AN ONTOLOGICAL ENGINEERING APPROACH TO EXTERNALIZE DESIGNERS' COMMUNICATION STYLE IN SUPPORT OF ARTISTIC-IDEA SHARING

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ABSTRACT:

In design activity that requires sensitivity (e.g. costume design), each designer has his or her own artistic-idea. For sharing ideas appropriately, design teams have their own explanation style to present their artistic ideas, which may be vague. An aim of our research is to develop a computer system, to support artistic-idea sharing in design teams. For this objective, we analyzed an explanation style in a Japanese textile design studio. In this paper, we show our ontological engineering approach to analyzing designers' artistic-idea explanation style. In ontological engineering, it is said that to define knowledge as ontology is effective in defining its essential qualities. We investigated the effectiveness of the ontological engineering approach on our research topic, and concluded that our ontological framework of designers' explanations is especially useful regarding these points: "clarification of the essence of the explanation style", "discovery of problems in explanations", and "analyzing

difficulties in acquiring explanation style for novices''. Moreover we built an artistic-idea sharing support system, and the results of its initial trial.

1. INTRODUCTION

In design activity that requires sensitivity (e.g. costume design), it is the key to success that each designer discovers his or her own artistic ideas, and the ideas are shared in the design team appropriately. Until now, many studies about design support systems with computers have been done. Specifically, for idea generation support, there are studies such as idea articulation and visualization system (Hori 1994), and a study of system interface influences on the idea generation process (Nakakoji and Yamamoto 2001). It is hoped to put these research outcomes to practical use and to reap the benefits of them. However, designers' artistic ideas may be vague, and appropriate sharing of them is hard. The studies about artistic-idea sharing support are insufficient. And so our research focuses on the support of artistic-idea sharing using computers.

We claim it is ideal that artistic-idea sharing support systems should be formed to match a design team's idea explanation style. In past studies of teams of experts (Brown, and Duguid 2002), it was reported that the teams have their own communication styles in sharing knowledge needed for their work. For example, in a study about technical service staff in Xerox Corporation (Orr 1996), it was reported that the technicians (technical service staff) share their knowledge for repairing copy machines by talking about their ''war stories'' with a characteristic style of talking. And the style had these features.

- It builds up naturally in the team.

- It is handed down implicitly from experts to novices.

On the other hand, past studies about knowledge sharing support systems aimed mainly at improving the experts' communication environment (e.g. high quality communication tools) and increasing communication frequency (e.g. incentive making methods). Those knowledge-sharing support systems were developed for versatile purposes, and independent of explanation styles in knowledge sharing. These past studies show the systems and methods of knowledge sharing support, without depending on experts' communication style. But for progress of knowledge sharing support, we think it is necessary to distinguish the experts' communication style as a manifestation of empirically-formed wisdom, and analyze it in order to externalize the features of this wisdom, to discover what point we can support in a computer system.

For the reasons described above, we set the aim in this paper to externalize the features and potential problems of designers' artistic-idea explanation style in a Japanese textile design studio. In our approach, the main theme is how to analyze the explanation style based on implicit knowledge. For this theme, we think it is effective to make an ontological framework of designers' artistic-idea explanations. Designers' activity can be understood through investigation and interview. And through making the framework, we can externalize some implicit aspects of designers' artistic-idea explanations, for example "background knowledge of explanations" and "roles and intentions contained in information in explanations". The result of building the framework makes the following things possible.

- To clarify the essence of artistic-idea explanations

- To discover potential problems in individual explanations

- To understand difficulties in acquiring the explanation style for novices

To make the framework, we took an ontological engineering approach (Mizoguchi 2003). To define knowledge as ontologies is effective in defining its essential qualities. In this paper, we check the adequacy and effectiveness of ontological engineering as a method for analyzing designers' artistic-idea explanations. In the next section we show the rough sketch of our approach.

2. ONTOLOGICAL ENGINEERING APPROACH TO ANALYZING EXPERTS' EMPIRICALLY-FORMED WISDOM

The background of the birth of ontological engineering is described below. If we want computers to process something intelligently, we have to develop rational frameworks to express the processed objects as models and rational procedures of operating the models for the goal of processing. And then we can implement models into computers and get the results of processing. In this situation, ontological engineering was born as a methodology for externalizing the features and the essences of processed objects. In ontological engineering, researchers articulate the objects or world into well-defined concepts. By analyzing the relationships between those articulated concepts, we can improve our understanding about the features and essences of the processed objects. Those concepts whose relations are well defined are called "ontologies". Ontological Engineering gives the type definition of relationships between concepts (for example, is-a relation, part-of relation), guidelines of concepts articulation, and guidelines for building computer processable object models. These are the benefits of ontologies.

- Ontologies give clear models of the processed objects and the world.

- By articulating the processed objects as concepts, we externalize experts' background knowledge of processed objects, which is usually unconscious.

- Ontologies give us the building blocks of an artificial system.

We thought these features of ontological engineering would make possible the following analyses in our research.

- To discuss designers' idea explanation style with expert designers precisely

- To externalize background knowledge, which is the basis of artistic-idea explanation

- To build consensus about the essences and characteristics of artistic-idea explanation style of designers

- To show our assumptions in development of the artistic-idea sharing support system clearly

To make the ontologies about designers' idea explanations consists of these four steps.

1) Observe designers' idea explanations and interview designers about the results of observation.

2) Make an ontological framework of designers' idea explanation from the results of the investigation and interview.

3) Review the suitability of the ontological frameworks and refine them in meetings with designers.

4) Discuss the designers' idea-sharing wisdom with them by using the ontological frameworks.

