

Proposal and Evaluation of Pictograph Chat for Communication

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Abstract - In Japan and China, pictographs have widely spread to add nuance to mails of mobile phones. We have developed a pictograph chat system, which can communicate each other using nothing but pictographs. We prepared 550 pictograph symbols. We applied the system for communication to 3 groups, which consist of the intimate friends group, the strangers group, and the foreign students and Japanese students group. We have carried out experiences 18 times. We report the results of the experiments as below. (1) The subjects understood over 70% of the content of the chat. (2) There were no difference between foreign students and Japanese students about the context of the chat. Japanese students tended to make the same context as foreign students.

Keywords: CSCW, Groupware, Pictograph, Chat, Cross-cultural communication

1 INTRODUCTION

The communication of information by E-mail, chatting, and electronic bulletin board has become widespread by the spread of networks. Moreover, communication can be easily done using MSN Messenger [1] etc. with a text base. In addition, face marks and pictographs have appeared, and are used to convey feelings [2].

Language becomes a barrier if we think about communication between different countries, and if a common language is not understood, it is difficult to communicate through conversation on a text base. Moreover, to learn a foreign language requires considerable time. Therefore, attention was given to pictographs that are used to convey feelings and slight nuances based on the idea that communication is possible if pictographs are used, even if a language such as English is not understood¹.

To add pictographs to chatting when experimenting on a teleconference between Japan and China [3], a recognition investigation of pictographs was conducted with postgraduate students from Japan and China (eight from each country). 112 pictographs were made for, and shown to, the subjects, who then evaluated their suitability for the meaning. As a result, between the Chinese and Japanese subjects, only 4 pictographs differed greatly in recognition (a school, house, motor sports, and rice ball). The pictograph for "school", for example, looked like a regular building. Though understandable to Japanese subjects, the Chinese did not see it as a school because Chinese had a grand image like a castle for school. "Rice ball" is not seen in China. There is a study that paid

attention to a difference of the recognition of the pictograph of a Japanese and the foreigner [4].

As a result, it was seen that the recognition of the pictographs was almost unchanged between the Japanese and Chinese subjects. We then sought to determine whether subjects could understand even if sentences were made and chat- ted only by pictographs, and developed a system in which only pictographs were used for chatting [5]. This system is a chat system that can send and receive messages made only from pictographs. Some others have pictograph chat system [6], [7]. 550 pictographs were prepared including ones to do animation. This system was actually applied to chat- ting among the groups of "Friends of a friend," "Persons who did not usually talk," and "International students and Japanese students." From the results of the experiment we considered whether communication that used only pictographs was possible.

Chapter 2 explains the pictograph chat system. In Chapter 3 we explain the understanding level that is the standard of the evaluation of the experiment that uses this system. Chapter 4 shows the experiment that uses this system. Chapter 5 describes the experiment results. Chapter 6 is a discussion. Chapter 7 describes an additional experiment. Chapter 8 is the summary

2 PICTOGRAPH CHAT SYSTEM

2.1 Composition of system

This system was developed in C# language using Microsoft Visual Studio.NET 2003. It is a program of about 1200 lines. The system consists of a chat log screen with a pictograph input screen where pictographs are selected and sentences are made.

2.2 Functions of system

Figure 1 shows the pictograph input screen. The chat log screen is shown in Figure 2. The mark of the first animal of Figure 2 shows the speaker. A pictograph can be added from the pictograph selection screen to the input field with one click. A new pictograph can be input by selecting the pictograph in the input field, and inputting a new pictograph from the pictograph selection screen between the pictograph that exists originally in the input field and the pictograph selected by clicking.

Moreover, the selected pictograph can be deleted by clicking the select image clear button, and pushing the Back Space key and the Delete key. When the auto animated cartoon button is checked, all pictographs of possible animation begin animation.

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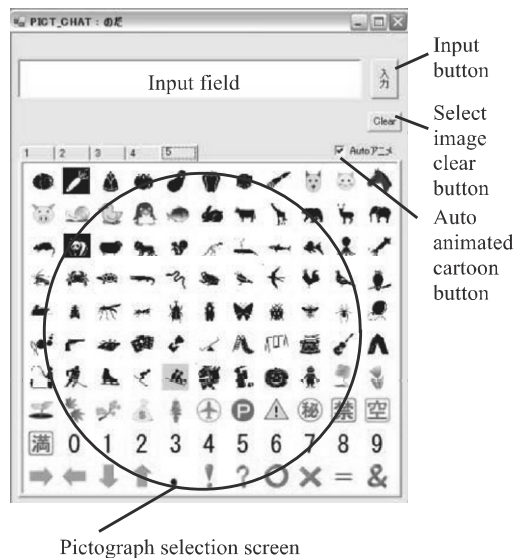


Figure 1: Pictograph input screen.



