PeCo-Mediator: Supporting Access to Unknown Partners for Cooperation Using Collective Personal Connections – Adaptable Menu-based Query Interface –

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This paper describes a groupware system, called PeCo-Mediator, and its adaptable menu-based query user-interface (UI). PeCo-Mediator collects group users' personal connections (PeCo) to help users finding partners who can solve their problem in business activities. Moreover, its UI is adaptable for a user's original perspective and another's viewpoint to use effectively diverse personal information.

1. INTRODUCTION

The Combined actions of two or more individuals realize net benefits that more than double the benefits available to a single individual. Human-human cooperation indicates the importance of creating an environment where refined solutions can be based on argument and the resolution of differing viewpoints[1]. It is significant to find a more capable and cooperative partner to meet the goal of cooperation.

Our research focuses on how a user can find a suitable partner who can solve a problem. A "PeCo" (personal connection) is often a starting point for finding vital partner(s)[2]. Users often find suitable partners of their acquaintances by using diverse personal information such as special abilities, interests and background in social interactions. Also, the trust based on the personal relationships makes it easy to obtain the cooperation.

We propose a groupware system[3] , called "PeCo-Mediator," that allows group members (users) to collect and use their PeCos[4]. All the users offer the information on their acquaintances and the closeness of their relationships to the system. The system helps users find a vital partner who can assist their problem solving, and supports access to the background of the hitherto unknown partners. To handling diverse and dynamic personal information which users obtained in their social relationships, the system will need the maximum flexibility in storing data from every user's perspective and the utmost adaptability in using data from every possible viewpoint.

In this paper, we describe the adaptability of the menu-based query user-interface (MUI) which makes the most use of diverse personal information. The characteristic features of the interface lie its allowing the user: 1) to freely customize the menu structure from