As the final objective, we want to get the ontological frameworks formed in suitable range and grain-size to support artistic-idea sharing, and so the four steps are done repeatedly.

3. ONTOLOGICAL FRAMEWORKS OF ARTISTIC-IDEA EXPLANATION STYLE

As previously stated, in this study we ontologized designers' idea explanation style as experts' wisdom, which is used in artistic-idea sharing by designers in a design studio. In this section, we show an overview of our subject of research at first, and show the main parts of our ontological frameworks of artistic-idea explanation next.

3.1. TEXTILE DESIGNERS' ARTISTIC-IDEA EXPLANATIONS

As our subject of research, we chose textile design. In the section below, we show the outline of design activities and designers' idea explanations.

Designers have artistic ideas about new products at the beginning of their design activities. Fig.1 shows a diagram of artistic-idea conversion into products. (In the section below, words referred to in figures are under-lined.)

In this figure, a design activity consists of planning-phase, design-phase, and production-phase. In planning-phase, designers have an artistic-idea about a product. A designer explains about his or her artistic-idea to other designers. Ideas are shared among them and an excellent one is selected. In design-phase, a fabric pattern is designed based on the selected artistic-idea. In production-phase clothes are produced from fabric pattern, and clothes are made into products finally.

It is important to share artistic-ideas exactly in planning-phase for adequate design in design-phase. And so designers use an explanation style, which is considered effective to share ideas by them. The figure shows that a designer (speaker) explains his or her artistic-idea to others (listeners). Listeners are the members of the design team who join the design activities as team leaders and workmates. To explain her artistic-idea, the designer (speaker) prepares media called "map"(Fig.2), which consists of pictures. In explanation of artistic-idea, he or she gives comments on the pictures, for example "Make it natural like this." or "It is cute and suitable.". In this explanation, it is said by designers that to make feelings in listener's mind is the most important aim of this activity.
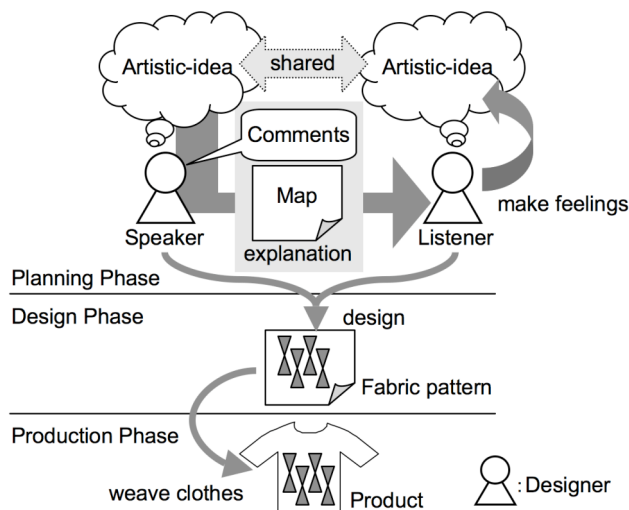

Figure.1: Workflow of Textile Design.

Figure.2: Map.

3.2. ONTOLOGICAL FRAMEWORK OF ARTISTIC-IDEA EXPLANATION

As we have shown in the previous section, the main aim of artistic-idea explanation is to give listeners the feelings intended by the speaker. We define the designers' explanation as two ontological frameworks. One is about ''What is an artistic-idea?'', and the other is about ''What is an artistic-idea explanation?''. The aim of these frameworks is to externalize roles and intentions of information presented in explanations. In making ontological frameworks, we used the ontology development environment ''Hozo'' (Kozaki et al. 2000, 2002).

3.2.1. AN ONTOLOGICAL FRAMEWORK OF AN ARTISTIC-IDEA

The Fig.3 shows a diagram of an artistic-idea. Let us read the details about it.

A designer's <u>artistic-idea</u> is realized as a <u>product</u>. The aim of design activity is to design products, which may be chosen by customers. The designer considers what kind of feeling should be held by a <u>customer</u> when he or she looks at the product. When the customer looks at the product, he or she has some feelings about it with thinking about a <u>user</u> of the product and the product's usage <u>situation</u> [a] (e.g. In costume design, the situation is called TPO, generally.) The customer and user are often the same person, but sometimes they are different people. (e.g. the cases of a mother who selects clothes for her child.) <u>Neighbors</u> are people (e.g. family members, friends, boss, etc.) around the user in some situations [b], [c] （e.g. home, workplace, etc. The customer <u>thinks of</u> the feelings of these people, too. And so the designer considers the feelings of these neighbors.

To summarize, an artistic-idea is a set of feelings, which a designer wants customers to have based on assumptions about situations regarding products. We ontologized such understanding about artistic-idea as shown in Fig.4. The details about it are shown below.