Figure 2: Chat log screen.

Pictographs were the original 255 images, 295 made of PIC-DIC [8], and 550 images in total were prepared. An original pictograph is one in which a newer pictograph was added referring to the pictograph used for cellular phones. Permission was obtained from Godai Embody Co., Ltd. for the use of PIC-DIC pictographs. Original pictographs are displayed in color, while PIC-DIC pictographs are displayed in black and white.

3 UNDERSTANDING LEVEL

For a conversation of N lines, if a line is completely understood, it gets a score of $(1/N) \times 100\%$; 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 $(M - 1/M) \times 1/N\%$. In N line of M pictographs, if a pictograph is partially understood but not exactly right interpretation, the understanding level is $(M - 1/M) + 1/2 \times 1/M \times 1/N\%$.

4 EXPERIMENT

Two subjects experimented using personal computers through LAN in separate rooms. It was not possible to communicate verbally at all. The subjects were all students at Wakayama

University. One was a third-year student of the Department of Economics, four were third-year students of the Faculty of Systems Engineering, 18 were fourth-year students, three were first-year graduate students of the system engineering research course major, and two were second-year graduate students. Similarly, two were third-year students, 3 of the international students were first-year graduate students, and one was a second-year doctoral student. The breakdown of the international students is four Chinese students, one Malaysian, and one Vietnamese. The subject combinations were as follows. Figure 3 shows snap shots of experiments.



Figure 3: Snap shots of experiments. Each subject experimented in different rooms.

Experiment 1: Japanese with good relations

Experiment 2: Persons with whom Japanese don't usually talk mutually (Japanese students)

Experiment 3: Japanese and international students

Subjects were 36 in total, with six pairs for each of the three patterns (18 pairs in total). Experiments were done two times for each second-year graduate student (experiment 2 and experiment 3). Otherwise, it was only one time for each. Whenever a one-line remark went out to the chat, the subject wrote the meaning of the remark of the other party and his remark while experimenting.

After about 30 minutes of chatting, they were asked to answer a questionnaire of five-point scale evaluation on the experiment and the system.

5 EXPERIMENTAL RESULTS

5.1 Example of each experimental chat

Figure 4 shows the experiment example of the screen. The result of the experiment 1 (Japanese with good relations) is shown in Figure 5, and the result of the experiment 2 (one about which the Japanese doesn't usually talk mutually) is shown in Figure 6 and the result of the Japanese and the international student is shown in Figure 7. The friend with a good relation of the fourth grader is talking with Figure 5 concerning the hour of rising, meal, and the graduation thesis. A conversation the same as usual is done. The mark of the first animal of Figures 5–7 shows the speaker.

Figure 6 is a conversation between Japanese who don't usually talk.

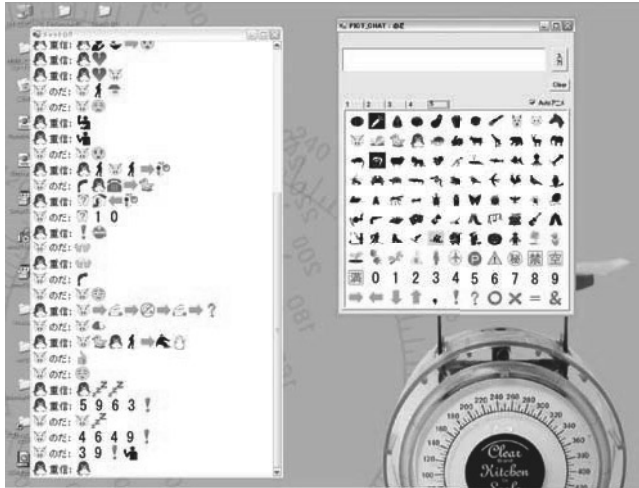


Figure 4: Example of screen of pictograph chat system.

The conversation to start getting to know the other party is done. Because the other party did not understand, it would have been written, “I am working part-time in a karaoke shop.” Once, the other party’s understanding is obtained by explaining again in detail in the pictograph.

