

Machine Translation Usage in a Children's Workshop

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Abstract. Machine translation (MT) enables a group of people who do not share a common language to work together as a team. Previous studies have investigated the characteristics of MT-mediated communication in laboratory settings and suggested various ways to improve it. Yet, few studies have investigated how MT is actually used outside the lab. We still lack an understanding of how MT is used in real-world settings, particularly when people use it in face-to-face situations. In this paper, we report on an ethnographic study of a multilingual children workshop using MT to communicate with each other in real world. We studied how children use various communication methods such as gesture and internet to compensate for the mistranslation

s of MT. For example, children tried to understand poorly translated messages by reading the alternative translations and used web browsers to search for pictures of unknown objects. Finally, we propose design implementations based on our findings.

Keywords: Children's collaboration, Multilingual Workshop, Field Study, Machine Translation.

1 Introduction

Different languages are the main barrier to the collaboration of multilingual groups. Machine translation(MT) services are now available and have been used as support systems [1]. They allow a multilingual team to work together without having a shared language. Many researchers have tried to support multilingual communication by evaluating [2,3] and improving MT quality [4,5]. Some researchers studied how MT is used in general [6,7] but how MT supports users in face-to-face communication remains an unstudied area.

Pangaea, a non-profit organization (NPO), organizes an event called Kyoto Intercultural Summer School of Youth (KISSY) once a year. Its goal is to encourage children to develop social bonds across boundaries and motivate them to communicate with children from different countries with different languages. KISSY is an event that encourages children from different countries to collaborate by working on a shared project using KISSY tool, which is a machine translation tool. It augments the face-to-

face communication established among children and staffs with different language backgrounds.

Hida [8] studied the KISSY workshops of 2014 and 2015. He suggested that problems were present in the children's communication and collaboration. One such problem is some of the messages were incomprehensible because of low MT accuracy. However, previous work did not discover how the children overcame the problems caused by MT errors.

In this paper, we report an ethnographic study of KISSY with narrative. The objective of this paper is to understand how users collaborated using the MT embedded in the KISSY tool. This year, our team conducted at KISSY a four-day ethnographic study involving 2 teams, a total of 16 users. From our observations, we identify the solutions used by the children when MT failed to help them fulfill their communication goal. Knowing how the children solve communication problems should allow us to better understand the communication difficulties raised by MT.

Our research question, 'How did the children solve their communication problems encountered when using MT', is intended to allow better support tools to be designed in the future, especially for users of low-resource languages. Low-resource languages refer to less-studied languages, minority languages or languages with low technological support resources and corpora. Our results should help HCI researchers to better understand the users' problems and behaviors when using MT, and thus create more effective design support systems for multilingual collaboration. Based on the results, we suggest the design of a multilingual tool that improves overall communication.

2 Related Work

2.1 Multilingual Communication Support

There exists a variety of studies aimed at supporting multilingual communication. Imoto [9] introduced a tool that translates sentences and displays possible answers based on the question's intention type; they claim that their system can be used in some specific applications, i.e. hospitals.

Many researchers are trying to support multilingual communication by improving the quality of MT and some researchers suggested that, involving human in the translation can improve translation quality and user understanding [10,5]. For example, Avramidis [10] integrated a human interpreter into the process of rating and post-editing machine translated messages. Morita [11] proposed a method using monolinguals to boost the fluency and adequacy of both sides of two-language machine translation. Other existing works consider back-translation [12], which was originally created to investigate translation quality. Back-translation has also been adopted for MT. Shigenobu's study [6] indicates that showing back-translation output can improve the accuracy of outward translation.

There are various multilingual collaboration support tools using MT systems developed in previous studies, including AnnoChat [4], Langrid Chat [13], and Online Multilingual Discussion Tool (OMDT) [14]. The support systems mentioned were

designed for adults and mainly used for general communication. YMC system, an existing MT system designed for children [15], was created for multi-language knowledge communication between children and adult experts.

2.2 Difficulties of Using Machine Translation

Although MT is a useful tool for multilingual communication, it can still create difficulties due to its unreliable quality. Yamashita et al. [4] studied how MT affects human communication. They gave pairs of users two sets of ten tangram figures which were placed in different sequences. The users were instructed to match the arrangements using an MT tool. They found that using MT lead to asymmetries in the machine translation process which yielded trouble in identifying tangrams and sequences through the expressions used and accepted.

The asymmetric quality of each MT service can also cause difficulties, especially, for low language resource users who cannot converse very well, because they cannot understand messages and communicate correctly. A group of researchers [16] proposed a method that made the choice of communication channel dependent on MT quality and users' language skill; it helps to balance the opportunity for participation in the conversation. However, still more MT problems remain to be studied.

3 Kyoto Intercultural Summer School for Youth (KISSY)

Children aging 8 years old to 14 years old from different countries gathered together at a university to participate in a workshop and collaborate with each other with no foreign language skills being required.