An artistic-idea is a set of "kansei", which is held by a designer as holder, for envisioned target product. A kansei consists of a feeling, which is held by a customer or neighbor as holder. Now we use similar words, 'kansei' and 'feeling', the usage of these words is expedient. This usage of words is for differentiating a designer as holder of an artistic-idea and a person as holder of feeling. In this case, "feeling" is defined as a mental phenomenon. And "kansei" is defined as an umbrella concept including a feeling, its holder, and its situation. A "holder" may be a customer or a neighbor. This means that if several kansei might be envisioned, several 'holders' or 'situations' can be envisioned. A situation is composed of a user, a human relation, a time, a place and an occasion. A "human relation" is between a holder of "kansei" and product user. People (customer, user, neighbor) are characterized by their physical features and "Liking" (See Fig.5).
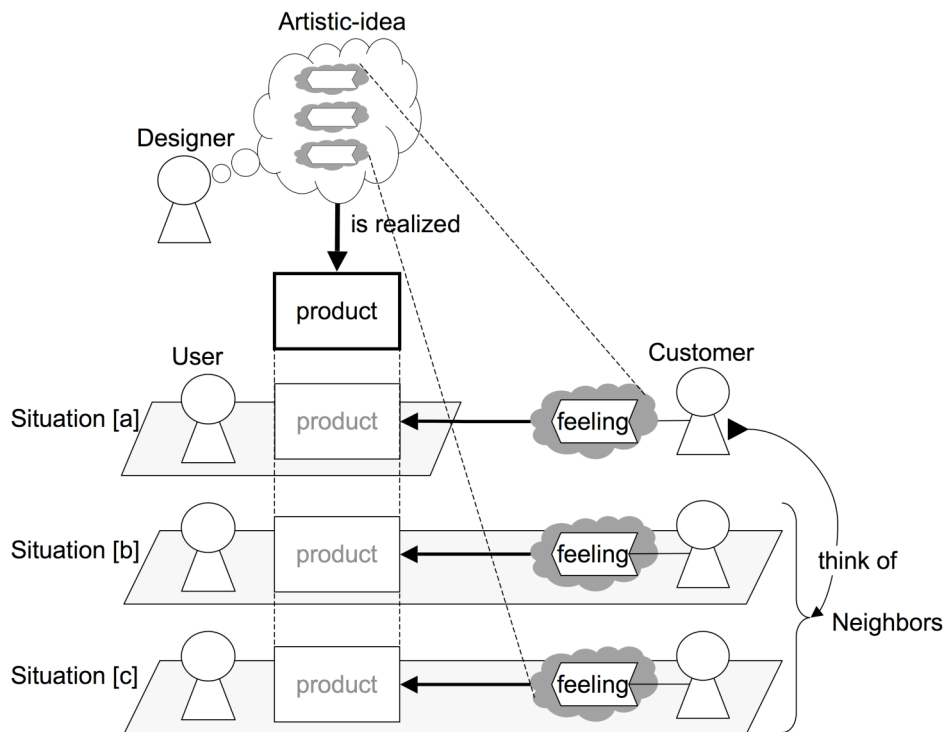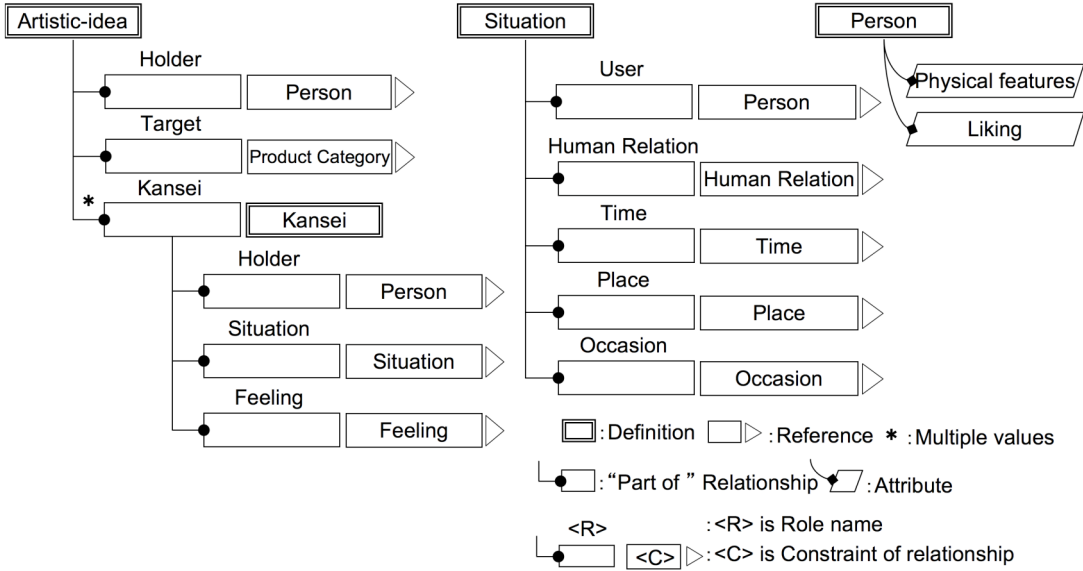

Figure.3: Artistic-idea.

Figure.4: Ontological framework of artistic-idea.

