage in the city, and we can see many kinds of operas, musicals and concerts in a very reasonable price.

3 Travel Schedule

04/09	03	・Departure from Sapporo ・Arrival at Berlin (via Narita and Munich)
	13	・First day of the German course
	15	・First visit to the laboratory
04/10	08	・Last day of the German course
	19	・First lecture (Systematic Product Development I)
04/11		
04/12	19	・Christmas party of the Lab
	20	・Winter holiday
05/01	02	
05/02	18	・Examination of the lecture
	25	・Submission of the research report
	28	・Departure to Delft

I arrived at Berlin September 3rd. I spent almost 1 week for registrations.

As for lectures, the German course for exchange students was started at 13th (from September 13th to October 8th). Winter semester was started from 3rd week of October. In the semester I had "Systematic Product Development I" from October 19th to February 15th. Therefore I planed to stay there after that (end of February). And I had an oral test for the lecture 18th February.

As for laboratory life, I visited the laboratory September 15th. I had belonged there till end of February 2005 undertaken a research and written a report.

End of February 2005, I moved to Delft in Netherlands by train.

4 Research and Lecture

Title: The research on user interface specification by using XIML and a state chart for usability assessment

4.1. Background

Recently, digital devices have many functions and become more complex. Because of this, the awareness of the design for usability in the product development phases is strongly needed for companies and the User Interface (UI) becomes to have a big role of the product's quality. Reflecting such a situation, ISO13407 (Human-centered design processes for interactive systems) was established. That means the difference of the UI gives big difference to the product's usability. Actually, there are many devices which have almost same tasks but different UI like a mobile phone. Therefore, the usability assessment of the UI in product development process is becoming very important.

In the current development process, the user test (which makes subjects to operate a mock-up) is mainly applied for the usability assessment. But it has problems about time, cost and objectivity. So developing the products in low cost and in the short period with considering the usability is required in order to satisfy the needs of customers and companies simultaneously.

The usability assessment of digital devices consists of the assessment from physical aspects (operability of the buttons, visibility of the displays) and the assessment from cognitive aspects (understandability and efficiency of the UI operations). Therefore the assessment from both aspects on one mock-up simultaneously is desirable for enough usability evaluation. Fig. 4.1 shows the typical mock-ups and UI embedded mock-up in the existing development process in order to evaluate the usability of a UI. Mock-ups are categorized in 3 groups (the mock-ups

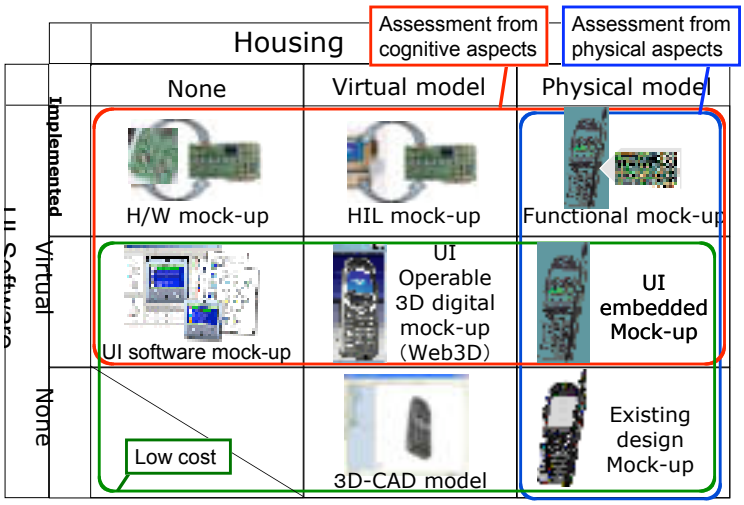

Fig. 4.1. Mock-ups in the development process

which can be assessed usability from cognitive aspects, the mock-ups which can be assessed usability from physical aspects and the mock-ups which can be prototyped in low cost). It shows no existing mock-ups realize the assessment from both aspects in a low cost and in the early phase of the development process. To realize the mock-up which satisfies all conditions, we proposed the UI embedded mock-up.