Figure 7 is a conversation between a Japanese and an international student. Another singer (Mr. Children and Boys and (II) men) is mutually imagined though the conversation was going to have been approved by both people. “Pig icon” (Japanese) wrote as “I like Mr. Children.” But “Penguin icon” (international student) interpreted the content as “I like Boys and (II) men.”

The following is understood from the results of the questionnaire taken after the experiments of application and the chat log.

5.2 Number of distribution of pictographs by subject

Figure 8 shows the distribution of pictographs for each user. The average number of pictographs in experiment 1, experiment 2, and experiment 3 is 44. About 3.2 pictographs on an average line (one remark) are used. The maximum number of pictographs on a line (one remark) is 10 in experiment 1, 10 in experiment 2, and 12 (though, if it is excluded, eight are the maximum because the same pictograph is repeated) in experiment 3.

5.3 The use frequency of each pictograph

Table 1 shows the use frequency of each pictograph. “Question mark” and “arrow” were used very frequently. “Snow” was used frequently, because all experiments were performed in winter. Pictographs which represent agreement, “OK” or “yes,” used frequently.

5.4 Understanding level of conversation

The mutual understanding level of the conversation of each experiment was calculated by comparing the meaning of the

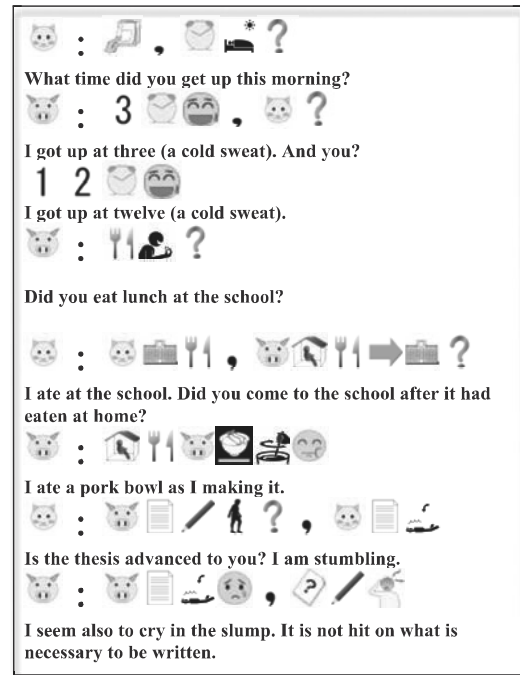


Figure 5: Chats of the experiment 1 (partly).

remark that the subject had written. The average of the understanding level of experiment 1 is 73%. The average of the understanding level of experiment 2 is 81%. The average of the understanding level of experiment 3 is 78%.

5.5 Questionnaire results

Part of the results of the questionnaire of five-point scale evaluation (Table 2) and opinions are shown. “5” is the highest score and “1” is the lowest.

Moreover, examples of the description-type results of the questionnaire are shown below.

- In what situation do you think that this pictograph chat can be used?
 - It is possible to use it cross-culturally.
 - It is possible for a child to use it.
 - It is possible to be used among companions usually.
 - It is possible to use it for communication with a handicapped person.
- Please write if you have an opinion about this system.
 - You should introduce the grammar.
 - As for pictographs, easy communication can be done even cross-culturally. It is far better than characters when it is used well.
 - If pictographs are expanded to do a complex conversation, it takes time to look for them. However, if one manages to do it, it is possible to use it well.

Table 1: The use frequency of each pictograph.

	Frequency	Meaning
	103	Question
	85	Go, change
	37	OK
	32	OK, yes
	32	Today
	31	Study
	26	Punctuation mark, a substitute of " "
	26	love
	26	Snow, cold
	25	Exclamation mark
	25	Please, I'm sorry
	25	Love
	25	Hello, laugh

Table 2: Results of the questionnaire.

Questionnaire items	Evaluation
When the pictograph is clicked once with this system, the pictograph is added to the input field. Was the operation easy?	4.6
Was sentence making easy?	2.0
Was the auto animated cartoon function convenient?	4.2
Could the meaning of an individual pictograph be understood?	3.6
Was a target pictograph easily searchable?	2.4
Was there a target pictograph?	3.1
Did you understand what the other party said?	3.8
Do you think that you were able to understand the other party?	3.7
Do you think that you can conduct a conversation chatting only with pictographs?	3.3
Was this experiment interesting?	4.6



Figure 6: Chats of the experiment 2 (partly).