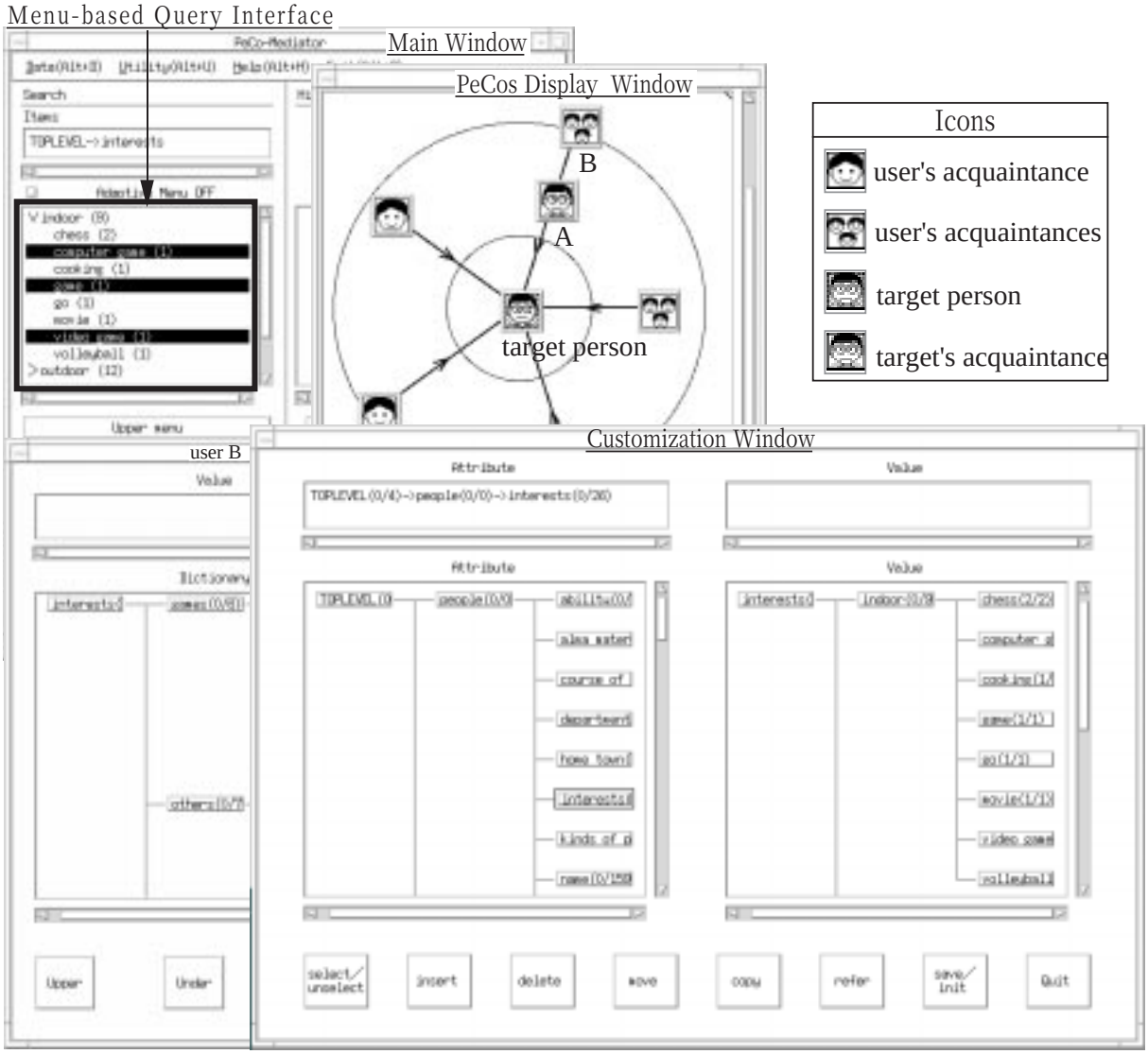

Figure 1. Screen of PeCo-Mediator.

his/her viewpoint; 2) to adopt others' menu structure as his/her own; and 3) to help users find partners not only from his/her own viewpoint but also from others' viewpoints. Namely, the menu is adaptable for a user's original viewpoint or another's one in its use to enhance human-computer interaction.

2. OVERVIEW OF "PeCo-Mediator"

2.1. Prototype system

We developed a prototype system on a workstation (see Fig. 1). The system consists of several clients and a server program and they are connected via the Internet. When they have some problems, users find target partners through the MUI in Main Window by using personal infomaion. PeCos Display Window shows the closeness of the relationships between a target and his/her acquaintances. The shorter the distance between a target

and an acquaintance is, the stronger the relationship they have. In Fig. 1, the user may smoothly cooperate with the target by the introduction of Mr. A and Mr. B.

2.2. Flexible database

Currently, the most popular type is based on the relational data model, where data are stored in records with pre-defined fields. To gather diverse and dynamic personal information, it is harder to pre-plan its data structures and predict all the ways in which the data will be looked at. PeCo-Mediator handles such information using TRIAS[5] which allows users to easily add, delete or change attributes or values at any time during its use. TRIAS represents data with triplets by a small grain size as (entity, attribute, value).

TRIAS can search triplet data employing search conditions where any elements can be replaced by "$*$"; (E, A, V), $(E, *, *)$, $(*, A, *)$, $(*, *, V)$, $(E, A, *)$, $(*, A, V)$, $(E, *, V)$, $(*, *, *)$. For example, users obtain "Ogata" and "Yano" whose address is Tokushima by the condition ($*$, address, Tokushima), when TRIAS has data such as ("Ogata", "address", "Tokushima"), ("Ogata", "interests", "programming"), ("Yano", "address", "Tokushima"), and ("Yano", "position", "professor").

2.3. Menu-based query interface

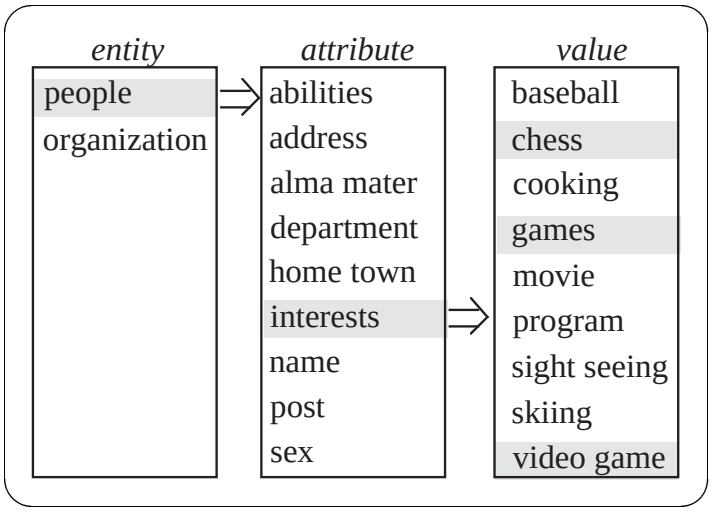

Figure 2. Flow of MUI.

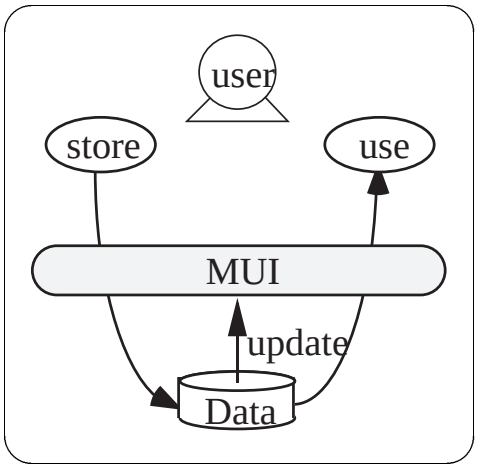

Figure 3. Basic frame work of MUI.

