[Practical Paper] Pictograph Communication using Tabletop Interface

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Abstract - The interpretation of the pictograph is approximately common through the world. We have developed a meeting type pictograph chat system that we assume to use at the tourist information center. The system can easily add a photograph as a pictograph, and use a tabletop interface for easy operation. Two users can operate the system simultaneously. Results of experiments show that the understanding degree of chat contents tended to improve when we used the photograph as a pictograph.

Keywords: pictograph, chat, tabletop interface, tourist support

1 INTRODUCTION

The Japanese who traveled in the foreign countries or the foreigners who traveled in Japan increased, and opportunities to regard communication as a foreigner increased. However, it is not still easy to communicate with a partner, who speaks a different language. Therefore a system supporting communication between different languages is requested without learning a specific language. The interpretation of the pictograph is approximately common through the world. Some systems support for communication using pictographs [1],[2].

We have developed a meeting type pictograph chat system that we assume to use at the tourist information center. The system can easily add a photograph as a pictograph, and use a tabletop interface (Diamond Touch Table) [3] for easy operation. In this paper, we show the experimental results using the system.

Chapter 2 explains the related work about this system, and Chapter 3 shows the proposed system. Chapter 4 describes the experiments and results, and Chapter 5 is the conclusion.

2 RELATED WORK

Pictograph chat communicator II [2] is a system, using only pictographs to communicate each other. The system consisted of two PCs via LAN. Pictographs are in color but a part is monochrome symbols. There are 547 pictographs in the system. This system has 9 tabs (including the History Tab), and pictographs are divided into 8 tabs. The application experiments of this system were performed by a Japanese student and a foreign student or an overseas international conference participant. The communication was performed smoothly. There was an opinion that there were few kinds of pictographs and few objective pictographs.

Zlango [4] is a pictograph-based system built for web and mobile messaging. The system has about 200 pictographs, which are changed from time to time, depending on its usage. Unused pictographs are deleted and new ones are being added to the system. The pictographs are divided into groups such as "People", "Actions", "Places", and "Feelings". Zlango was developed in Israel and could be installed in cell phones in 12 countries. Zlango's customers include Portugal Telecom/TMN, Globe (Philippines), Kiyv Star (Ukraine), Celcom (Malaysia) and other mobile operators.

3 THE PICTOGRAPH CHAT COMMUNICATOR III-T

3.1 Design policy

(1) The use of the tabletop interface

We use Diamond Touch Table, which is one of a tabletop interface. The system has a large view area and enables the intuitive simultaneous operation with plural people.

(2) A function to display a proper noun as a pictograph

We implement a function, which adds photos or images as pictograph. The pictographs which are made from these photographs and images let difference in interpretation of the communication reduce.

3.2 System configuration

The system was developed for Diamond Touch Table. In the upper part of the system, a mirror reflects a picture from a projector, and then the picture is displayed on a display of Diamond Touch Table. The screen display domain is 490mm x 650mm. Two users use it in a meeting. They can operate the system simultaneously. They can use it synchronously. The number of pictographs is 560 and the size of pictograph is 45x45 pixel (29mm x 31mm on the screen). The system can use photographs as pictographs. A photograph can be fetched from Web or a digital camera. We use Flash, PHP, and XAMPP for the system. Figure 1 shows a screen of the system. The system consists of about 2,000 lines programs.

3.3 Operation of system

At first the user chooses one's icon. In Figure 1, "cat" icon (left in bottom) is a user's icon. A supporting pictograph (left in middle) is displayed when user chooses a tab (square and colorful button in bottom). If user finds the objective pictograph, then user touches the pictograph. The pictograph is selected and then input to the input field (left in bottom). In Figure 1, pictographs of "question" and "drop of water" are in the input field. The func-

Figure 1: A screen of Pictograph chat communicator III-T.

tion of delete and sorting are equipped at the input field. User repeats the operation mentioned above and makes a sentence. If the sentence is completed, then user touches the input button (pentagonal button in the middle of bottom). The sentence is represented vertically   in the output field (right in top). Another user operates it in the same way in the other side simultaneously.

