Creative Communication for Concept Articulation in Shopping

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ABSTRACT

This study considered the information presentation method to help the customers make a concept-articulation type of purchase. When customers follow the concept-articulation type of thinking, they only have vague requirements, and try to make a gradual clarification of of what they want through the interaction with salesclerks and so forth. We constructed a system called S-Conart (CONcept ARTiculator for Shoppers) to support the concept-articulation type of purchase based on the observations from an analysis of human behavior in actual purchase activities. This paper describes the system configuration and interaction design of S-Conart, and introduces the result of a user study conducted using S-Conart. The user study suggests that changing the contents and/or the method of presenting information can bring an change to the human mental world, which is also observed when sales-clerk appropriately reacts to the customer in a real-life shopping situation, although in a different form.

Keywords: purchase, online-shopping, concept articulation, creativity, menatl leap, chance discovery

1. INTRODUCTION

When observing human behavior in the actual purchase activities, the underlying mental process may be roughly categorized into the following two types: *problem-solving* and *concept-articulation*. When customers follow the problem-solving type, they have clear image and functional requirements on desired products, and perform problem-solving in a way that they look for the products which meet their requirements. When they follow the concept-articulation type, on the other hand, they only have vague requirements on their needs, and try to make a gradual clarification and/or refinement of their requirements through the interaction with salesclerks and so forth.

Most of existing online shopping sites assume that customers' requirements have been already determined[5]. That is, they only target the problem-solving type of purchase. This study aims at developing online shopping systems which can help the customers make a concept-articulation type of purchase. Its purpose is specifically to establish information presentation methods to effectively support the customer's concept formation process, and to build the design methodology for Human-Computer Interaction (HCI) to realize them.

This study started with observing human behavior in the actual purchase activities. Then, the protocol analysis of actual conversation between the customer and salesclerk revealed that appropriate information given by the clerk in a timely manner often causes the customer's focus to be changed to lead the change of their search goal itself in their decision-making process when shopping. It also found that this interaction is effective in decision-making for the concept-articulation type of purchase.

Based on these knowledge acquired from the analysis of human behavior in the actual purchase activities, this study has created a system, called S-Conart(CONcept ARTiculator for Shoppers), to support the concept-articulation type of purchase. The authors are developing a system which puts special emphasis on the appropriate information presentation to support the customer's concept formation instead of replacing human communication with HCI as is. This paper describes the system configuration and interaction design of S-Conart, and introduces the result of the user study conducted with S-Conart. Through this user study, the authors argue that changing the content and/or presentation method of information provided by the system can bring an equivalent change to the human mental world, although it is in the different form from the human interaction.

2. CREATIVE COMMUNICATION IN ACTUAL PURCHASE ACTIVITIES

This study first made an examination of human behavior in the actual purchase activities [6]. Specifically, we collected protocol data for customers' behavior in actual apparel shops, which were used as a clue to the decision-making process of customers. We recruited sixteen subjects for the data collection and had them carry a taperecoder when they go shopping to record the conversation with salesclerks in the shops. Among 107 pieces of purchase protocol data collected, 51 cases were analysed excluding remaining 56 cases because of difficulties in data analysis from inaudibility of voices recorded, use of demonstrative words such as *this* and *that*, and so forth.

Our analysis showed clerks ' interaction patterns could be classified into two types, that is, expected reaction and unexpected reaction.

In a regular purchase, a customer reaches to more satisfactory solution, or product, through the conversation with the salesclerk. In such situation, the clerk present another solution, or product, to the customer that better fits her requirements. These kind of reactions from the salesclerk confirms the customers requirements or thinking presented by words, and present candidates that better fits the requirements. We can say that these are *expected* reactions.

On the other hand, we observed reactions that promote customers ' decision-making by saying opinions that provide a different viewpoint to the customers. These kind of reactions from a salesclerk are *unexpected*, in a sense that it divert from the usual reaction, which present solutions that better fit the requirements of customers.