When usability assessments by using above mock-ups are undertaken, the specification data of the UI has also important role. In order to apply a specification data for the designing and the usability testing, it should include the information for the usability assessment and is easy to be redesigned based on the results of the usability assessments.

4.2. Purposes

In order to realize above conditions, we proposed UI embedded mock-up. In this research, we propose the UI specification method which is applicable for the user test by using UI embedded mock-up. The conditions required for the specification are that

-it is easy to be described
-it has both UI's structural information and behavior information
-it is easy to be diverted for other products.
-it is applicable for the user test
-it is applicable for the simulation test before the user tests
-it is easy to be re-designed based on the results of usability tests

The structural information describes the UI's components and construction and the behavior information describes the superficial behavior of the UI.

Additionally targeted products of this research are handheld digital devices which have at least one display and some of push buttons and slide switches (e.g. mobile phone).

We combine the existing UI specification techniques and propose the UI specification method which satisfies the all above conditions.

4.3. Existing UI specification techniques

In order to propose UI specification which satisfies above conditions, we researched existing UI specification technique. Table 4.1 shows the result.. Each criterion is rated between 1 and 5. This table shows the state chart diagram and the XIML get high score and they have complementary characters each other. From this result, I decided to propose the UI specification technique which consists of the state chart and XIML in order to satisfy all requirements.

Table 4.1. The characters of the methods

	State chart	Use case model	XIML
Versatility of specification	1	1	5
Understandability of diagram	4	4	1
Adaptability of describing UI	4	3	4
Ease of applying its data to usability tests	3	3	4
Ease of redesigning	1	2	4
The description of detail of tasks	5	3	2
Ease of manipulation by the computer	5	1	4
total	23	17	24

Versatility of specification: the specification data can be reused for latter similar products.

Understandability of diagram: the diagram can be understood easily.

Adaptability of describing UI: the technique is suitable for describing UI (because some of them are proposed not only for UI).

Ease of applying its data to usability tests: the specification is applicable for usability test (especially for user test).

Ease of redesigning: the specification is changed any part of them easily.

The description of detail of tasks: the specification has detailed information about detailed process of functions.

Ease of manipulation by computer: the data is suitable for being manipulated by computers

4.4. User Interface design with XIML and matrix algebra

In this method, the designer describes the UI specification as the XIML model. The XIML model basically consists of the Task model, the Domain model, the Dialog model and the Presentation model. Therefore designer can define the abstract tasks, the information which is viewed and manipulated by the user, the operations which the user can operate to realize the UI's task and the appearance of the UI.

However the XIML model is not good for describing the behavior of the UI. Therefore we use the state chart to describe the superficial behavior of the UI at the same time. The problem of the state chart is that it needs time and effort to describe. Because of that, we don't want to describe the state chart directly by hands. (When we undertake usability tests and redesigning

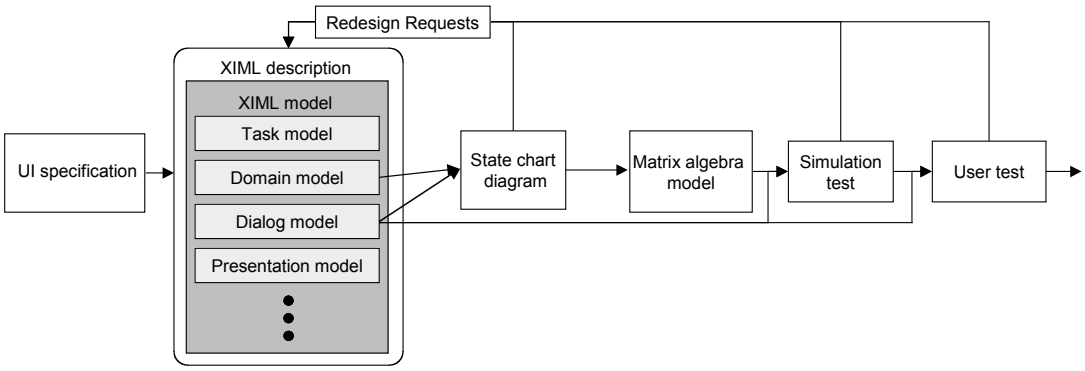

Fig. 4.2. The data flow in the UI designing

many times, we need to describe the state chart many times in order to reflect the changes.)

