GUI Usability Development Tool with Dynamic *Kansei* Labeling

- -*Kansei* Evaluation Method for Understanding the UI Process-

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Abstract: As for GUI usability evaluation, questionnaire form and protocol analysis that analyze users' consciousness and unconsciousness are mainstream. As one of techniques of protocol analysis, development of logging tool is very much done and research of method for handling statistical data that acquired with logging tool is also popular. However, though logging tool could catch user's behavior as quantitative data, it couldn't catch *kansei* as qualitative data. In other words, even if a result (quantitative) data could be caught, a user's experience (qualitative) data couldn't be caught. It is clear that an experience is important in the understanding process.

In this research, we develop an application for compressing protocol. Firstly, we classified user's behavior from user test movies. Consequently, a user's behavior has been classified into 13 kinds. 13 kinds of items were Stuck up, Confidence, Confirm, Watch preview, notice own mistake, label following search in pop-up menu, trial and error understanding, learned effect, select tab, confusion, comparison these behaviors were used as the *kansei* label. Observer stuck it on user behavior context in movies and context was captured with *kansei* label. Next, user's behaviors with *kansei* label were classified into each label. Then label was structuralized using KJ method and user's protocol was indicated as a map.

In the result, since an observer's awareness of the issues are expressed as label, adding label and structuralized are an act that creates an observer's mental model rather than user's mental model. In order to express a user's mental model more clearly, it is necessary to research on the usage of the label.

Key woods: usability, kansei evaluation, understanding process

1.Introduction

We carried out MFP's* GUI** usability test in Germany, France, United States of America, and Japan last year. After these user tests, although we evaluated these user test movie with protocol analysis method, we found some problem in protocol analysis method and evaluation. These problems can be summarized as follow:

- Result of evaluation was lacking in a unified view, because we carried out user test in four countries and observer who evaluate user test was different in each country. Therefore, it is doubtful whether results of evaluation are reliable or not.
- Importance of problem which was distilled from user test movie was not clear.
- We cannot classify user model. (User model means structurized user behavior.)
- We need a lot of time to evaluate user test movie with protocol analysis method.

・ Observer cannot tell problem to designer well, because a designer cannot realize a problem, unless he or she see prolonged user test movie.

In this research, we try to develop a new analysis method that could catch user behavior efficiently and assist the observer in creating user model to solve these problems. [1], [2] For that reason, we direct our attention to *kansei* behavior, because we thought that *kansei* is concerned with UI understanding process.

Understanding process is one of function of brain. Function of brain can divide into logical and illogical. *Kansei* is a part of illogical, and it is surely concerned when user is going to understand GUI. We distill *kansei* data from user test movie with *kansei* labeling method and application that we made. Then we generate a compressed description of the user behavior.

UI understanding process was defined by compressing and structurizing user behavior. By sharing result data with designers, it becomes subject of discussion, and they can have problems as common recognition. Handling both of quantitative data and *kansei* data at the same time also raises efficiency of the protocol analysis.

Figure.1 shows framework of this research. First, we carry out user test experiment and record experiment with DV camera. Then, observer analyzes user test movies with application that we made. With this application, we are able to capture users' behavior from user test movie. Also, it's able to analyze these data with DEMATEL method. Result data can be shared among designers and developers, and becomes subject of discussion to prove GUI.