Which of expected and unexpected reactions is an appropriate interaction depends on the current context. Our analysis also showed that capable salesclerks can successfully grasp values and potential wishes of customers to use an appropriate interaction pattern for the occasion, whereas less capable salesclerks tend to adopt an inappropriate pattern. Typical examples are shown below.

Among different purchase cases of different subjects, five cases happened to have the same situation where they mind that the jacket under consideration is short. Below is an example of unsuccessful conversation which didn't lead to the purchase.

Customer I want a little longer one. This (candidate A) is a bit too short. I want to hide as much of my waist as possible.

Salesclerk (After considering for a while) If so, how about this one（candidate B)? This is tucked in the waist and designed to have a long hem.

Customer Well, let me see... I'm afraid this is not my taste.

Shown next is an example of successful conversation which led to the purchase.

Customer This (candidate B) is a little short, isn't it?

Salesclerk Such a design is popular this year. Almost every shop deals with short ones. Do you prefer longer one?

Customer Too short to cover my waist...

Salesclerk It depends on the balance with your skirt or pants. 'cause you're now wearing shorter tight skirt, you think that way, but if wearing a long skirt, you will feel better.

In the former case where the conversation didn't lead to the purchase, the salesclerk responded straightforward to the customer who complained of the shortness of jacket by presenting a longer jacket, whereas in the latter case where the conversation led to the purchase, the customer's mental world was changed from one where the relevant attribute is *length of jacket* to another where different attribute called *balance* is relevant. Through the conversation, the capable salesclerk shown in the latter case could grasp the customer's wish that she make herself look as good-shaped as possible, and induce the appropriate goal ("short but well-balanced jacket") in accordance with it.

3. RELATED WORK ON CREATIVITY SUPPORT

Interestingly, the interaction patterns recognized in our analysis of human behavior in the actual purchase activites agree well with assertions by previous studies on creative support.

Gero grouped the design activities into the following three types: routine design, innovative design, and creative design [2]. Routine design can be defined as that design activity which occurs when all the necessary knowledge is available. Innovative design can be defined as that design activity which occurs when the context which constrains the available ranges of the values for the variables is jettisoned so that unexpected value become possible. Creative design can be defined as that design activity which occurs when a new variable is introduced into the design. Boden defined the ordinary task as one within a concept space and the creative task as one which causes a concept space itself to change [1].

The capable salesclerk shown in the above example changed the customer's mental world from one where only variable called *length* is handled to another where a new vaiable called *balance* has been introduced. This may be exactly the same process as the creative design.

Traditionally, when the creativity is mentioned, it is often taken as a special capability of special professionals such as artists and researchers. Also in the field of creativity support studies, the implementation of support systems has been attempted for specialized activities such as designing and paper writing.However, the above example shows that people display their creativity even in everyday activities such as a purchase. In their everyday activities, they adroitly realize a similar process to the concept formation process observed in the creative activities.

4. AN APPROACH TO S-CONART

Capable salesclerks combine various knowledge appropriately using meta-level strategic knowledge to provide suitable information for the context. Can the human-computer interaction be expected to have such richness of the human interaction? An approach immediately thought of is to build capable software agents equivalent to capable salesclerks. However, it is yet to be solved well what strategic knowledge capable salesclerks have and how they make use of it.

As such, the authors take a different approach to the design interaction. That is, we are developing a system which puts special emphasis on the appropriate information presentation to support the customer's concept formation instead of replacing human communication with HCI as is. This approach is based on the idea that changing a representation system for information provision from computer to human being has the same effect (in a sense that user's mental world is changed) as that for applying different strategic knowledge to control the interaction.

In order to consider what system providing what infomation should be implemented with this approach, it is necessary to organize what information provision is effective in changing customer's mental world in the human-human interaction. An examination of what information is provided by salesclerks has found the following three types of information provision useful for helping customers make a concept-articulation type of purchase with the unexpected reaction:

1. to directly present new viewpoints to the customer.
2. to present well arranged relevant information that guides the customer to new viewpoints.
3. to provide such a context that triggers the formation of new viewpoints or let the customer naturally accept new viewpoints.

