Proposal and Evaluation of Pictograph Chat Communicator II

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Abstract

In this paper, we propose a system called the pictograph chat communicator II, a system that allows people who do not share the same spoken language to communicate using pictograph based chat system. Realizing the fact that non-Japanese people might not be very familiar with the usage of pictographs, we have carried out studies that researched the differences in between Japanese and non-Japanese, as well as guidance functions in our system to guide them. We carried out experiments of chats between Japanese and non-Japanese people in and outside of Japan (China). The experiments were carried out 8 times, 30 minutes each time. We report the results of the experiments as below.1) The average of chat lines were 29 (in Japan)/ 47 lines (in China). 2) The average understanding level was 83% (in Japan)/ 86% (in China). 3) The average usage of the history tab was 24% (in Japan)/ 13% (in China).

1. Introduction

The basic interaction tool that enables two or more people to communicate and collaborate with each other is the common language. Without sharing the same common language, we become handicapped in doing shared tasks. Although some may suggest body language, sign language or face expressions, these are only possible if two people are in the same place. What happens if they are not? What are the possibilities of two or more people to interact and communicate, to bond and to develop a relationship that benefits, when these people are thousands of miles away and do not share the same spoken language? Here, we propose the usage of the pictograph chat communicator II, a tool that may be the answer to our question. We had developed a system before [1]. This system was a chat system that can send and receive messages made only from pictographs. 550 pictographs were prepared. The new system (Pictograph chat communicator II) has a history tab, which can save and reuse all pictographs they used in the chat. The goal of this study is to understand the usability of the pictograph-based chat system.

In our study proposal, we focus on using only pictographs, to chat and develop communication between parties who do not share the same common language. We conducted experiments of 2 people chatting, one a Japanese person and the other, a non-Japanese. The experiments were carried out 8 times (Four times in Wakayama University and four times in the Palace museum (Forbidden City) in Beijing).

In a pre-experiment study, we researched about the differences between Japanese and non-Japanese people on the usage of pictographs. We learned that Japanese people, especially the youngsters are used to using pictographs in their daily life. This is caused by the widely used pictographs in cellular phone text messages. On the other hand, non-Japanese are not very familiar with pictographs, since in their home countries, pictographs are often only linked with cute faces only to bright up their texts in chat rooms like MSN messenger [2] or Yahoo! Messenger [3]. Because of this reason, we separate our subjects into two groups, Japanese and non-Japanese.

In this paper, we first discuss about the pre-experiments that gave us a clearer view of our study. This pre-experiment study explains about the order of pictographs in pictograph communication by Japanese and non-Japanese. Next, we explain the composition and function of our system, the pictograph chat communicator II. Then, we explain the details of how our experiments were conducted. After that, we present the experimental results. We discuss then lastly conclude this paper on section 8.

2. Related works

It is a project of the NHK South Pole kids project [4], and it is a pictograph chat system for children from all over the world to communicate using only pictographs. Concerning this system, pictographs which can be lined up to eight are expressible using the chat system of the Web base. However, there is the translation function of words and pictographs in this system and depends on a certain language. Similarly, a research involving communication with children in different countries using pictographs was done [5]. However, it is a mail-based system, not a real-time. There is a pictograph mail system, named Pic-Talk [6] and this

system is used for cellular phones.

Although sign language is a method that might allow communication excluding conversation, there are a lot of ways to express the same words in sign languages, and these ways differ by countries, or culture. For instance, the Japanese sign language differs from the Chinese sign language. At present, there are international sign languages (ex. Gestuno [7]) common to all parts of the world though they are not so general. The comparison with this is a problem for the future. Moreover, people in the sphere of Chinese characters can communicate in writing (kanji characters). The comparison with the Chinese character is a problem for the future..

3. Pre-experiments on the order of pictographs in pictograph communication by Japanese and non-Japanese

3.1. Order of pictographs based on English and Japanese texts

In this experiment, we show texts of English or Japanese sentences to Japanese and non-Japanese people (non Japanese people who know at least a little bit of Japanese language to understand the simple text), then had them choose pictographs that represent the text. The purpose of this experiment is to study whether the language of the text and the subjects' native language have any influence towards the order of pictographs chose.

The English text had 3 sentences, which were 1) I am eating a cake, 2) I dislike winter, and 3) I like flowers. The Japanese text had 3 sentences too, same meaning of text but written in Japanese language. There were 80 pictographs to choose from. We did the experiment on paper and using PDA [8] too. The experiment on paper had the subjects to choose numbered pictographs provided by writing the equivalent number on the paper (Figure 1(a)). The upper part of Figure 1 (a) is the sentences of the question and the lower part of the figure is the pictographs to choose from. The one by PDA had the subjects to choose the pictographs in the PDA by using the PDA pen (Figure 1(b)). Pictographs in the PDA and pictographs provided on the paper were the exact same ones.