**Multi Function Peripherals, **Graphic User Interface*

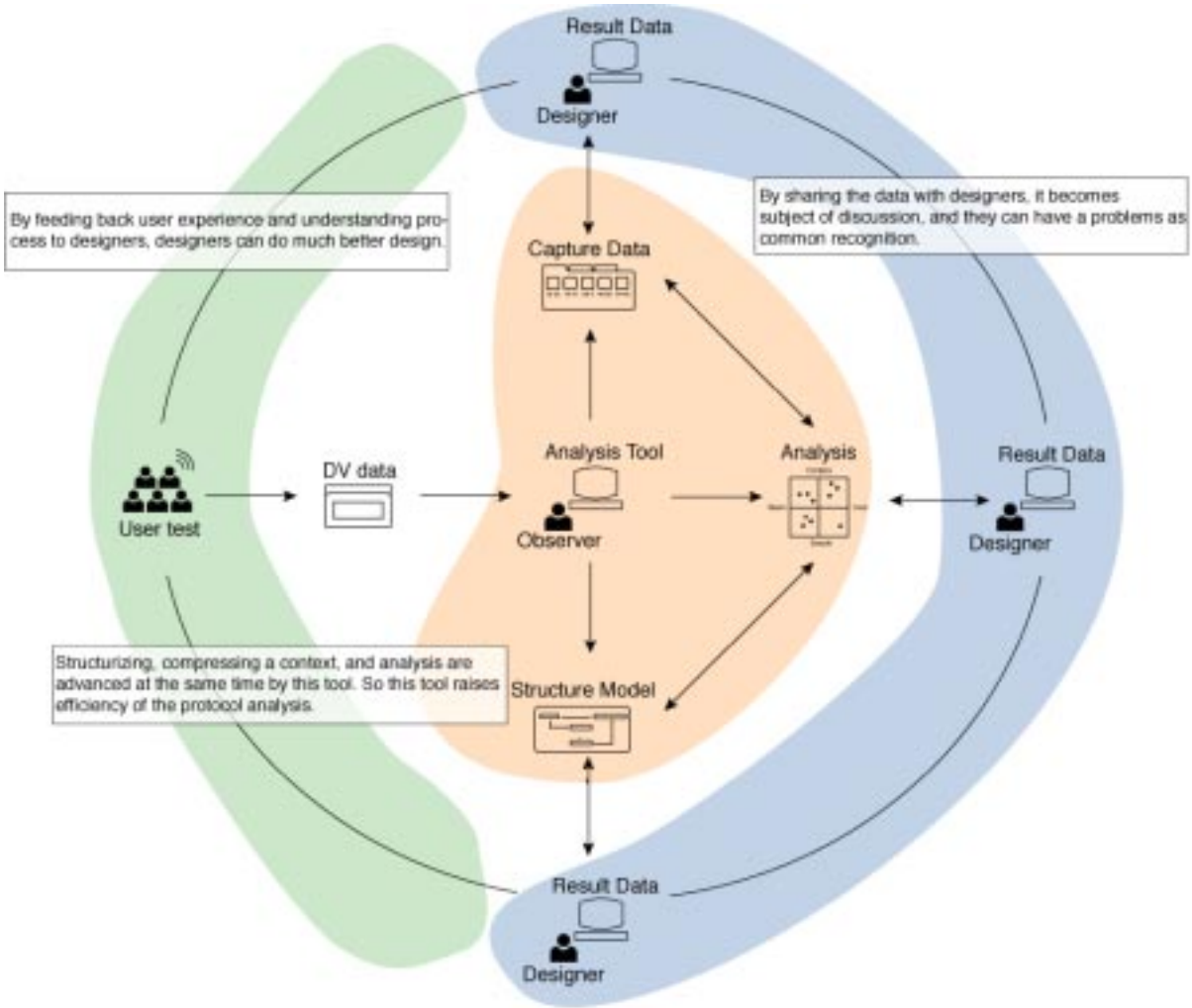

Figure.1 Framework of research

2.Process

This research has three basic phases; developing *kansei*-labeling method for compress user behavior, developing application that equips *kansei*-labeling function, and case study. These three phases can be summarized as follow:

- *Kansei*-labeling method: In this phase, we try to understand *kansei*, because we thought that *kansei* operate on understanding the UI process. First, we develop a method that called "*kansei* labeling" for extracting *kansei* from user test movies. Then we apply this method for application.
- Developing application: In this phase, we develop an application that equipped a function of *kansei*-labeling with macromedia director. Then we evaluated user test movies.
- Case study: In this phase, we use application, and analyze result data.