Several alternative types of interfaces have been developed, including MUI, graphical interfaces, natural and pseudo natural language interfaces, and browsers. These interfaces are oriented towards non programmers and novice users. A research validated that even a novice user could most smoothly construct desirable answers through a MUI[6]. Therefore, we adopted the interface into PeCo-Mediator.

The system generates the menu structure from triplets in the database and makes a hierarchy of entity, attribute, and value from the contents of the database. Fig. 2 shows menu structure of "interests." In this figure, the user retrieves people who are interested in "chess", "games", or "video game" by employing ($*$, "interests", "chess"), ($*$, "interests",

"games"), and (∗, "interests", "video game"). By selecting simply from menu items, users can find partners without the familiarity with the contents or organization of the database.

Fig. 3 shows the simple framework of PeCo-Mediator. Users can store every personal information which they obtained in their social activities. The menu items are automatically updated according to additions, deletions or changes of attributes or values in the database. In other words, the menu has the autonomy to adopt the database contents into itself. Therefore, users can browse the contents of the database in that time.

3. ADAPTABLE MENU FOR A USER'S VIEWPOINT

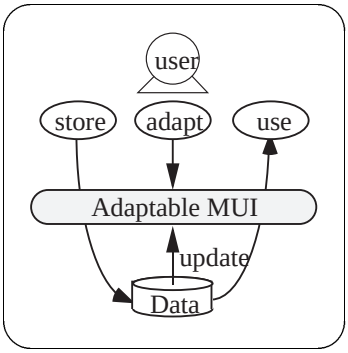

Figure 4. Frame work of adaptabele MUI.

Groupware systems are used by several workers in a group. Users' expertise and interpretation of data are different[7]. Ordinary MUI which have the only predefined contents are short of the flexibility. According to a user's respective viewpoint, PeCo-Mediator allows him/her to customize him/her menu structure freely and to adapt their conceptual structures to the menu (see Fig. 4). By this feature, users can get rid of needless information and reach needed information intuitively. That is one kind of information filtering systems.

Fig. 5 shows menu structures of User A and User B after customizing respective menu such as Fig. 2. In this case, User A divides into "outdoor" and "indoor," and User B is interested in "sports" and "game."

In this way, dummy values which the user inputed clarify the relationships between the values (concepts). The view of information throughout his/her own menu is sure to enhance human-computer interaction between the user and the system. In Customization Window, users graphically customize their respective menu structure by using the command buttons such as "insert" (see Fig. 1).

4. ADAPTABLE MENU FOR DIFFERENT VIEWPOINTS

The research on customizable software (i.e., X-window customizing file) pointed out that users requested to share their customization in its design. This study has demonstrated that customization is not surely individual activity. Members of an organization may affect each other's behavior for long periods. Considering the report, we propose the multi-users frame work, extending the single user one (see Fig. 6). Its main characteristic is that a user obtains useful ideas through browsing different menu structures.

4.1. Customization of menu structure

In PeCo-Mediator, a user selects the suitable structure from three candidates such as a nominated user's menu and domain knowledge bases. PeCo-Mediator has the two ways to tell a user some useful ideas from the different viewpoints. One is "bottom up approach" and the other is "top down approach." Bottom up approach derives the user unknown upper concepts from the user selected value. For example, when User A wants to know