13 Japanese people and 13 non-Japanese were the subjects of experiment using Japanese language text. Non-Japanese people consist of 4 Malaysians, 4 Chinese, 2 Koreans, an American, an Australian and a Nigerian. It was an experiment on paper. Experiment using English language text was done on paper and PDA. 12 Japanese (10 on paper, 2 using PDA) and 17 non-Japanese (12 on paper, 5 using PDA) were our subjects. The non-Japanese were 3 Chinese, 2 Koreans, 2 Americans, 2 Malaysians, an Australian, a Uruguayan and an Indonesian (on paper), 2 Koreans, a Turkish and a Chilean and a Chinese(using PDA).

Based on the results, we found that there were 2 ways of orders of the pictograph sentences. Subject+Object+Verb (SOV or we call it JAPANESE TYPE, because of Japanese language text style) and Subject+Verb+Object (SVO or ENGLISH TYPE; see Figure 1 (b)). Those that did not fall under these two were compiled under OTHERS (same pictographs used twice etc).

(a) (b)

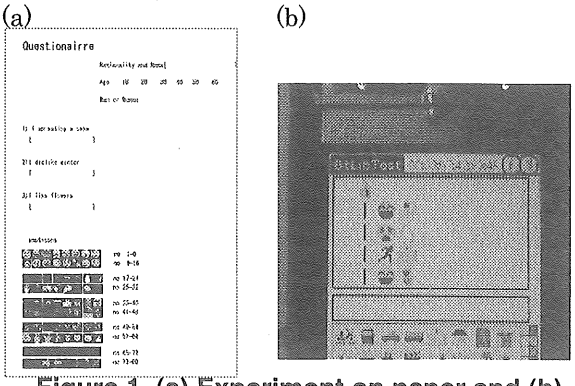

Figure 1. (a) Experiment on paper and (b) Experiment using PDA.

In the experiment using English text, 61% of Japanese people chose the pictographs in the order of English Type or SVO. 17% arranged the pictographs by the order of Japanese Type while the rest of 22% falls in Others. However, in the experiment using Japanese text, 46% of Japanese people chose the pictographs in the order of Japanese Type and a close percentage of 44% arranged the pictographs by the order of English Type. Only 10% falls in Others. On the other hand, non-Japanese who were the subjects in the English text experiment ordered the pictographs mostly in English Type (45%), 25% in the order of Japanese Type but a large sum in Others (30%). In the Japanese text experiment, they ordered pictographs by the Japanese Type (60%), only a small number of 10% arranged the pictographs in the English Type form. However, a large percentage of 30% falls under Others.

3.2. Order of pictographs based on pictograph questions

In this experiment, we used pictographs to make 3 questions, and then had our subjects answer the questions using pictographs as well. We use the PDA system [8] for experiments. Same as the experiment before, the subjects were divided into 2 groups,

Japanese and non-Japanese. The motive of this experiment is to study the order of pictographs arranged by these 2 groups of people, whether it is influenced by the order of pictographs of the questions asked.

When an SVO or English Type of order of pictograph questions were asked, 59% of Japanese arranged their answers in the same order. 27% arranged the pictographs in SOV or Japanese Type form while 14% went under Others (same pictographs used twice etc). When an SOV or Japanese Type of order of pictograph questions were asked, 55% of Japanese people arranged the pictographs of their answers in the same order, 27% with the opposite order and 18% of neither one. On the other hand, non Japanese people arranged the pictographs with 33% of SVO, 27% of SOV and a very large percentage of 40% of neither type when asked with an SVO or English Type of order of pictograph questions. When asked with an SOV or Japanese Type of order of pictograph questions, they answered with 47% of SOV, 7% of SVO and a very large percentage of 47% of neither one.

3.3. Discussion on pre-experiments

Based on the experiment results, we found that compared to Japanese people, non-Japanese are still not very used to the usage of pictographs. This is because, in Japan pictographs are widely used, especially in cellular phone text messages.

We also think that there is a tendency of imitating the order of pictographs by a partner when 2 people are chatting or communicating using pictographs. The flexibility of the pictograph order allows people of different language backgrounds to communicate without misinterpretation caused by the pictograph orders.