[Opinion]

- I think that I was able to understand more than I had expected.
- It is interesting to decipher what the other party wants to say.
- The animation is lively and happy.
- It takes time to look for a target pictograph.
- Aren't some rules needed?
- The pictographs are few (Proper nouns cannot be expressed).

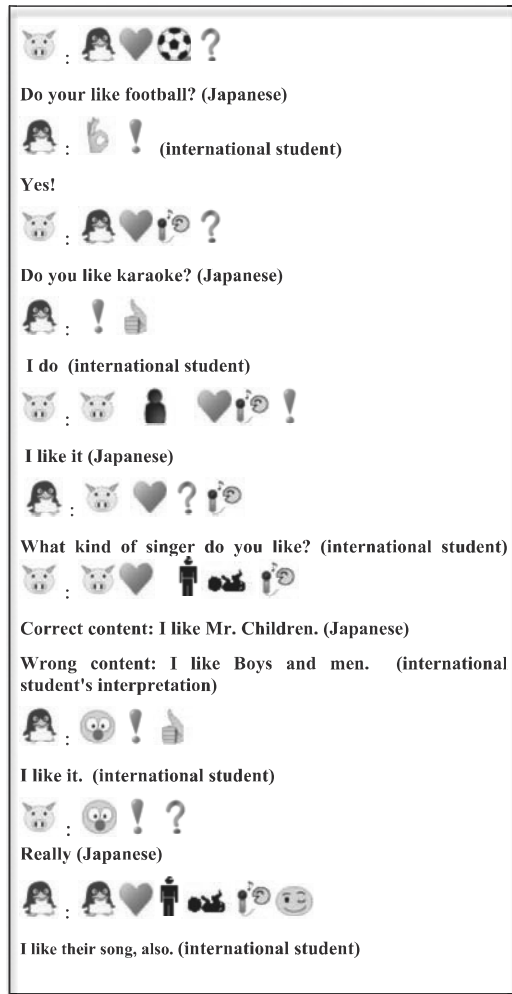


Figure 7: Chats of the experiment 3 (partly).

6 DISCUSSION

6.1 Difference by experiments in understanding level

The understanding level of experiment 1 is 73%, which is lower than the understanding level of experiment 2 and experiment 3. Two subjects in experiment 1 often talked usually, and were wellacquainted with each other. Therefore, they talked as an extension of their usual conversation, and the content of the conversation became deep. Much of the content was a continuation of the conversation of two people on the day before the experiment on topics like research, graduation travel, Valentine's Day, etc. However, there were no pictographs of proper nouns for the content of deep conversation. Therefore, we thought that it caused a gap in their interpretations, and it led to such a result. There was no topic for "Ice-breaking" that was used to be mutually friendly.

The understanding level of experiment 2 (81%) is a little high compared with the understanding level of experiment 1 and experiment 3. Two subjects of experiment 2 were two people who might not speak to each other especially. Ice-breaking topics, for example the weather, appeared in all six experiments. The sentence composition is simple. The sub-

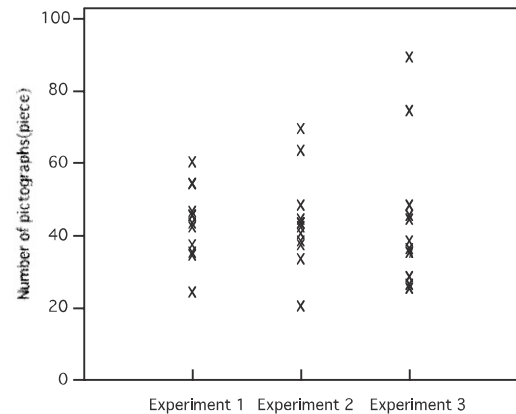


Figure 8: Distribution of pictographs for each user.

jects understood most though there was a slight mix up in individual pictographs. Therefore, it is thought that it led to such a result.