The additional function of the pictograph was implemented by PHP and Flash. When user wants to add the pictograph, user pushes the browser start button (a picture of the earth in the right of bottom) of Figure 1 and runs a browser. Next, user searches the image which user want to add as a pictograph on Web, and then user saves it in a designated folder manually. When user takes in a photograph from a digital camera and flash memory, user copies it in a designated folder and has only to save it.

4 EXPERIMENTS AND RESULTS

4.1 Experiments

The experiment went with two one set. One acts as a tourist, and the other acts as a member of explanation of the tourist information center at Osaka city.

We explained only the simple operation of the system to a subject. We do not explain the meaning of the pictographs. When user cannot express the content that user wanted to convey only with a pictograph prepared beforehand, we directed that user took an image from Web at any time. The experiment was finished when a member of explanation of the tourist information center replied it for all questions of the tourist.

The procedure of the experiment is shown below.
(1) The subject of the part of tourist asks questions decided beforehand such as a place or a route about sightseeing spot to a member of explanation position of the tourist information center. The questionary is shown Table 1. We do not tell a content of question to a member of explanation of the tourist information center at all. The subject assumed that there was knowledge around the sightseeing to some extent. Figure 2 shows a scene of experiment.

(2) The subject wrote down how he/she interpreted the meaning of one's remark and the remark of the partner after the chat end. The subject did questionnaire entry last.
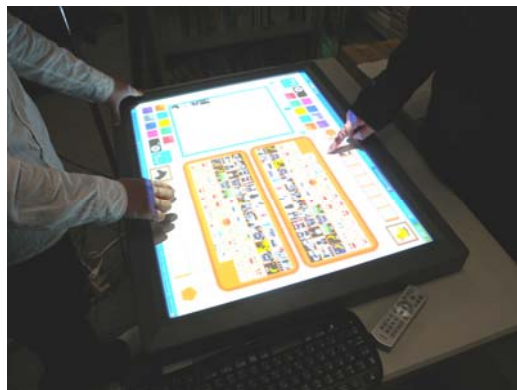

Figure 2: A scene of experiment.

Table 1: Questionnaire.

Questionnaire
(1) How do I go from Osaka to the Chinatown of Kobe?
(2) How does it take time?
(3) How much does the fare depend on?
(4) Which direction should I walk in if I arrive at the station?
(5) What is the recommended cooking in the Chinatown?

4.2 Results of Experiments

We have performed experiments using the system eight times. Three foreigners act as tourist (other five times were Japanese). Table 2 shows an experiment number and the profile (nationality, male/female, pictograph user/non-user) of the subject.

Figure 3 shows a result of a chat (experiment No.7). The bus icon corresponds to the tourist and the Penguin icon corresponds to the member of explanation of the tourist information center. The result that described the meaning of the remark by one's pictographs is shown below. The pictographs, which are made from pictures of a Chinatown, Chinese food, the station name board of Sannomiya Station, and the steamed meat bun, are used

Table 3 shows time and output linage and the understanding degree that were needed for the chat of each pair. We take the evaluation method that Munemori [5] suggested in a calculation of the understanding degree into account.

Table 4 shows the ratio of the image and the ratio of the image per line, and understanding degree of each experiment. The term of image includes photographs and images. "Image/line" means the number of images divided by the number of lines.

Table 5 shows the questionnaire results of experiments. The value of Table 5 shows the mean value of each 8 person about tourists or members of explanation of the tourist information center.

Table 2: The profile of the subject.