However, we learned that non-Japanese are not as comfortable as Japanese people in using pictographs to communicate. Based on the second pre-experiment (in section 3.2), almost half of non-Japanese failed to arrange pictographs in the order of SOV or SVO, therefore the possibility of misunderstanding the sentence that they are trying to convey is high.

Thus, we introduce the pictograph chat communicator II, a system that allows both people who are used to the usage of pictographs or not, to communicate with each other using easy-to-understand pictographs, as well as guidance tool and functions to help and guide them.

In our system, we introduce the "history tab". This is to guide our system users to make sentences using pictographs in the order that both parties could understand. Used pictographs by both parties would appear orderly in this tab. So, one party can imitate the other (for example, a person who answers the question can choose pictographs in the same order that the person who asked the question chose his pictographs). This way, both parties would make the same order of pictographs and minimize the possibility of misunderstanding caused by the differences of order. Apart from this, the history tab also minimizes the time to search for targeted pictographs.

4. Pictograph chat communicator II

4.1. Composition of system

The hardware of the system is SONY VAIO type-U (OS: Windows XP) computers. Two PCs are linked by LAN. Software was developed by FLASH Professional 8 (Macromedia). It is a program of about 1100 lines. We made pictographs in color. However, a part of pictograph (Monochrome symbols) was made by the PIC-DIC symbols [9].

The pictograph size is 54 pixels * 54 pixels. Each pictograph is represented about 5mm * 5 mm in the screen. All operation is performed by a pen.

4.2. Function of system

Figure 2 shows the pictograph chat communicator II screen.

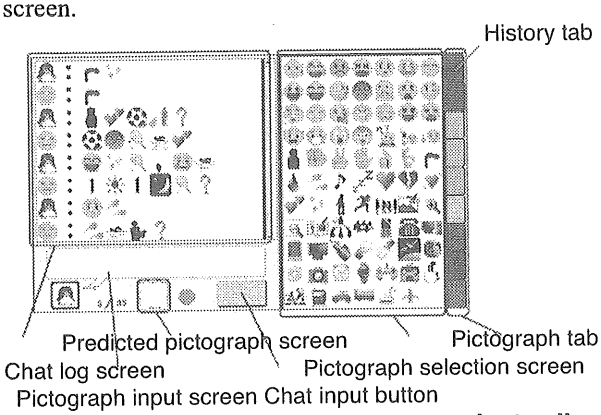

Figure 2. Pictograph chat communicator II screen.

The pictographs are divided into 8 tabs. By tapping on the tabs, the pictographs will be on display in the pictograph selection screen. There are 550 pictographs that we have prepared. The number of pictograph symbols is almost the same as NHK South Pole kids projects [4], but with different kinds of symbols. To select a pictograph from the pictograph selection screen, tap on the chosen pictograph and it will appear in the pictograph input screen. The same process is repeated until a sentence is made by using pictographs. The chat input button is tapped when a sentence is made and it will appear on the chat log screen, for both

chat communicators to see. Deleting unwanted pictographs from the input screen is done by removing (dragging) those pictographs away from the input screen.

The guidance functions are the history tab and the predicted pictograph screen. Figure 3 shows the function of the history tab.

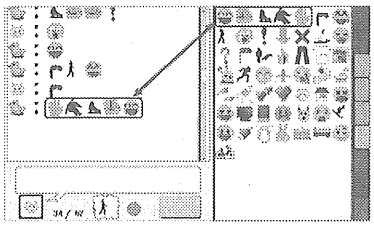

Figure 3. History tab.

The top tab besides the pictograph selection screen is the history tab. When this tab is tapped, used pictographs by both chat communicators will appear. Apart from giving chat communicators hints on the order of pictographs, this tool also minimizes the time to search for a targeted pictograph. Recently used pictograph will be on the top left of the pictograph selection screen. The maximum of 77 recently used pictographs could be on display here.

Based on the order of pictographs from previous lines of chat, the predicted pictograph screen will give a hint of which pictograph might go next by displaying the predicted pictograph. For example, if in one of the previous chat lines, a pictograph of a flower comes after a heart-mark, then, when a heart-mark is chosen again, the pictograph of the same flower will be in the prediction screen. Chat users can easily choose this pictograph by tapping it from the predicted pictograph screen.

In the second tab, we grouped face expressions and frequently used pictographs together (for example, likes and dislikes, PC, mobile telephone, game, transportations). In the third tab, we grouped the pictographs that shows numbers, arrows, ○ and X, and also sports. In the fourth tab, we grouped verbs to express movements. In the fifth till ninth tabs, we grouped nouns (animals, food, accessories).