Concepts used in describing parts (human relation, situation, etc) of each explanation with an ontological framework are defined as ontologies. For example Fig.5 shows part of the ontology about "Liking". It defines "Liking" as a class structure. The top level includes 'Color', 'Trend', 'Quality', etc. More specific concepts are defined as leaf nodes. A generic concept and its specific concept relationships are defined as "IS-A relationships".
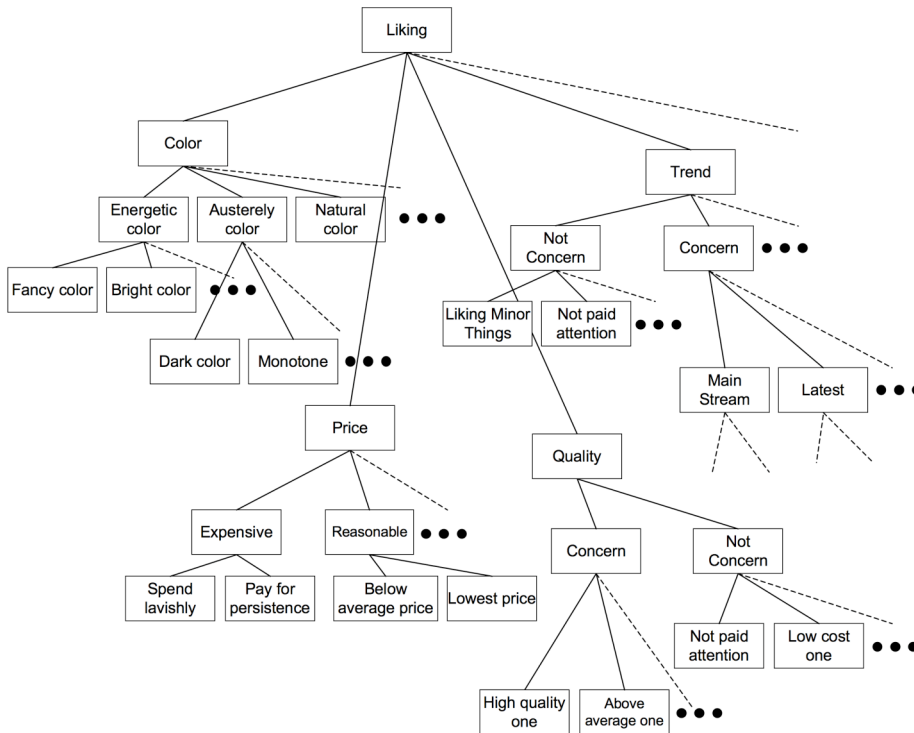

Figure.5: "Liking" Ontology.

3.2.2. AN ONTOLOGICAL FRAMEWORK OF ARTISTIC-IDEA EXPLANATION

As we show in Section 3.1, a designer tries to share his or her artistic-idea by explanations with maps. In explanations, they put "kansei-words" with the pictures in map like "Make pretty like this" and "Make elegant like this". We call this action to put a kansei-word on a picture "comment" (Fig.6). The figure shows one comment, which means "The product should be cute like this picture. (or I'd like to reflect the cuteness of this picture to the product.)".

A <u>comment</u> consists of <u>picture notation</u> and its <u>intention</u>. An intention of picture notation shows a relationship between a feeling held by a listener caused by picture notation and a feeling which is expected by a speaker in his/her kansei. In the figure, the intention of the comment is "reflect" type. This means the feeling held by the listener as a consequence of the picture notation is the same as the feeling, which the product should deliver. Other intentions of kansei-words are "accentuate", "reduce" and "negate partially". In the figure, the <u>picture of a bear</u> is the target, <u>cute</u> is the kansei-word, and <u>"reflect"</u> is the intention of mention.

Fig.7b shows the ontological framework of an explanation about an artistic-idea as a set of comments. In the figure, the framework is contrasted with the framework of artistic-idea.

An <u>explanation</u> is performed by a <u>designer</u> about a product as a <u>target</u> using several comments on a map. A comment includes assumptions about a holder and a situation, and a <u>picture notation</u> and its <u>intention</u>.

In contrast with the definition in Fig.6, we add "holder" concept and "situation" concept to the definition of comment in Fig.7b. We show the reason for and process of this addition in Section 4.3.
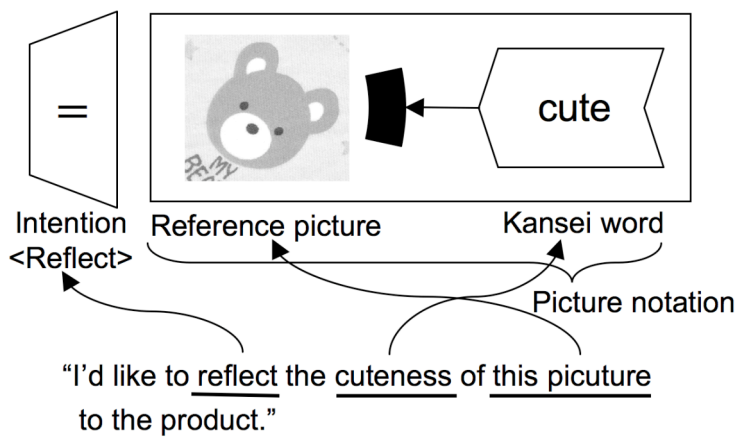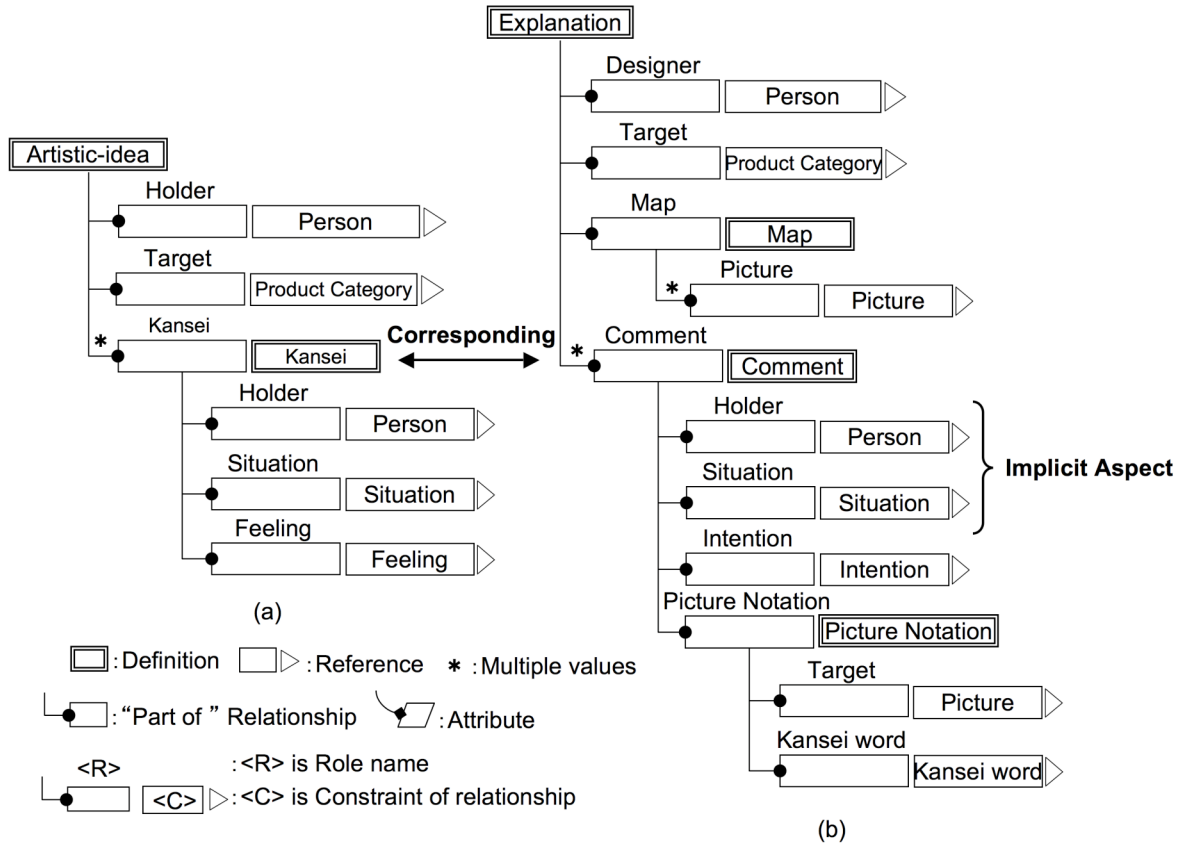

