A creative thinking support system reflecting convergent thinking

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Abstract

In this thesis, we propose a new system which supports a user's creative thinking process using computers. The creative thinking process is located at the upper stream in human problem solving activity.

In the process of the creative thinking, ideas are generated and arranged. We call the idea creation process "divergent thinking process" and the idea arrange process "convergent thinking process". In the real situation of the creative thinking process, the quality of ideas can be improved by repeating the divergent thinking process and the convergent thinking thinking one.

Focusing on this aspect, we consider the application of current divergent thinking support systems to the thinking process that a user in a convergent thinking process does divergent thinking one again.

A lot of previous systems which supports the divergent thinking by human, gave only the related information which stimulates a user's creative thinking process in the concerned theme. But there is some doubts as to whether it is a good use of user's thinking. That is, when returning from the convergent thinking process to the divergent thinking one, the structure of user's convergent thinking is disregarded in the previous divergent thinking support systems. Therefore,it is not easy to say that these systems are realistic. In the study of current creative thinking support technology, the support method from the convergent thinking to divergent thinking was insufficient though support method from the divergent thinking to the convergent thinking had been performed in various way.

Then, in this study, we propose a mechanism which supports user's divergent thinking by finding information which user did not notice. The system finds information from the

diagram created by user in a convergent thinking process. It makes the user to take notice of useful information by the method of visualizing the information and reflecting it in the diagram. We developed an experimental system based on this method.

In this system, the creative thinking is supported by using the frame work of KJ method. The system generates useful related information for the divergent thinking from the diagram of the KJ method which the user made at the convergent thinking process and visualize it to the user. In this study,we aimed at the keywords in the text for the creating of the related information just like previous divergent thinking support systems. Concretely, these systems pull out the words which are suitable to be keywords from words written in the labels of KJ method diagram which the user made. We call these keywords theme keywords. The related keyword which promote user's creative thinking is generated from each theme keywords and data which the system has beforehand.

Most previous systems use the relevance degree to generate the new keywords with a strong relation to the given theme keywords. However, we applied the fast mining algorithm for generation association rules.This algorithm is often used in the field of the Knowledge Discovery in Database (KDD) to the keywords in text. Then the system does filtering to leave the important one for obtained information because it attempts to find the relation which is hidden between keywords more aggressively. We put emphasis on the way of viewing the related information which is able to reflect the ideas made by a user. In most current systems, the way to visualize related information is divided into the method of using a list form and the method of arrangement on the two dimensions space. But user's ideas do not reflected in these methods because they are achieved based on information which the system has beforehand. For a users who repeat the divergent thinking and convergent thinking, the way of showing the relation among the generated information is of no use. Therefore we use the way of showing what relation exist between the generated information and user's idea. Our the system clarifies the relation directly between each related information and the diagram which the user had made by putting the useful information into the diagram.

By this method the system achieves to classify the information based on its content. This is the advantage of the 2 dimensions space arrangement The result is shown in the order of strength of the relation or importance. This is the advantage of the list form can be expressed by sorting each pad place using heuristics.

In addition, we developed a mechanism to change the structure of the diagram which a user made for the purpose of changing the user's point of view. In this method, the system automatically groups the KJ method's labels based on the related information which the system generated and synthesizes the obtained diagram and the diagram which the user made. This synthesizes algorithm is based on Fuzzy relation.

The experimental system is implemented in X11R5(X Window Release 5) environment on Sun Sparc Station 5. This system is composed of three modules. The first module is for building keyword information from News group texts. This information is the form of association rules. The second module works for creating information concerning KJ method diagram which the user made. The third module functions for visualizing these information. We used D-ABDUCTOR for the KJ method support system. D-ABDUCTOR is a system developed to attain an effective integration of human thinking

capability and computer information capability.

Finally, we evaluated this system through two following points. One is concerned with evaluating the element technology used in this system, and the other is held for investigating the effectiveness of the system by comparing ideas of the user generated when this system was used and those when other tools were used. The effect of the system is examined in the point of how user's point of view had changed by comparing diagrams which the user had made before and after use of the system As a result, when this system was used, the change in user's point of view was seen and the utility of the mechanism proposed by this study was confirmed.

In this thesis, we proposed a mechanism of the creative thinking support where the idea of the user was reflected based on information extracted from the diagram of KJ method which the user had made. Based on this mechanism, we implement an experimental system and show the effectiveness of the mechanism through some experiments.

In future, we will verify the effectiveness of the system and improve the system.