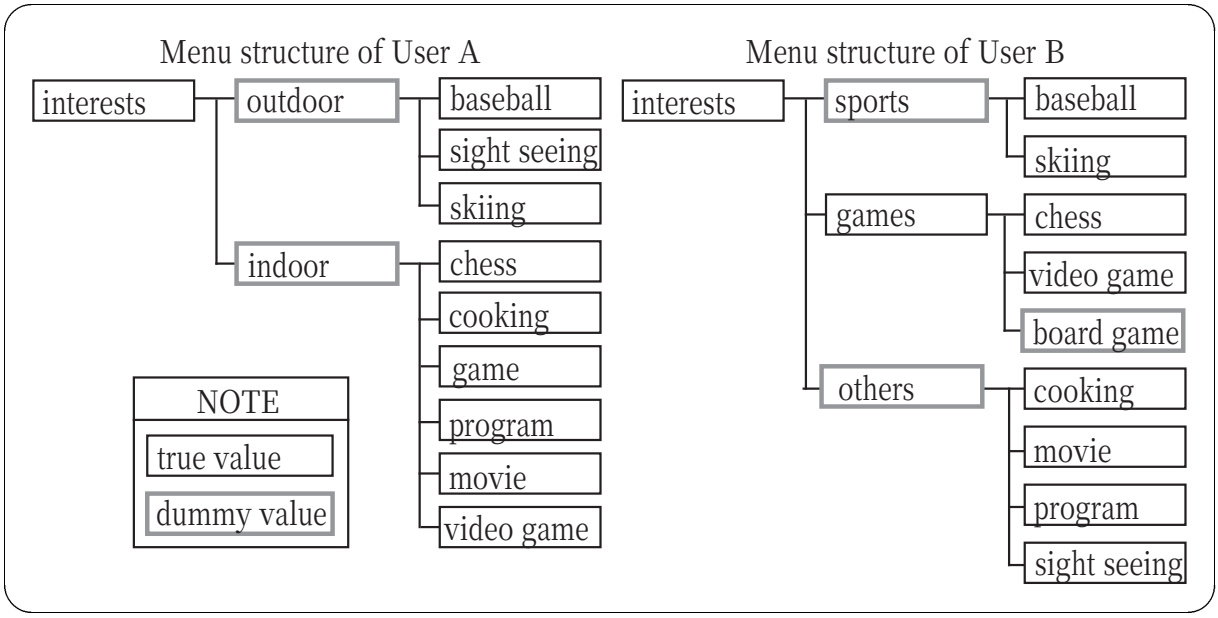

Figure 5. Menu structures after the customization.

what "video game" is included by, the system shows "game" and "indoor" as the answer by the selection of "video game" and "upper button" in Fig. 7.

On the other hands, in top down approach, User A finds some under concepts of "indoor " except the user's menu structure by the selection of "indoor" and "under button." In Fig. 7, user A can adopt the idea(s) of User B into his menu. User A may find an advantageous or adapted idea to classify "indoor" under "games" and "others." Of course, this is realized by the permission of User B to User A. Moreover, the system shows users the domain knowledge bases such as address.

4.2. Finding a partner

When users retrieve partners through users' menu, PeCo-Mediator allows them to use different menus temporarily. For example, as shown in Fig. 7, User A can use User B's menu instead of User A's menu in Fig. 5 by selecting User B's viewpoint from shared viewpoints. Moreover, User A can also use a part of the general menu. In this way, users can find partners not only from users' original viewpoint but also from others' ones.

5. CONCLUSION

Our research focuses on the ways members can find partners for human-human cooperation using their PeCos. In this paper, we proposed an adaptable MUI which allows users to systematize personal information according to their viewpoints. The questionnaires on the MUI indicate that it is efficacy for most users, and that its adaptability is efficient and significant for browsing through personal information to find suitable partners.

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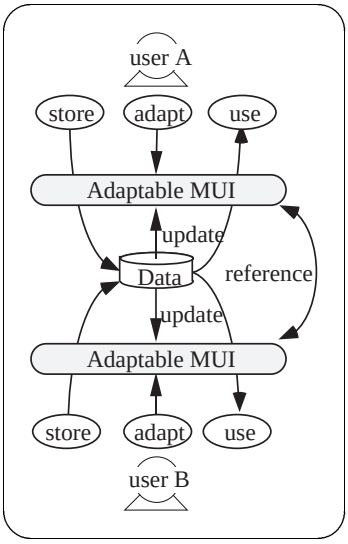

Figure 6. Frame work of Adaptable menu for different viewpoints.

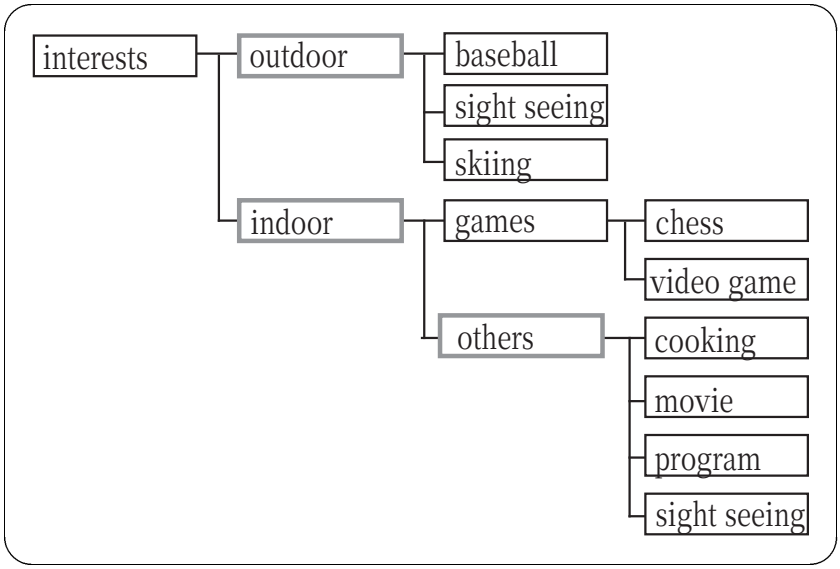

Figure 7. User A's menu structure after adopting the idea of User B.

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