Figure.6: A comment in an explanation.

Figure.7: Ontological framework of artistic-idea Explanation.

4. BENEFIT OF ONTOLOGICAL ENGINEERING IN ANALYZING DESIGNERS' ARTISTIC-IDEA EXPLANATION

In this section, we investigate the features of designers' artistic idea explanation method and its potential problems, from the viewpoint of idea-sharing support. And we sum up the benefits of ontological engineering.

4.1. FEATURES OF THE ARTISTIC-IDEA EXPLANATION STYLE

4.1.1. AN ARTISTIC-IDEA IS A SET OF FEELINGS OF CUSTOMERS ENVISIONED BY A DESIGNER

As we saw in Fig.3, designers consider an artistic-idea as a set of feelings. The holder of an artistic-idea is a designer, but the holder of a kansei is a customer (or a neighbor in some situation). We call this "duality of holders". This means that a mental image is not of a designer's kansei, but a customer's kansei as imagined by a

designer. By comments in an explanation, this customer's kansei are shared. And so, the comments are worked out with an agreement about holders (customers and neighbors) and situations (product users, places, etc.) between speaker and listener.

4.1.2. ROLES OF PICTURES AND KANSEI-WORDS IN ARTISTIC-IDEA EXPLANATIONS

Artistic-idea explanations are used to share feelings as mental phenomenon, by making feelings in the listener by providing some kansei-words on pictures on a map. In the explanations, a picture has a "giving feeling role" to generate a feeling in the listener. In this role, it is uncertain if the listener has an adequate feeling, because the feelings arising from a picture have some variations. The kansei-words have "directing feeling role" to direct the listeners' feeling to an appropriate one.

4.2. POTENTIAL PROBLEMS IN ARTISTIC-IDEA EXPLANATIONS

We analyzed the potential problems in artistic-idea explanations by the discussion about ontological frameworks shown in Section 4.1. Participants in the discussion are 5 designers, including experts who have mainly over 10 years career experience and a rookie who has less then 1 year career experience.

4.2.1. DIVERGENCE IN UNDERSTANDING ABOUT "DUALITY OF HOLDERS"

In discussion about "duality of holders", a designer said that "The holders of artistic-ideas and the holders of kansei is same designer". This is said based on the thought that ideas are generated by a designer with her intuition. When a designer arrives at an idea, he or she does not think about the holder of feelings and about the situation. In this way, a designer has a different understanding about the contents of artistic-idea at the starting point of the discussion. This difference interrupts the suitable sharing of artistic-ideas. So this problem should be solved in artistic-idea sharing support.

4.2.2. MISUNDERSTANDING ABOUT HOLDERS AND SITUATIONS IN COMMENTS

As we saw in Section 4.1.1, comments contain holders and situations, even though they are not explained exactly. About this feature of explanations, an expert designer said "The holders and situations are presumed, based on the knowledge about products and users. If there were no explanation about these things, an expert

could assume and understand.''. On the other hand, another expert designer said ''In communication by experts, misunderstanding among them happens, and it leads to confusion at the design phase in a few cases''. This is an example of externalization of a potential problem, externalized in the discussion with ontological frameworks of explanation.

4.2.3. MISUNDERSTANDING ABOUT MEDIA IN EXPLANATIONS

As explained in Section 4.1.2, pictures and kansei-words in comments have roles which depend on the aim to give listeners adequate feelings. When we discussed these roles, some designers pointed out one problem. It is that if some novices like rookies are given comments, it sometimes happens that they focus attention on pictures' features like colors and shapes. To analyze this problem with ontological frameworks, we can define the problem concretely as, ''It is hard for novices to understand the role of pictures in mentions as ''giving feeling role''''.