The understanding level of experiment 3 is 78%, which is higher than the understanding level of experiment 1, but lower than the understanding level of experiment 2. The subjects of experiment 3 are an international student and a Japanese student. There were a couple of subjects who did not usually speak to each other at all, and there were five pairs who met for the first. Therefore, there appeared in all of the six times in the ice-breaking conversation "What time did you sleep yesterday?" "Do you like skiing?" "Do you like soccer?" "Do you like karaoke?" "Do you like certain singer?" as well as in experiment 2. Moreover, the other party's country of origin was occasionally heard. However, the name of a country's not being given happened because in that case, there was no pictograph for the proper noun, and the topic changed suddenly. However, a panda pictograph was used to depict China. There was a conversation like "What do you like?" In this case, they were not able to talk well due to absence of expressible proper nouns. The conversation level reached an understanding level that was higher than experiment 1, because it was not different from experiment 2. We think that experiment 3 had a result that the understanding level is lower than experiment 2 due to the problem that there were no proper nouns though we tried to get to know the other party in detail. Moreover, international students alone did not differ in their evaluation scores on the questionnaire (Table 2). We think that they used the system in the same sense as the Japanese.

6.2 Difference of description of Japanese and international students

We consider whether there is a difference in the sentence composition between Japanese and international students from the chat log regarding the composition of sentences. Figure 9 shows a comparison of the conversations "What time did you get up today?" and "What time did you sleep yesterday?" that had come out while subjects did a lot of talking. Seeing this figure, it was understood that the Japanese and international students also include persons who combine pictographs of action after the pictograph of time and those who combine

pictographs of time after pictographs of action.



Figure 9: A comparison of sentence construction.

6.3 Extraction and correspondence of problem

There were various devices when it was not possible to correspond directly to the pictograph. For instance, China is shown by using a panda pictograph because there is no pictograph named China in experiment 3 for the question “What country do you come from?” Moreover, there was a device to make it read by an adult pictograph and baby pictograph as Mr. Children (Figure 7).

From the results of the questionnaire, 69% said the pictographs could be understood, and 56% said there were appropriate pictographs. Especially, the lack of proper nouns was pointed out. In addition, the demand for needed pictographs were the following.

- “Yes” and “No,” seasonal pictographs, and pictographs that show other people.
- Time expression such as “Former,” “Old times,” “Soon,” “This morning,” “Month,” “Day,” and “Year”
- What, when, where, who, how, and adverbs, conjunctions, proper nouns, units, and signs.
- Proper nouns

We have to deal with the lack of proper nouns. Hieroglyphic Tompa characters [9] have a lot of proper nouns. It is possible to show them basically by combining meanings. Japanese is expressible by Tompa characters. For instance, you may express the proper noun “Yamakawa (Mountain and river)” by combining characters that show “Mountain” and

“River.” It is uncertain whether this meaning can be communicated in a conversation between a Japanese and a foreigner. As for hieroglyphs [10], one alphabet character corresponds to one pictograph as a proper noun. Subjects were Japanese, Chinese, Malaysian people, and Vietnamese people. Because these subjects can at least read the alphabet, it seems that it is necessary to prepare proper nouns to write by the alphabet.

6.4 Related work

Zlango [6] 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.

It is a project of the NHK South Pole kids project, and there is a pictograph chat system for children all over the world to do communication using only pictographs. Concerning this system, pictographs which may be lined up to eight are expressible by the chat system of the Web base. It doesn’t have an animation function. Similarly, research involving communication with children in different countries using pictographs was done [11]. However, it is a system using not a real-time chat but a mail base.

There is sign language as a method with the possibility that communication can be done excluding conversation. However, there are a lot of dialects of sign language by country. The sign language that shows Japanese is different from that which shows Chinese. At present, there is international sign language [12] common to all parts of the world though it is not so general. The comparison with this is a problem for the future. Moreover, a person in the sphere of Chinese characters can communicate in writing. The comparison with the Chinese character is a problem for the future.

7 ADDITIONAL EXPERIMENTS

That the sentence structure (order of the pictograph) is different depending on the person has been understood from the experiment. However, there is a possibility that the sentence structure is controlled by written sentences. Then, the same sentences were shown to the Japanese and Chinese who lived in China in their respective mother tongues as an additional experiment, and it was written using pictographs. The Japanese subjects were 20 students at Wakayama University, and the Chinese subjects were 11 staff members in the Institute for Digitization of the Palace Museum Heritage in Beijing. We didn’t use the system, but administered a paper questionnaire form. We examined how many pictographs or face marks to use beforehand. We examined whether there was a pictograph or a face mark used in ten recent mails. As a result, subjects who used 0 to 2 pictographs or face marks were 9 people, 3 to 6 were 4 people, and seven or more were 7 Japanese subjects. Subjects who used 0 to 2 pictographs or

face marks were 7 people, 3 to 6 were 2 people, and seven or more were 2 Chinese subjects.