No.	Tourist	Picto-graph	A member of a tourist information center	Picto-graph
1	Japanese student－Male	User	Japanese student－Male	User
2	Japanese student－Male	Non-user	Japanese student－Male	User
3	Japanese student－Male	User	Japanese student－Male	User
4	Japanese student－Male	Non-user	Japanese student－Male	User
5	Foreign student－Female	User	Japanese student－Female	User
6	Japanese student－Male	Non-user	Japanese student－Female	Non-user
7	Foreign student－Female	User	Japanese student－Male	User
8	Foreign student－Female	User	Japanese student－Male	User

Table 3: Time, output linage, and the understanding degree that we needed for a chat.

Mean value
Time (minutes): 23.3
Output linage: 19.5
The understanding degree of a tourist (%): 90.9
The understanding degree of a member of a tourist information center (%): 94.3
The understanding degree of all subjects (%): 92.9%

The description part of the questionnaire is as follows.
(1) About adding a photograph and an image to a chat
  -Because it was fetched an image by Web, it is easy to have come to express it.
  - Because a proper noun comes as well as a nuance properly, it is good.
  - It is good that I can add it, but may be clogged up in a part of the letter input in the difference of the language when it is a foreigner handling Arabic with a Japanese PC.
(2) About system
  - It was easy to take the pictograph big, but it was difficult for a lot of tabs to look for it.
  - Not only I open up a browser, search results should be displayed in a chat screen.

(1) Because I want to eat Chinese food in a Chinatown, how is it good in a train if I go?
(2) You can eat if you get on a train for Sannomiya Station.
(3) How does it take time by a train?
(4) It is 2:00 (misunderstanding).
(5) How much is a price to Sannomiya?
(6) It is 250 yen.
(7) Which direction should I go to from the station?
(8) You walk from Sannomiya.
(9) Which direction should I have walked in?
(10) That exists a direction, where many shops are existed, from the station.
(11) Then there is a Chinatown.
(12) Thank you.
(13) How does it take time on foot from the station to the Chinatown?
(14) You arrive on foot in five minutes.
(15) What kind of delicious dish is it eaten?
(16) A steamed meat bun is delicious.
(17) I like steamed meat buns.

Figure 3:Example of chat.

 - I want operation of the pictograph input to be possible with drug and/ or clicks.
  - It is difficult to express progress of time.
  - If there was a brief cartoon film pictograph, it was better.
  -You should make a tab used well.
  - There were many pictographs, which I did not use.
  - I wanted the enlarged function of the photograph.
  - I want relevance in the content of tab and the tab itself.
  - It was difficult to show a direction.
  - The destination of the image is hard to find.

4.3 Discussion

(1) Pictograph chat
- About the interpretation of the pictograph

Table 4: Rate of image (%), image/line (%), and understanding degree (%).

No.	Rate of image (%)	Image /line (%)	Understanding degree (%)
1	9	29	89
2	6	22	88
3	14	50	91
4	15	67	93
5	2	5	95
6	11	32	93
7	15	69	96
8	19	77	98
Mean value	11.4	43.9	92.9

The understanding degree of chat was 93%. By the former experiments of general purpose, the understanding degree of chat was 91% and input line par minute was 2.3 [2].

-About Diamond Touch Table

The average of the evaluation to show in the following assumes it the mean of a tourist and the member of explanation of the tourist information center.

Question item (3) - 3 of Table 5 (We can see the pictograph of our partner in input field. I predicted that the partner wanted to tell and was able to consider it to my sentence making.) was evaluated 3.8. During an experiment, a subject assisted an input of the partner, and a subject also replied it to see an expression of the partner. It may be said that there was a merit to make face-to-face communication by Diamond Touch Table.

(2) The consideration about the additional function of the pictograph

The average of the evaluation to show in the following assumes it the mean of a tourist and the member of explanation of the tourist information center.

Question item (3) - 1,2 of Table 5 (Adding images to pictographs was convenient and it was easy to understand the sentence when images were added to pictograph) was evaluated 4.5. As for the ratio of the image for pictograph and the ratio of the image for the output linage, understanding degree tended to become high if the ratio of the image was high. As for the coefficient of correlation, that there was equilateral correlation with 0.46, 0.51 was confirmed each. From the questionnaire description part above (verse 4.2), it evaluated good.