4.3. EFFECTIVENESS OF ONTOLOGIZING THE EXPERTS' COMMUNICATION STYLE

Up to this point, we studied features and problems of explanations in artistic-idea sharing. On the basis of these results, let us study the effectiveness of making an ontological framework of experts' communication style.

4.3.1. MAKE ANALYZERS AWARE OF THE IMPLICIT ASPECTS OF COMMUNICATION

It is effective for externalizing the implicit aspects of explanation to analyze the ontological frameworks, like those in Fig.4 and 7. For example, at the outset of this research, we recognized the comments in explanations are expressions of designers' feelings implicitly. But at the end of analysis, it is more reasonable to think that comments are expressions of feelings held by customers or neighbors in any situation, as in Fig.3. We noticed this when we contrasted the framework of artistic-idea (Fig.7a), and the framework of explanation (Fig.7b). And the contrast made clear the relationship between feeling of customer (assumed by designer) and the comments in explanation. As shown above, to give awareness to analyzers is one of the important functions of ontological engineering.

4.3.2. MAKE THE POINTS CLEAR IN DISCUSSION ABOUT COMMUNICATION STYLE

As we said in Section 4.2, at the start of the discussion, designers have different opinions about "duality of holders" about artistic-idea. We let designers discuss this problem with ontological frameworks. As a result, a consensus was built, that a holder of feeling is a customer of product or neighbors, because having an artistic-idea is certainly based on an aim to make a product for someone. In this way, ontological frameworks give a basis in finding the differences in experts' understanding about their own communication style, and allow experts to discuss about it. So in consequence, ontological engineering make it possible to build a consensus about the experts' communication style. Moreover, ontological framework of explanation style may be a basis of education for rookies or members with little experience.

4.3.3. EXTERNALIZE POTENTIAL PROBLEMS IN PUTTING EXPERTS' COMMUNICATION STYLE IN PRACTICE

As we said in Section 4.2, in the discussion of ontological frameworks, we heard opinions such as "It is difficult for rookies to understand the 'giving feeling' role of pictures used in comments" and "Experts may fail at artistic-idea sharing by inadequate understanding of holders or situations in comments" from designers. In this way, ontologized communication style triggers externalizing the potential problems in interviews with experts. By analyzing opinions using ontological frameworks, it is possible to give a concrete definition of potential problems, and to analyze important points, which should be noted in teaching the methods to rookies.

5. A PROTOTYPE AND A TRIAL OF MENTAL IMAGE SHARING SUPPORT SYSTEM

We built a prototype system for mental image (or artistic-idea) sharing, based on understanding about the features and potential problems in designers' artistic-idea explanations. In this section, we sketch out our system and report a trial use of it.

5.1 MENTAL IMAGE SHARING SUPPORT SYSTEM

The main functions of our system are to guide system users (designers) to make suitable comments and to store these comments with maps in the system repository. The aims of the system are as follows.

- To help designers to share understanding about their explanation style

- To reduce the potential problems in each mental image (or artistic-idea) explanation

- To help novices (like rookies) to learn the explanation style for the design profession

Fig.8 shows the system architecture.

Our system provides dictionaries used in giving comments to maps. The dictionaries consist of ontologies and kansei-word meaning network (We'll see this network afterward.) As the vocabulary describe background knowledge of comments, ontologies include a "Liking" ontology (See Section 3.2) to describe holders of kansei, a "human-relationship" ontology to describe situations as human-relationships between customers and users , and so on. In practical operations, we made ontologies with the ontology editing environment "Hoze", and transferred them to our system in XML.

The "kansei-word meaning network" is a dictionary used to chose suitable word to use in descriptions of mentions. It was built based on understanding of role of kansei-words in comments to "direct feelings" (Section 4.1.2). This network shows the possibility of paraphrasing kansei-words, to make the positive or negative intentions included in comments clear. Fig.9 shows a part of the network centered on the kansei-word 'pretty'. For example, if a designer tries to use 'pretty' in a comment, the system shows candidates 'friendly' and 'fine' as words accentuating positive meaning aspects of 'pretty', and 'weak' and 'unreliable' as words accentuating negative meaning of 'pretty'. In this way, the system helps its users to chose and use suitable kansei-words in mentions. This dictionary was built as a the designers' group project.