3. *Kansei*-labeling method

3.1. About *Kansei*

Kansei is surely a function of brain. Also, brain has two functions, logical and illogical. As *kansei* is often used as emotion, passion, and feeling, we interpret that *kansei* exists in those compound domains. (Figure.2)

Human being uses various information in various environments. However, they don't always have information for understanding these phenomenon. They don't always prospect for further action. Also, they always cannot deal with problem correctly. Ironically, they don't grasp completely even about the structure of the processing in many cases. They also have vague judgment standard. We considered that *kansei* has been ability to get through these situations with vague and incomplete judgment standard. Therefore, we direct our attention to *kansei* in users' UI understanding process and UI learning behavior.

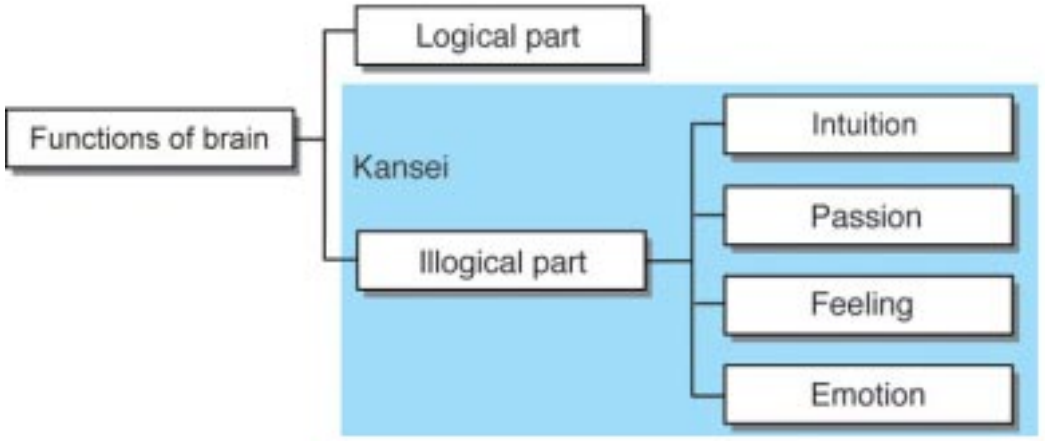

Figure.2 Function s of brain.

3.2.*Kansei* in UI understanding process

Although we have written that *kansei* exists in illogical part on former section, the question remains whether we deal with the *kansei*.

In UI understanding process, we can see some behavior that are Stuck up, Confidence, Confirm, Watch preview, notice own mistake, and so on. Also, these actions are fed buck as user experience. We consider that *kansei* exists and concerns user experience in UI understanding process. In this research, we tried to show the structure of UI understanding process by structurizing *kansei* in each experience.

3.3. Make *kansei* label

Kansei label is a unit that observer picked up user's behavior in each context of user test movie and added additional information.

First, we had written out key word and comment about user behavior while observing user test movie. Then, we had classified these key word and comment tag with KJ method*. After classified tag, we determined higher rank concept of the group, and we call these *kansei*-label.

*KJ method is a classifying method that was created by Jiro Kawakita.

Figure.3. Label with comment for KJ method.