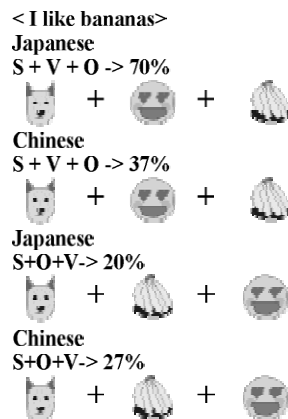


Figure 10: Results of experiment (S+O+V).

Figure 10 shows an example when the Japanese and Chinese write sentences “I like bananas” using pictographs. When these sentences were written with pictographs, the ratio that the Japanese wrote in order of subject + verb + object was 70%, and the ratio for Chinese was 37% though these sentences became the order of subject + object + verb if it was written in Japanese. The Japanese was 20% in the order of subject + object + verb that was the original Japanese order of writing, and 27% in Chinese. The total does not reach 100% because there are examples that cannot be classified like this as the pictograph is described by only one character. Next, the example when the Japanese and Chinese write sentences “I go to school at ten o’clock” with pictographs is shown in Figure 11. If these sentences are written in Japanese, it becomes the order of subject + complement + complement + verb. The order of the writing of (subject) + verb + complement + complement is 90% in the Japanese when these sentences are written with pictographs, and 64% in Chinese. The ratio that the Japanese wrote in order of complement + verb + complement was 10%, and 0% for Chinese. The total does not reach 100% because there are examples that cannot be classified like this as the pictograph is described by only one character (Chinese).

When hieroglyphic Tompa characters are seen in the word order [9], subject + verb + object it is basic, though it is not a pictograph (There are exceptions, as well). Moreover, the word order is verb + subject + object in the hieroglyph. The verb comes ahead of both objects.

Pictographs are often written in the same order in Japanese and Chinese with a different original word order. Moreover, the understanding of each pictograph hardly changes. It seems that the understanding level that exceeds 70% is obtained if it limits it to daily conversation. The questionnaire results concerning how many pictographs to use with a cellular phone and the experiment results are compared. There is nothing said that he can’t write with pictographs because the age is high. Moreover, it was understood that a person who uses pictographs well is not necessarily good at communication only with pictographs.

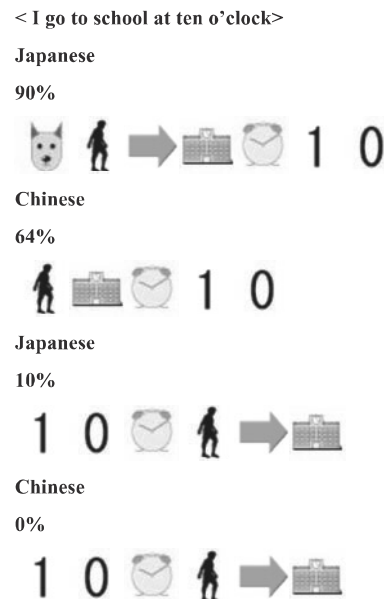


Figure 11: Results of experiment (S+C+C+V).

8 CONCLUSION

We have developed a system for chatting with only pictographs using 550 pictographs. This system was actually applied to “Japanese with good relations,” “Persons who did not usually talk mutually,” and “International students and Japanese students” and it was applied to 36 a total of people. The following was understood as a result.

- (1) It is possible to communicate 70% or more even by sentences only of a combination of pictographs if it is a simple conversation.
- (2) There is no difference of the evaluation value in the difference of the sentence composition between Japanese and international students when talking by combining pictographs, and in the questionnaire. Japanese tend to write pictographs in the same order as the international students.
- (3) The correspondence such as preparing more pictographs to express proper nouns when friends have a deep conversation, and the ability to input proper nouns, is necessary.

We think it is possible to communicate enjoyably using pictograph chatting. However, we admit the need for improvement of the lack of pictographs showing proper nouns. And, we think it is an effective system as a new method of communication. Moreover, we think that between friends and persons meeting for the first time it is effective to communicate only by combining pictographs between different countries. We want to perform the experiment with a European person and the American in future.

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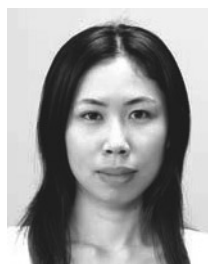
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