The main task for the workshop was to create a short clay animation using clay figures. The participants were asked to create a story from one or two given objects: one brown rectangular block, and one white clay piece shaped like a bottle gourd. Each team had to create a scenario, model the clay, take photos, draw backgrounds, record sound effects, assemble the results, and edit the videos.

The workspace for each team was separated but within the same hall; partitions were not used. Each team had a main table for discussions around a laptop PCs; the children sat in a U-shape facing the middle of the table, see Fig. 1. There was a shared screen linked to the team leader's PC, who sat next to the screen. There was a table for clay sculpting next to the photo booth.

Each group had their own editing table with two PCs for sound and video editing. The positions of the photo booth, clay work table, and editor PC table were similar but slightly different for each team. The order of participant's seating within the group was changed a few times during the four-day workshop.

In addition to the team work space, there was also a space for administrative use, for example to distribute equipment in different parts of the activity hall. In this area, also had a small tent some distance from the team work space for making sound and voice recordings.

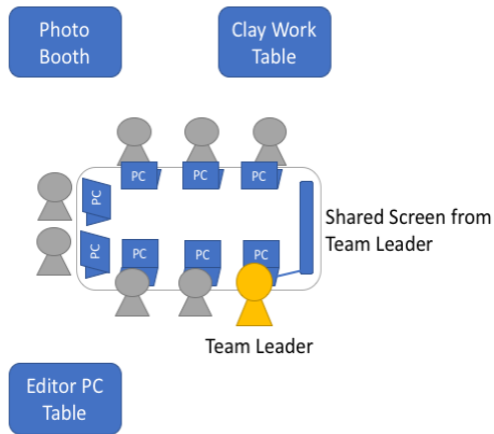


Fig. 1. Sketch of team work space

3.1 KISSY Tool

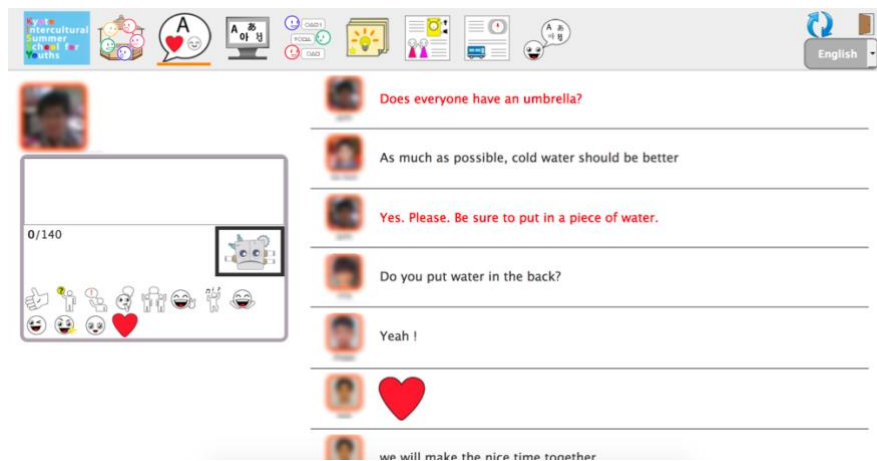


Fig. 2. A screen shot of KISSY tool *team chatroom*

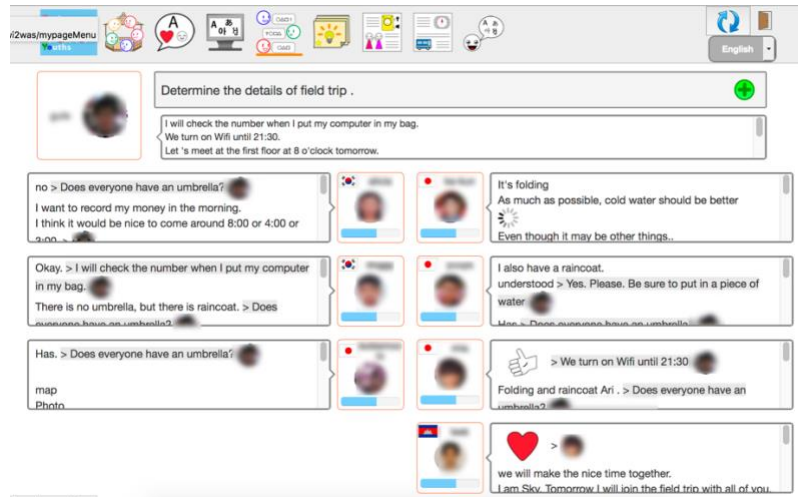


Fig. 3. A screen shot of *discussion screen*

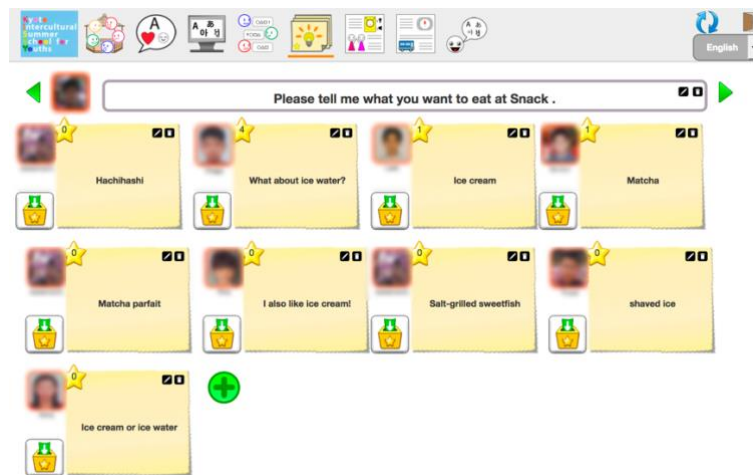


Fig. 4. A screen shot of *ideaboard*

KISSY tool is a web application with various functions to support multilingual collaboration; it was created specifically for KISSY. In order to use the system, each participant was provided with a laptop PC and internet connection. Each user was given a username and a password to access the system. They could choose the interface language that they were comfortable with, from English, Khmer (Cambodian language), Korean, and Japanese. The main function was the multilingual *chatroom*, where the user could input text in her/his language and see everything in her/his language while the other users saw the text in their own languages. It has two interfaces for sending messages and reading messages in team chatroom. One of them is a general

chat interface, the arrival of a new message pushes out the oldest message being shown, see Fig. 2. Another chat interface gave everyone their own space in different boxes. Messages from each participant appeared only in each person's box, as in Fig. 3. This function makes it easy to see the messages of all users at a time.

Fig. 4 shows *ideaboard*, the interface of another function of KISSY tool that was used often. The team leader could use *ideaboard* to pose a question and the children could express their ideas by typing in virtual responses in their own language. Each member could vote (click) for one favorite idea per question.