5. Experiments

The experiment was carried out 8 times. Each experiment consists of 2 people, a Japanese and non-Japanese chatting using the pictograph chat communicator II (Figure 4). The experiments were carried out at Wakayama University (Wakayama, Japan) or the Palace Museum (Beijing, China). The chat users are students of Wakayama University and the member of the Institute for Digitization of the Palace Museum, aged in the between 20 and 50 years old. We had 16 subjects, 8 Japanese people (3 females and 5 males) and 8 non-Japanese people (4 Chinese females, 2 Chinese males, 1 Malaysian female and 1 Indonesian male). We first carried out experiments in Japan, using foreign students studying in Wakayama University as our non-Japanese subjects. However, we realized that having non-Japanese people living in Japan as our subjects might bias our experiment result, in one way or another. This is because, they may share the same linguistic and cultural experience as the local Japanese, as a result of living in Japan. So, we carried out 4 more experiments, handled outside Japan (China), with non-Japanese subjects who do not share the same linguistic and cultural background with the Japanese people.

The subjects were given no chat topic and were told to have a free chat communication for 30 minutes. They were only taught the way to use the system (how to choose and delete pictographs etc), and were told that the purpose of the experiment is to study the possibility of using pictograph chat for communication. After 30 minutes of chatting, both chat users were told to write down the meaning of each line of pictographs they made and the meaning of lines they think their partners said. After that, they were asked to answer a questionnaire of five-point scale evaluation on the experiment and the system.

[In Wakayama University (the same room)]

4 groups consist of 4 Japanese students and 4 non-Japanese students are shown as below.

Exp.1: Chinese (female) - Japanese (female)
Exp.2: Chinese (female) - Japanese (female)
Exp.3: Indonesian (male) - Japanese (male)
Exp.4: Malaysian (female) - Japanese (male)

[In the Institute for Digitization of the Palace Museum (the same room)]

4 groups consist of 4 Japanese persons and 4 Chinese persons are shown as below.

Exp.1: Chinese (female) –Japanese (male)
Exp.2: Chinese (male) – Japanese (female)
Exp.3: Chinese (male)- Japanese (male)
Exp.4: Chinese (female)- Japanese (male)

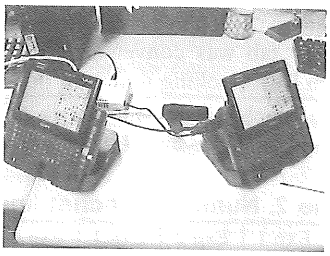

Figure 4. Pictograph chat communicator II.

6. Experimental results

Most contents of chats were for "ice-breaking". A

result of the chat (Exp.2 in China) by Japanese student and Chinese person is shown in Figure 5. "Pig" and "Penguin" are corresponding to the subject. "Pig" is a pictograph chose by a Chinese male to represent himself and "Penguin" is a pictograph chose by a Japanese female to represent herself.

He said that he owns three cats.


She was surprised that he owns three cats.


He said that it was true.


She said that unfortunately, she does not own any cat or dog.


He said he has three cats and a dog.


She said that that was great.


As a joke, she asked whether he keeps a horse.


He answered with cold sweat.


She later told him that it was a joke.

Figure 5. An example of chat.

We found that a Chinese person could not understand the symbol "🏃:running man" that a Japanese student used to convey "sport". A Japanese person could not understand "💤: What time do you sleep?".

The description-type result of the questionnaire is shown in Table 1.

Table 1. The description-type results of the questionnaire.

Please write down any opinion about this system.
• Please increase the pictographs.
• Pictographs that can be used to express daily words and behaviors need to be increased.
• The categorization of the pictographs is incomprehensible.
• There should be ways to express 5W1H.
• It is hard to express place and time.
• The history tab was convenient, but I had a hard time when I was looking for a new pictograph.

Chat lines of each experiment are shown in Table 2 (The upper line: in Wakayama Univ., the lower line: in Beijing).

Table 2. Numbers of chat lines.

	Exp 1	Exp 2	Exp 3	Exp 4	Average
Chat lines	36 49	23 58	13 41	42 39	29 47

Each experiment's level of understanding is shown in Table 3 (The upper line: in Wakayama Univ., the lower line: in Beijing). For a conversation of N lines, if a line is completely understood, it gets a score of (1/N)*100%; if the interpretation is very different, it gets 0%. In N line of M pictographs, if there is one non-understood pictograph, the understanding level is (M-1/M)*1/N%. In N line of M pictographs, if a pictograph is partially understood but not exactly right interpretation, the understanding level is {(M-1/M)+1/2*1/M}*1/N%.