Capable salesclerks can use meta-level strategic knowledge to combine these three types of information appropriately for use. In order to present appropriate viewpoints in 1., in particular, advanced strategic knowledge is needed, and thus it may be difficult to realize this with computer support. Information provision in 2. and 3., on the other hand, may be realized well also with computer support.

One of methods to appropriately provide related information as shown in 2. is an information presentation

using spatial arrangement. Previous studies have verified that *spatial-arrangement* style of information presentation is effective in the creativity support [3]. Accordingly, this study applies spatial-arrangement style of presentation commonly used in the studies of creativity support to our experimental online shopping system, and implements a system function to arrange product items on a two-dimensional space using multi-dimensional scaling method to indirectly present the relationship between them.

The study by Ishino et al. on the support for product concept formation [4] found that information on concrete scenes or situations of the use of product items (which we call *scene information*), as shown in 3. above, is effective in the concept articulation. Thus, this study implements a function which can provide appropriate scene information for the current user's mental process to help the user try the context expansion and therefore concept articulation.

5. SYSTEM OVERVIEW OF S-CONART

S-Conart is implemented as a Web application and consists of product information database, spatial-arrangement and listing representation subsystems, words presentation subsystem, and so forth.

This system only deals with Japanese sake (rice wine) as product items. The product information database uses PostgreSQL as a underlying DBMS, and stores sake data with 12 attributes and of 193 kinds as product data.

Each subsystem is implemented with servlets and Java Server Pages (JSPs). In addition to them, the spatial-arrangement representation and phrase presentation subsystems also include an engine for calculating coordinates of product items or words as well as an applet for the spatial-arrangement style of presentation in the Web browser.

Major features of S-Conart system are as follows:

Displaying products in spatial-arrangement style: Allows the user to select desired attributes of products in the database, and displays products in spatial-arrangement representation based on the selected attributes (See Fig.1). Clicking on a product node in the space causes the detailed information on the product to be displayed. It also includes a function to display products matching specified conditions in a different color from that for other products. This feature is designed to arrange product items on the two-dimensional space to indirectly present the relationship between them. We expect that this spatial-arrangement style of information presentation may trigger the user's mental process to change their mental world, and consequently help them make a concept-articulation type of purchase.

Displaying products in listing style of presentation: Allows the user to select desired attributes of products in the database and their value ranges, and displays the products matching these conditions in listing representation (See Fig.2). Clicking on a product name in the list causes the detailed information on the product to be displayed. This feature is designed primarily to make a comparative experiment with the spatial-arrangement representation.

Entering and viewing comments: Allows the user to enter and browse their comments freely for each product item. This feature is designed primarily to collect the materials to be used for spatial presentation of words. We expect that browsing others' comments on the products may affect the user's mental process. Comments, in a sense, can be information which provides different viewpoints directly. However, it differs from salesclerk's reaction in actual purchase activities in that the user will need to make a conscious browse.

Displaying words window in spatial presentation: Displays a network of words based on cooccurrence between words extracted from collected comments (See Fig.3). Both graph and tree views are available on the screen.

- **Graph view:** Graphs the global structure of words extracted from comments. Arranges the words in a two-dimensional space and draws each link between words as a line whose width is determined by cooccurrence between them.
- **Tree view:** Represents as a tree a local structure around a word in the graph view. Allows the user to trace links from a selected word to other related words sequentially.

These features are designed to provide appropriate scene information for the current user's mental process to help the user try the context expansion and therefore concept articulation. Because the tree view in particular allows the user to trace the tree to expand the desired context, unexpected relations may also be found quickly. The authors think that the language control major portion of the human mental activity and therefore play an important role in articulating an image as a scene information.

6. INTERACTION DESIGN FOR S-CONART

S-Conart is intended to help the users make a concept-articulation type of purchase through the interaction with the system when they only have vague requirements on what they want. We expect both features of spatial-arrangement style of information presentation and verbal provision of scene information to be effective in supporting the users' concept formation.