(3) Discussion about the experiment environment

About question item (1) – 3,5 of Table 5 (There were targeted pictographs that I wanted to use and I was able to understand the things my partner was trying to say), a tourist evaluated them 3.9, 3.4 each, and the member of explanation of the tourist information center evaluated

Table 5: Questionnaire results of experiments.

Questions	A tourist	A member of a tourist information center
(1) Pictograph		
1. I was able to understand the meaning of all pictographs in the system.	3.8	3.6
2. Sentence making (using pictographs) was easy.	3.1	2.8
3. There were targeted pictographs (pictographs that I wanted to use).	3.9	2.7
4. I was able to understand the things my partner was trying to say.	3.6	3.5
5. I was able to make sentence what I want to say.	3.4	3.0
(2) Diamond Touch Table		
1. The input operation was convenient.	4.3	4.5
2. Elimination and sort of pictographs was easy.	4.3	4.1
3. Pictograph was easy to see.	4.0	4.1
4. I was able to look for the targeted pictographs smoothly.	3.3	2.0
(3) System		
1. Adding images to pictographs was convenient.	4.5	4.5
2. It was easy to understand the sentence when images were added to pictograph.	4.5	4.6
3. We can see the pictograph of our partner in input field. I predicted that the partner wanted to tell and was able to consider it to my sentence making.	3.6	4.0

1 : I disagree strongly, 2 : I disagree, 3 : I don't agree nor disagree, 4 : I agree , 5 : I agree strongly

them 2.7, 3.0. About question item (2) – 1 of Table 5 (The input operation was convenient), a tourist and a member of explanation of the tourist information center evaluated it very high. Because Diamond Touch Table has multi touch function and the system is operated by multi-user simultaneously. About question item (2) – 4 of Table 5 (I was able to look for the targeted pictographs smoothly), a tourist evaluated it 3.3, and a member of explanation of the tourist information center evaluated it 2.0. For both questions, the evaluation of the member of explanation of the tourist information center was low. Therefore, the expression of the answer side is more difficult than that of the question side. It is thought that pictographs specialized in a guidebook are necessary. But, too many numbers of pictographs are difficult to treat.

Specialized pictographs were requested with limit. There was no difference between the combination of the subject by this experiment.

(4) Discussion about the difference in interpretation

About the question item (4) of Table 1 (Which direction should I walk in if I arrive at the station?), a tourist asked as Figure 4, and the member of explanation of the tourist information center answered as Figure 5. Both subjects understood "which direction I should have gone" about the question of Figure 4. By the answer of Figure 5, there existed various answers like "go straight the hospital right", "go the hospital in the south", or "went along the bottom of the hospital". There existed some interpretation. We understood that we were hard to express an act to be twisted. It is difficult to express the act to be twisted in Figure 5. The pictograph, which is showed as "bending to the left" "bending to the right" is requested.

Figure 4: A question tourist.

Figure 5: The answer of the member of tourist information center.

5 CONCLUSION

We have developed a meeting type pictograph chat system that we assume to use at the tourist information center. Two users can operate the system simultaneously. We show the consideration of the result of the experiment below.

(1) It was easy to come to express a style by using a photograph and images such as a building and a place, and the scenery as a pictograph. Then, it was easy to have come to tell content to a partner. In addition, the average understanding degree was high with 93%, and understanding degree tended to become high if the ratio of the photograph and image was high.

(2) A pictograph specialized in a guidebook to "go to the north" and I "turn to the right" is necessary to do a guidebook.

(3) We were able to confirm that user predicted that the partner wanted to tell, because they met each other. So, user can support the input of the partner. This operation is one of the merits of the system.

In the future, improvement of the interface (ex. adding a map function), the making of a pictograph specialized in a guidebook moderately, and an example sentence indication function will be requested. The system will be used on a tablet PC.

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