Knowledge producers are people such as readers or expert designers in design studios and knowledge engineers, who build ontologies and "kansei-word meaning network" as dictionaries. Designers, as system users, create a map and add comments to it using the system interface to explaining his artistic-idea. At that time, the system provides the "validation function", which checks for conflicts in comments, the "Description support function" which gives the words to help system users describe comments or queries, and the "search function" which gives the search result from the repository. Explained artistic-ideas are held in the system as a data structure, which is not based on an artistic-idea framework (Fig.7a) but on an artistic-idea explanation framework (Fig.7b).
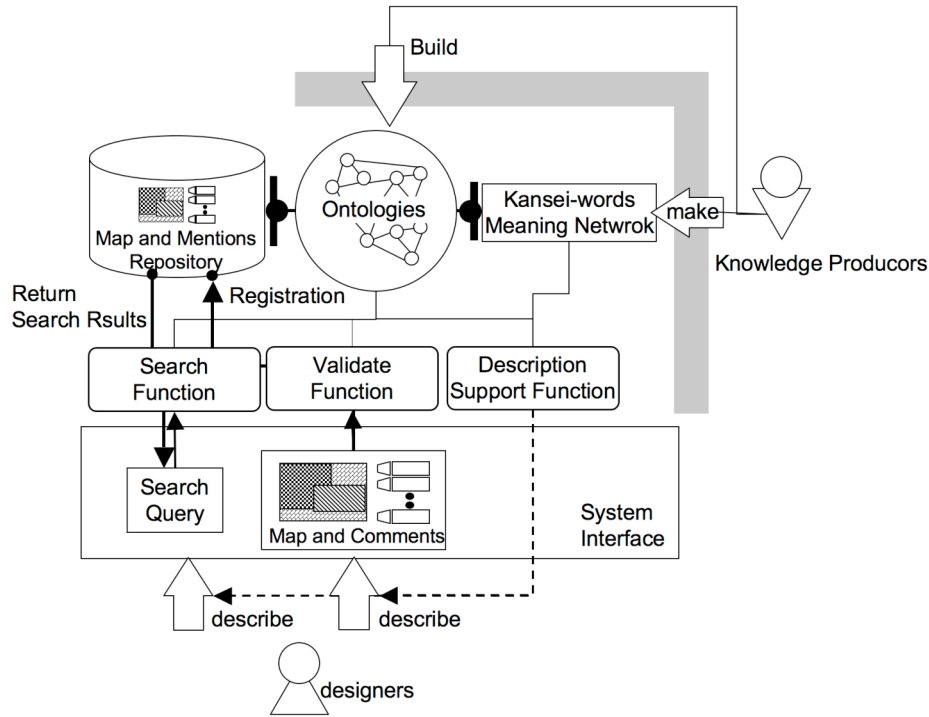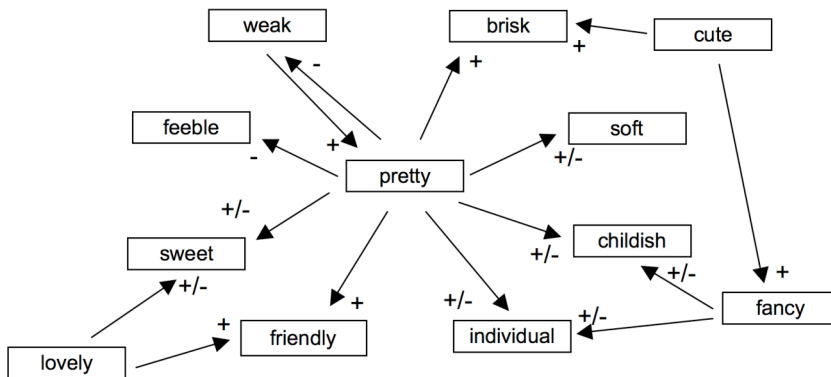
Figure.8: System Architecture.
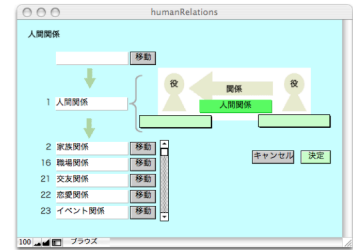

Figure.9: Kansei-word meaning network.

To see the steps of artistic-idea explanation in our system, see also the system interface in Fig.10. In the "Adding comments panel", users create a map and add comments to each picture on it. Dictionary panels provide the words. And users chose suitable words for their explanations. In comments, system users (designers) are forced to describe holders and situations in kansei, which they assume implicitly. In more detail, system users describe the persons who may play the role of customers and product users at first, and describe situations as human-relationships between these persons.
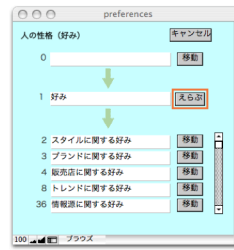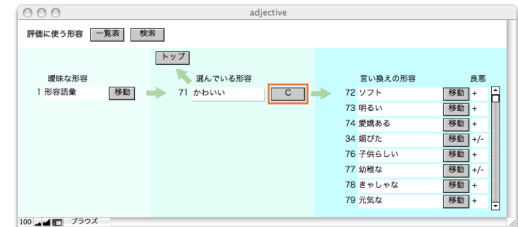
"Liking" ontology panel   "Human-relations" ontology panel

"Kansei words meaning network" panel

(a) Adding mentions panel   (b) Dictionaries panels

Figure.10: System interface.

As explained above, the system supports the points below by showing the way to describe comments to the map using the interface.

- To reduce the difficulty of artistic-ideas sharing by prompting system users to make assumptions in comments clear

- To show the way to explain artistic-ideas to novices

- To help novices to use suitable words in comments by providing dictionaries

5.2 A TRIAL OF THE SYSTEM

Our system was developed to support the points in the previous section. We want to recognize if the system achieves the aims, but it is difficult to check this quantitatively in a short period because the design studio is a tiny community and it is impossible to gather enough examinees. To check the achievement over a long period of operation is needed. Therefore, we show the trial use of out system and the results as the initial stage of consecutive operation.

In the design studio, comments to maps are made verbally at present. Then the maps are preserved, but the mentions to maps are not recorded. If someone sees the preserved maps, they have to guess at the artistic-

idea expressed by the map, or ask for an explanation from the map creator. The aim of trial use of this system is for the viewpoint that the system provides some beneficial changes to communication in the design studio.

5.2.1 ARRANGEMENT AND PROCEDURE OF TRIAL

To examine if map-browsing users can get suitable artistic-ideas from our system, we check the suitability of the artistic-ideas held by them, using the task below.

Here is the procedure of a trial. Trial users (we call them "browsing users" below) are given several maps and patterns of clothes designed based on the maps, and they perform tasks, which require suitable matching between maps and patterns of clothes. This task is based on the expectation that "If a user could get a suitable artistic-idea from the map held in the system, he could choose the pattern of cloth as the realization product of the artistic-idea". The details of the trial are below.