This section illustrates what human-computer interaction occurs in S-Conart system with an example where the spatial-arrangement style interface is used.

Specifying attributes to get product items arranged: When you select the spatial-arrangement style interface, a screen for selecting attributes first appears. Then, when you finishes attribute settings, a spatial-arrangement result screen appears (Fig.1).

Browsing product attributes or comments: The result screen is divided into three major parts (Fig.1). On the left pane, product items are spatially arranged based on their similarities. The right pane displays detailed information on the selected item. The bottom pane displays the comments on the selected item. Fig.1 shows the result when selecting *Shimeharizuru* (which is a kind of sake) to cause its product information to be displayed in the right pane. The bottom pane displays the comments already collected on *Shimeharizuru*.

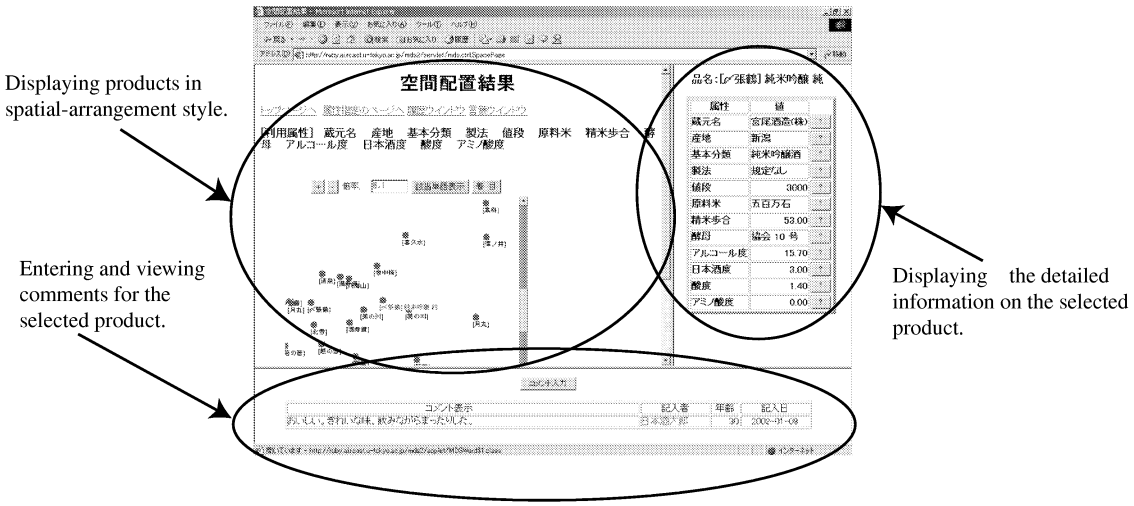

Figure 1: Displaying products in spatial-arrangement style of presentation

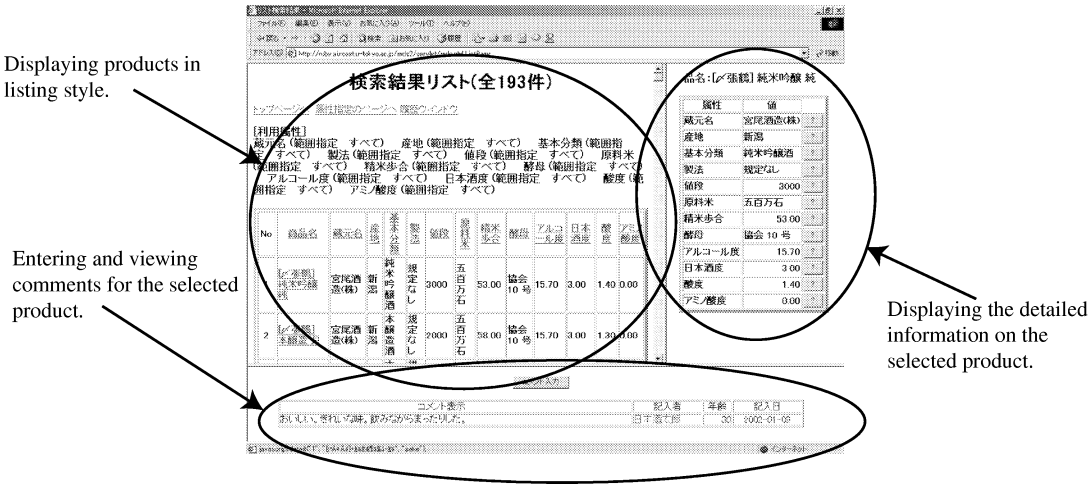

Figure 2: Displaying products in listing style of presentation

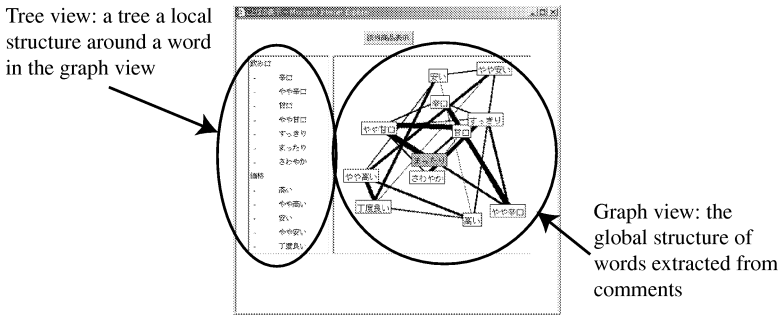

Figure 3: Displaying words window in spatial presentation

Diplaying the words window: To diplay the words window for the product item (*Shimeharizuru* in this example) selected in the product space, just click on the *view related words* botton. You can also display the word graph for multiple items selected at once. Fig. 3 shows the Words window displayed after selecting *Shimeharizuru*. Because the comments on this item contain *tasty, clear, rich*, and other words, corresponding words are highlighted.

Selecting words matching the image: When you select the word(s) matching your mood or image of desired product items in the words window (Fig. 3), the items whose comments contain these word(s) are highlighted in the product space (Fig. 1). If *rich, clear*, and *somewhat dry* are selected on the words window, corresponding to this, it Seiun, Kasen, Shimeharizuru, and other matching items are highlighted in the product space.

Concept articulation through interaction: Repeating operations mentioned above allows you to start with consideration of some initial item and reach different product items via the world of words. And, through this iterative process, you can gradually clarify the image of what you want and consequently buy satisfactory items. With the aid of the words displayed in the words window, even users without enough knowledge of products can explicitly represent their image being articulated, and resultingly acquire the product knowledge.