Table 3. Level of understanding.

	Exp 1	Exp 2	Exp 3	Exp 4	Average level
Level of understanding(%)	79 88	94 88	70 73	88 93	83 86

Table 4 shows the usage of the pictograph tabs and the history tab (The upper line: in Wakayama Univ., the lower line: in Beijing).

Table 4. Usage of pictograph tabs and the history tab.

	Exp 1	Exp 2	Exp 3	Exp 4	Average
Percentage of chosen pictographs from history Tab (%)	21 22	30 2	9 15	36 14	24 13

After the 30 minutes chat experiment, subjects were asked to answer a questionnaire of five-point scale evaluation of the experiment and the system. Results of the questionnaire are shown in Table 5 (The upper line: in Wakayama Univ., the lower line: in Beijing).

Table 5. Questionnaire results.

Questions	Evaluation
In one tap, the chosen pictograph can be added into the input field. Was that operation easy?	4.5 4.4
Was the history tab used?	3.6 4.3
Was the history tab useful?	4.4 4.2
Was it easy to create sentences using pictographs?	2.5 3.1
Was each pictograph's meaning understood?	3.5 3.1
Was the process to find pictographs conducted smoothly?	2.4 2.7
Was there a targeted pictograph to find?	2.4 2.7
Was it easy to understand what the partner is saying?	3.5 3.4
Do you think it was able to understand each other?	4.0 3.3
Do you think it is possible to chat using just pictographs?	3.9 2.9
Do you think this experiment was interesting?	4.6 4.6

7. Discussion

In 30 minutes, an average of 29 (in Japan)/ 47 (in China) chat lines was developed. The number of output lines of this system is slightly up, comparing to the conventional system (from 26 lines [1] to 29 (in Japan) and 47 (in China)). There are possibilities to increase these chat lines by improving our system. Based on the questionnaire results, low evaluations were graded for three questions of [Was it easy to create sentences using pictographs? (2.5 (in Japan)/ 3.1 (in China))], [Was the process to find pictographs conducted smoothly? (2.4 (in Japan)/2.7 (in China))] and [Was there a targeted pictograph to find? (2.4 (in Japan)/ 2.7 (in China))]. The evaluation of the conventional system [1] is 2.0, 2.4, 3.1 in each. [Was it easy to create sentences using pictographs? (2.5 (at Japan)/ 3.1 (at China))] is slightly up from the conventional system (2.0) [1]. We can say that the main reason of this improvement is the new function of the system (the history tab). The transferring information from text form to pictographs is still a difficult task and time consuming, and so we are thinking of more ways to guide the chat users in creating sentences using pictographs. When a sentence becomes complicated, a method to divide using commas is thought about.

We also learned that there are difficulties to find pictographs and the grouping of the pictographs might be the main reason. We are thinking of the best way to group the pictographs so that users are able to easily find them and create sentences. Many have also expressed the difficulties of telling the time and place so we are thinking of ways or new pictographs to express these, as well as the 5W1H.

We also found that chat users tend to change the conversation topic unless they understand the contents of the conversation. The average understanding level was 83 (in Japan)/ 86% (in China). The average understanding level of the conventional system is 77%[1]. Although it was not a full 100%, we consider this number as quite satisfying while aiming to increase the level. The pictograph design selection was done by comparing and researching the influence of culture to pictograph design. The research was done in China by surveying the pictograph design that can be understood by both Chinese and Japanese people. However, there are pictographs that are not suitable for people other than Japanese and Chinese, such as kanji letters. We are planning to remove these pictographs in further experiments.

8. Conclusion

The purpose of our study is to understand the usability of pictograph based chat system. Realizing the importance of language, and how it affects the communication between two parties, we have introduced the pictograph chat communicator II, which allows people who do not share the same spoken language to communicate with one another. The system has a history tab, where chat users can track the pictographs that they have already used in the previous chat lines. We envision our system being used in learning each other's cultures, lifestyles and languages as well as developing good friendships by different nationalities of people all over the globe. The following was understood as the result of our study.

1) The average of chat lines in 30minutes was 29 (in Japan)/ 47 lines (in China).
2) The average understanding level was 83 (in Japan)/ 86% (in China).
3) The average usage of the history tab was 24 (in Japan)/ 13% (in China).
4) We need to improve our system especially in pictographs grouping, guidance tools and more pictograph designs to enable the chats between users to flow smoothly.

In the future, we are going to improve the system based on the results of this application. We want to apply this system to the tourist information centers of the sightseeing spot where foreigners gather, too.

Acknowledgments

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