  - Preparations

    In trial use, we prepared 8 maps and patterns of clothes pair. The fig.11 shows one of the pairs. All maps included comments by the creators using the system. We call the maps including comments "commented maps", and the maps which do not include comments, and browsing user can't see the comments "non-commented map". And we make sets of commented maps, no non-commented maps, and patterns. The sets are shuffled to prevent detection of the relation between maps and patterns. To reduce correct answers due to luck, we put dummy patterns into the pattern set. The maps, patterns and dummy patterns were prepared by an expert designer, under the limitation that the sets of maps and patterns would be hard to match correctly only by guessing even by an expert designer. All trial users did the task through the steps below.

  - Procedure of trial

    1. Use "non-commented map set" and "pattern set", and perform matching task. (This task refers to the current state of the design studio.)

    2. Use "commented map set" and "pattern set", and perform matching task. (This task means the state of the design studio after introduction of the system.)

    The aim of these tasks, and their comparison, is to confirm if the system has factors which contribute to artistic-idea sharing.
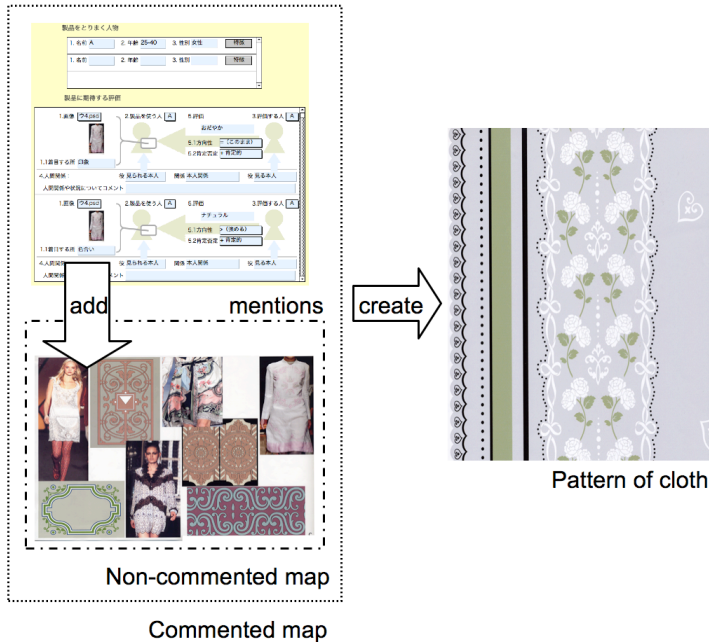
Figure.11: A pair of a map and a pattern of cloth.

- Browsing users (Examinees)

Number of examinees: 9

Composition of examinees: 3 months experienced as a designer, 1 person. 2 designers each with 1 year, 3 years, 5 years, and over 10 years experience.

5.2.2. RESULT OF TRIAL

Table.1 shows the answers of Browsing users (examinees). In the task with non-commented maps, the percentage of questions answered correctly was 15.2%. Against this, result on the task with commented maps was 69.5%. About dummy patterns, in the task with non-commented maps, one browsing user chose 1, but in the task with commented maps no one chose dummy patterns. The result means that the system may have the good features for artistic-idea sharing support.

In the questionnaire about the trial, some examinees gave remarks that "In design planning meetings, the system helps us not to forget the important assignment in explanations, and to prevent the loss of the assignment in listening ". In the questionnaire to the designers who helped with preparation of the trial, a designer gave a remark that "the dictionaries help us when we can not think up suitable words in making mentions". As a result, we got mainly positive comments for the system, and for ongoing use of it in the design studio.

Table.1: Result of trial.

(a) Percentage of correct answers

	Min	Max	Ave	Ave Percent
Commented maps	0	3	1.22	15.2 %
Non-commented maps	2	8	5.56	69.5 %

(b) Percentage of dummy patterns excluded

	Number	Percent
Commented maps	17	94.4 %
Non-commented maps	18	100.0 %

6. CONCLUSION

In this paper, first we analyzed the designers' communication style in vague artistic-idea sharing in a Japanese textile design studio using ontological engineering. Second, we investigated to confirm that making ontological framework of designers' artistic-idea explanations is effective regarding the points shown below.

- To clarify the characteristics of the designers' explanation style

An artistic-idea explanation gives listeners the feelings expected by the speaker (who thinks up the idea) by using pictures and kansei-words. In activities, pictures and kansei-words play their characteristic roles, which are "giving feeling role" and "directing feeling role.

- To identify potential problems in the designers' artistic-idea explanations

Artistic-idea sharing sometimes fails. One cause of this is insufficient sharing of knowledge about customers and situations regarding product usage. Another cause of this is divergence in understanding about "duality of holders" of artistic-ideas among designers. These are the problems, which should be reduced by an artistic-idea sharing support system.

- To specify difficulties in learning the explanation style

Some reasons for difficulty in learning the artistic-idea explanation style can be defined as the difficulty in understanding "duality of holder in kansei" and, the difficulty in understanding the characteristic roles of pictures and kansei-words.

As described above, ontological engineering contributes regarding these points: "clarification of the features of the explanation style", "discovery of potential problems of the explanations", and "analyzing difficulties in acquiring explanation style for novices". And these are basis of development of artistic-idea sharing support systems.

Moreover, we have built an artistic-idea sharing support system, which is based on understanding about these features, and understanding about potential problems of the explanations. The trial of our system was small-scale, but from the test trial we can see that making ontological frameworks of designers' communication style is effective in getting the basis of artistic-idea sharing support methods and systems.

In the future, we will examine the effectiveness of our system more elaborately. At that time, we will setup the experiments to check performance improvement using our system, compared to expert designers' explanations.

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