7. USER STUDIES

The authors first conducted an experiment to examine the effect of spatial-arrangement style of information presentation. This section describes the content and result of the experiment. The effect of verbal presentation of scene information is currently under consideration, and will be reported as soon as it is concluded in the future.

A comparative experiment on eight subjects with a product selection assignment was conducted to examine the difference in human cognitive process between when using spatial-arrangement style interface to indirectly present the relationship between the product items and when using listing style interface to present the product items in the list [7].

The subjects were given a document describing the content of the experiment and assignment and then performed their experiment following the given procedure. Two kinds of assignments were prepared, and each subject did one assignment using listing style interface and the other using spatial-arrangement style interface. What was happening during doing assignments was shot with a video camera. When the subjects have an interview regarding their assignments, watching this video and their operation history stored in the system, they were asked for preferably detailed explanation about why they performed each operation and what they had in their mind at that time. What they said was recorded and used for the protocol analysis.

The findings from the protocol analysis are summarized as follows:

The user trying to select desired product items usually first make a plan for what items should be selected in what policy. When the requirements are clear, a clear plan will be easily determined, however, in many cases the plan will be revised in trial and error basis through the interaction with the system. When a clear plan cannot be made, a tentative plan will be made and used for the search, then revised based on the search result. Therefore, the user's decision-making process as a whole often repeats a cycle consisting of planning, action, evaluation, determination, reconsideration, and so forth to gradually approach more satisfactory candidate (product item). A number of problem-solving type of purchase processes realized by the iteration of *expected reactions* and their corresponding revision requests were observed in human behavior in the actual purchase activities, however, it is interesting that similar characteristics were found also in our online shopping experiment.