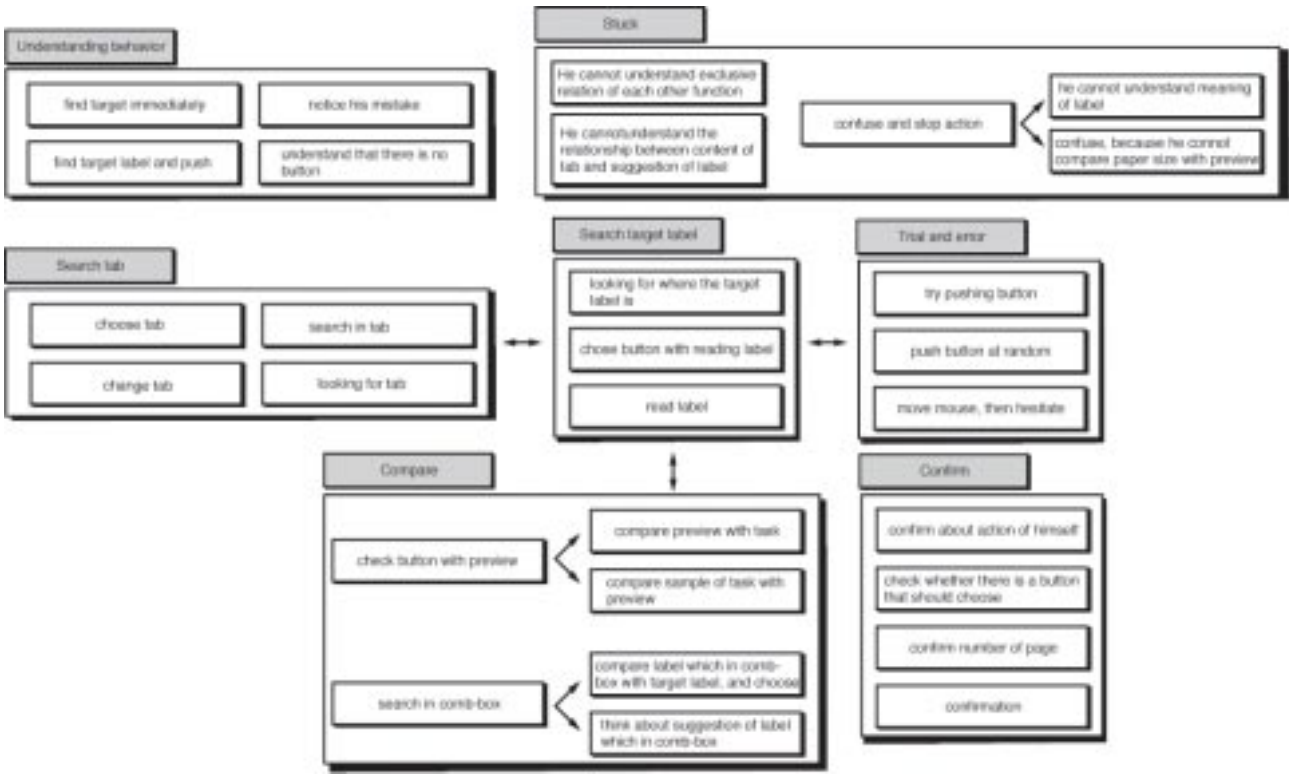

Figure.4. Classified labels with KJ method

4.Developping application for *kansei* labeling

4.1.Framework of application

We developed an application that equipped a function of *kansei*-labeling with macromedia director. The specification of application is as follows.

- Setup labels: Operator creates the labels that were made by KJ method in advance. Then operator enters these labels into the application. Label and functions are set up at setup window. Capture mode, setup label mode,

thumbnail information mode, structure model mode, and analysis mode are chosen with function button at the bottom part of the window.

- Capture user test movie with label: Operator captured user's behavior based on these label. Also, time data are added to captured movie. Operator clicked movie, then movie was captured. Captured movie are classified and accumulated in each label with thumbnails. [Figure.5, 6]
- Replay and add additional information on captured movies: Operator can replay classified movie by clicking each pictures. Operator also can add an additional comment and key words about user's behavior. [Figure.7]

Figure.5.Movie Screen.

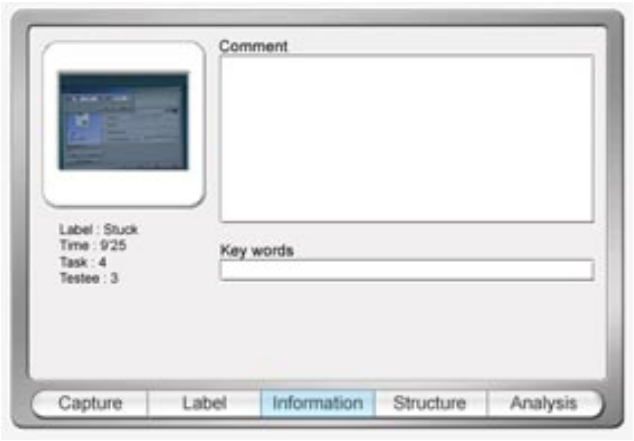

Figure.7.Function screen.

Figure.6.Captured movies.