Therefore, we propose the algorithm to translate from the XIML model to the state chart. By applying this algorithm, we can get the state chart from the XIML model. And when the designer wants to re-design the specification, he only needs to change the XIML model. The outline of the data flow is shown in Fig 4.2. At first, the designers describe the XIML model based on the results of product planning. At that time they have to write at least the Task model, the Domain model and the Dialog model. And when they describe the state chart, they apply the algorithm for the Domain model and the Dialog model and create the state chart. When they redesign the specification, they can get the redesigned state chart by changing the XIML model. In the next section, I explain about the conversion algorithm.

4.5. The algorithm of the conversion

When we consider the state chart of the interactions between the user and the UI, the transition arrows mean user's actions to UI and the states mean the states of interaction information of UI. Therefore, it can be made from the XIML dialog model (which represents user's actions to UI) and the domain model (which represents information of interactions between the user and the UI).

In this algorithm, the fundamental rule is that the <DIALOG_ELEMENT>s become the transition arrows, and the <"pre" CONDITION>s and the <GOAL>s of <DIALOG_ ELEMENT>s become states.

4.6 Conclusion

We proposed the UI specification method which consists of XIML and the state chart. In order to realize that, we invented the algorithm that converts a XIML model to the state chart.

This specification contains both UI's structural information and behavior information, and can be diverted a part of the specification for the other products (this comes from the XIML's character). And we can describe the state chart diagram systematically following to the algorithm. So we can say the effort for describing the state chart is decreased.

5 Exchange student life

5.1. Dormitory

Dormitory was near from TU Berlin (10 minutes from TU on foot). And there is near from S bahn station. So, the dormitory was good for going to both school and city. On my floor, there are more than 10 students who are from China, Turk, Netherlands, Germany and so on. It was not easy to communicate with them because they communicate in German and some of them can't speak English. But it was fun and they helped me to live there.

5.2. University

In the laboratory, I had researched in Computer room of the laboratory with another exchange student from Keio University. We received the room key, so we always could use the room. So we usually researched there and sometimes drank coffee with members of the lab in the morning and coffee time. We'd eaten lunch in the university or restaurants near the university.

Fig. 5.2.3 is a picture of the Christmas party of the lab. This party was taken placed 19th December and after this, we had winter holiday.

Fig. 5.2.1 TU Berlin

Fig. 5.2.2 Computer room of the laboratory

Fig. 5.2.3 Christmas party

5.3. Berlin and surrounding

In usual, I ate dinner in the restaurant. In Berlin there are many good restaurants. And more, there are many kinds of beers in Berlin and they really taste good. So I went to drink in almost every weekend.

In this 6months, I went to many places in Berlin and surrounding. There is a world heritage in Berlin. The world heritage, the museum island is very beautiful. There are many museums in the island and all those museums are beautiful architectures.

Moreover, I traveled to Hamburg and Potsdam. There are also beautiful cities. But Berlin is a very big city enough to do everything for life. So it is not necessary to go to other cities. (On the contrary, it is not easy to live without going other cities here in Delft Netherlands)

Fig. 5.3.1 Berlin Zoo station

Fig. 5.3.2 old national gallery

6 Suggestions to the Project

When I applied for this project, one of my purposes was to do research in a different research environment. I could meet the purpose.

I got good environment to research and members of the laboratory always helped me. So I could undertake a research and wrote a report of that. So I have no complaints about the environment. Only one problem for me is that academic schedule of those universities are little bit different. So many lectures of TU Delft are already started when I arrived at TU Delft.

7 Summary

This was my first experience to study abroad. I could experience different country, culture, university and laboratory. Everything was new for me and I could get many things in this 6 month. I have more 5 months in Delft. So I'd like to spend student life in Delft based on my experience in Berlin.