On the other hand, the phenomena similar to the concept-articulation type of purchase realized by *unexpected reactions* observed in the human behavior in the actual purchase activities were also observed in the decision-making process analyzed from the experiment result. For example, in the experiment conducted by one of subjects using spatial-arrangement style interface, he/she originally tried to make a search with a goal of "*Ginjo-shu* from northern regions at a reasonable price". He/she used the focusing functionality to balance matching product data with each other. If it were an expected reaction, this balancing would result in narrowing down candidates or relaxing conditions. According to this subject's remarks, however, while looking at items colored orange in the focused view, an item (colored blue) not corresponding to the current view caught his/her attention, thus clicking it to view the data proved it to be *Junmai-shu*, which he/she was inclined toward, and then, he/she chose to try another focused view for Junmai-shu. That is, something which caught the subject's attention affected his/her mental process to cause the plan to be changed.

8. CONCLUSION

This study has considered the information presentation method to help the customers make a concept-articulation type of purchase when they only have vague image of what they want, and created S-Conart as one of its enabling systems.

We started with observing human behavior in the actual purchase activities and found that appropriate information given by the salesclerk in a timely manner often causes the customer's focus to be changed to lead to the change of their search goal itself. And, this interaction proved to be effective in decision-making for the concept-articulation type of purchase.

Then, this study created a system called S-Conart to support the concept-articulation type of purchase based on these knowledge acquired from the analysis of human behavior in the actual purchase activities. This paper described the system configuration and interaction design of S-Conart, and introduced the result of the case study conducted using S-Conart. The result of this case study verifies that spatial-arrangement style of information presentation is useful as a trigger to change the user's mental world. Further, this result suggests that changing the content and/or presentation method of information provided by the system can bring an equivalent change to the human mental world, although it is in the different form from the human interaction.

9. LOOKING AHEAD

The authors think that in the future we need to make more detailed analysis of what characteristics of the spatial representation caused the user's mental world to be changed in what way. And, making various devices to the listing representation as well as the spatial representation is expected to cause the user's mental world to be effectively changed. This point also needs to be examined. Enough analysis of how changing the information representation can change human mental world has not yet been made. Knowledge about this problem is being gradually accumulated from the studies by various researchers including us. The goal of our study is not to build the current S-Conart system but to use it examine human mental process and continue to make improvements to the system that reflect the result from the examination. We ourselves would like to explore the interaction design desirable in terms of conceput formation through this iteration.

References

[1] M. Boden, The Creative Mind: Myths and Mechanisms, Basic Books, 1991.

[2] J. S. Gero, Computational models of Creative Design Processes, Artificial Intelligence and Creativity (T. Dartnall, ed), Kluwer Academic Publishers, the Netherlands, pp.269-281, 1994.

[3] K. Hori, Concept space connected to knowledge processing for supporting creative design, Knowledge-Based Systems, vol.10, no.1, pp.29-35, 1997.

[4] Y. Ishino, K. Hori, and S. Nakasuka, Concept development of consumer goods utilizing strategic knowledge, Knowledge-Based Systems. vol.13, pp.417-427, 2000.

[5] P. Pu, and B. Faltings, Enriching buyers' experiences: the SmartClient approach, Proceedings of ACM CHI2000, pp.289-296, 2000.

[6] H. Shoji, and K. Hori, Chance Discovery by Creative Communicators Observed in Real Shopping Behavior, T. Terano et al.(Eds.), JSAI2001 Workshops, LNAI2253, pp.462-467, 2001.

[7] H. Shoji, and K. Hori, Strategy emergence from human-computer interaction, J. S. Gero and K. Hori(eds), Strategic Knowledge and Concept Formation III, pp.87-99, 2001.