4.2.Function of application

In this application, operator can capture users' behavior with *kansei* label that was made in advance. Application captures before two seconds, and after two seconds from the moment the operator clicked. Then, captured movies are accumulated as picture at once, and accumulated movies are displayed every label with time. When operator clicks these picture, captured movie is replay, and operator can add additional comment and keyword on context of movie. Compressed protocol that is made by these methods can watch user behavior every categories. If operator wants to watch stuck behavior of users, operator can watch only stuck behavior of users that application captured. As Application captures before two seconds, and after two seconds from the moment the operator clicked, it becomes a clue to find cause of users' behaviors.

When a designer watches at the compressed protocol data, it becomes possible to find the key point, without watching prolonged user movie data. By comparing the same behavior, an observer also can deepen understanding

to UI structure.

For finding a cause of user's behavior and user model, we use DEMATEL analysis method. DEMATEL analysis method is a one of method for analyzing structure. By the questionnaire form, special knowledge is collected and structure of an object problem is clarified in DEMATEL method. It can be clarified the degree of influence and relation of each element by describing relation between each elements which constitutes an object in matrix

5. Case study

5.1.Capture users' behavior with application

In this chapter, we consider validity of application. We use user test movie that recorded at United States for case study. User's tests in the United States had five persons. They were one woman and four men. In this user test, we give them task of printer driver operation, and had it done.

First, we picked up user behavior to make the *kansei* label, and classified these with KJ method. Table.1 is a result of KJ method.

Then, we captured users' behaviors in user test movie and stuck on these *kansei* labels with our application. Result of capture the movie is as follow. We stuck these *kansei* labels on user test movie and capture. By using application, we can collect 342 user behaviors. Detail is shown in a table.2.

Table.1.*Kansei* labels with KJ method

Stuck	Confidence	Confirm	Watch preview	Notice own mistake
Label following	Search in pop-up menu	Trial and error	Understanding	
Learned effect	Select tab	Confusion	Comparison	

Table.2.Result of capture

	Count	%
Label following	89	27.4
Select tab	41	12.6
Search in pop-up menu	40	12.3
Trial and error	35	10.8
Confusion	26	8
Watch preview	24	7.4
Notice own mistake	17	5.2
Confidence	15	4.6
Confirm	14	4.3
Comparison	10	3
Stuck	10	3
Understanding	10	3
Learned effect	6	1.8
Achieve goal	5	1.5
Total Case	324	100

5.2. DEMATEL analysis

For DEMATEL analysis, we use *kansei* labels as element of matrix and number of times on which *kansei* label was stuck as a value of a relation. (Table.3) About the number of times that stuck the *kansei* label, we counted based on the order of stacking the label. Therefore, when context of users' behavior moved from "Label

following" to "Search in pop-up menu", we counted relation between "Label following" and "Search in pop-up menu" as one time. Figure.10 is a result of DEMATEL analysis. [3],[4],[5]:

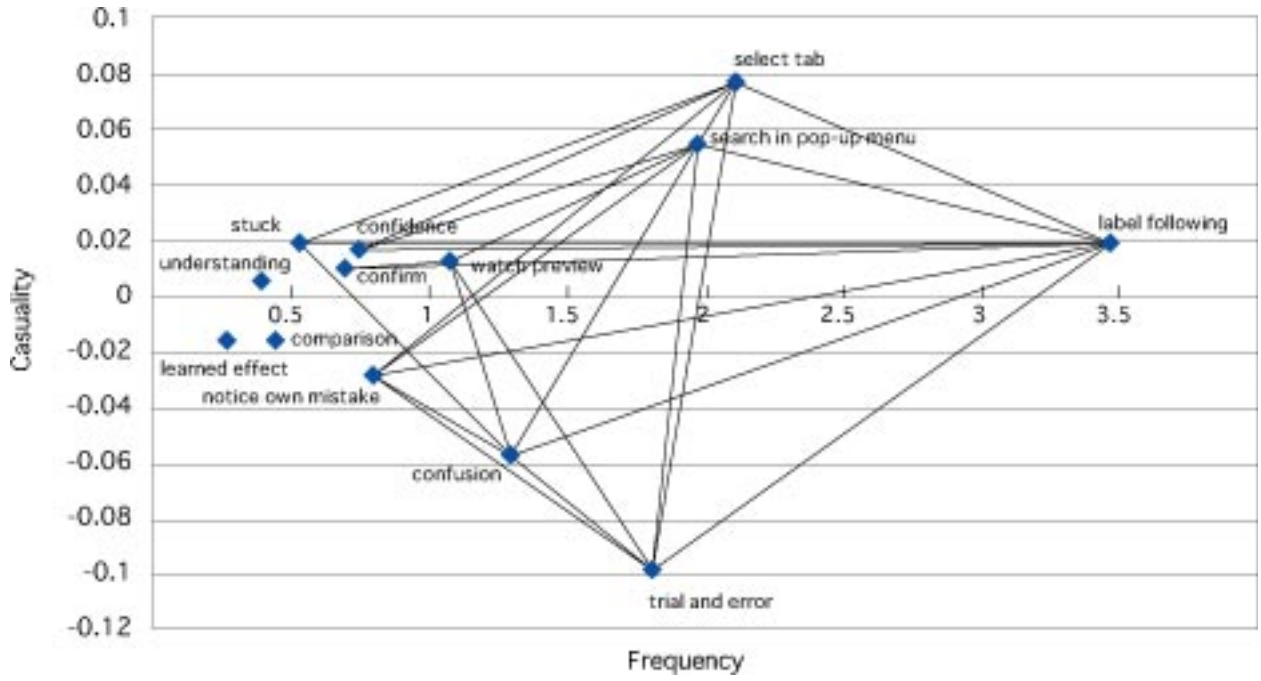

Figure.10. Result of DEMATEL

From result of DEMATEL, vertical axis expresses order of users' behaviors. High degree expresses user behavior that is able to watch at forepart, and lower degree expresses user behavior that is able to watch at latter part. Since previous behavior lead to following behavior, vertical axis shows causality. Horizontal axis expresses relation between each label. Since it is proportional to the number of labels, horizontal axis shows frequency of users' behavior.

Result of DEMATEL can be summarized as follows:

- "Label following" behavior is most important action in UI understanding.
- We expected that watch preview is important function to understanding this UI, but it is not so important.
- Tab structure is easily accepted in a user.
- In understanding UI process, user tends to select more confident labels.
- Problem of UI is notation of labels.

"Label following" behavior is the highest frequency. From this result, it turns out that users tend to have paid attention to label of UI, when they are going to understand this UI. This behavior called label following strategy, and we can usually watch it in display-based interaction. [6] Since the frequency of a "watch preview" behavior is not so high, it turns out that users have paid attention to the label rather than preview picture. "Select tab" and "Search in pop-up menu" are elements that are high degree of causality, and "trial and error" is element that is low degree of causality. Therefore, degree of "select tab" shows that user tends to understand UI form tab structure, and it shows that an understanding of tab structure has permeated users. From this result, it turn out that user behavior changes from "select tab" to "Label following". Consequently, since "stack" occurs from these actions, it turns out that the problem of UI is notation of labels. As degree of causality of "confidence" is higher than "trial and error", it turn out that users tend to select more confidential labels.

6.Discussion

In this research, we tried to discover UI's problems by dividing user behavior into each kinds with *kansei* labels and replaying these behavior with application. By watching same kind users' behavior in a lump, we could find some problems from user test movie. Since the same operator uses this application, we have got unified result of analysis. About the analysis of the user behavior with the DEMATEL method, it can change quantitive data into qualitative data by expressing relationship between the frequency and the causality of user behavior as a map. Consequently, we were able to express analysis result more clearly. Also, we were able to understand the cause of UI's problem by grasping the causality of user behavior. It is easy to communicate information with others by expressing user behavior as a map.

7.Conclusion

Result of case study shows that our application improve problems of protocol analysis. Especially, since observer can use same format for analyzing user test movies, result of evaluation have a unified view. *Kansei* label was also efficient for making a user model.

Although we used our application and method for printer driver, we want to apply our application and method for other cases. This research is the first step of the method to analyze UI understanding behavior, and we will also develop our application and method in the following directions.

- Developing application and method that can apply for other cases.
- Developing method and application to acquire *kansei* data more efficiently.

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