MT services used by KISSY tool were provided by LanguageGrid [17, 18]. Services selected for each pair of languages were provided by GoogleTranslate.

4 Method

We conducted an ethnographic study by observing the participants and staff at KISSY. Ethnography is the most basic form of social research [19]. It is a method, most often used in anthropology, that involves encounters, respecting, recording, understanding, and representing human experience [20]. This method is now practiced in various discipline.

Of the five teams participating in KISSY, two teams were observed for this study. Each team consisted of one adult facilitator, called team leader, and seven participants.

Team Red had a Japanese team leader two Korean children, four Japanese children, and one Cambodian child. Team Green had a Japanese team leader, three Korean children, three Japanese children, and a Cambodian child. Korean children could communicate in simple English, while most Japanese children could not communicate in English. Cambodian children also could speak very little English.

Videos were recorded from afar to minimize interference with the activities and to encourage the participants to relax and react in a natural manner. The videos were analyzed in our laboratory.

After the event, we conducted face-to-face and online interviews. For each team, we interviewed two children and the team leader. We also interviewed bilingual and trilingual staff who were not part of any team but helped with the translation.

5 Coping with Mistranslation

During the workshop, when a mistranslation occurred, users tried to solve the problem both by themselves and by asking a human interpreter for help, as shown in Fig. 5. The chart is discussed in detail in the following subsections.

Alternative methods of communication when MT translated message was not understandable

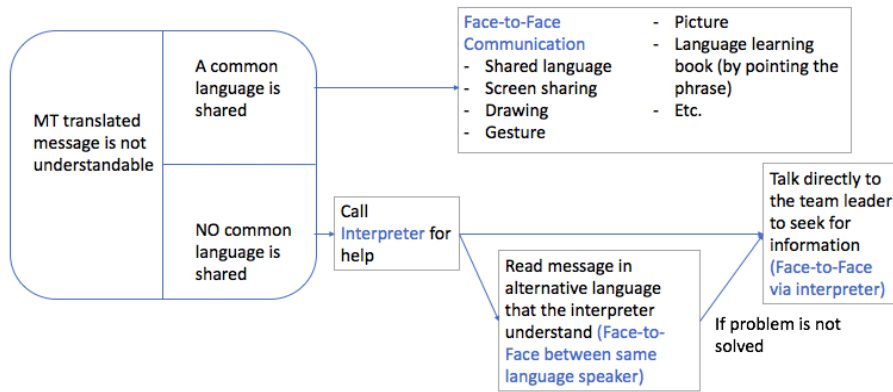


Fig. 5. Behavior of users when MT translated message was not understandable

5.1 Alternative Channels of Communication

When an MT problem occurred and users shared a language, even if the language skill was low, they turned into face-to-face communication. As shown in Fig. 3, the alternative methods included using shared language, other media including screen, drawing, gesture, picture, and language learning books. Many times, they used more than one communication channel at a time, usually including trying to use their shared language even though their shared language skill was low. Here is an example of MT failure and the user's response. The paragraphs in italic are from the ethnography transcript.

During role decision of Team Green, team leader(TL2) asked everybody a question via the ideaboard function. He typed this question in Japanese 'どの役割がいいですか?' which basically means 'what role do you want to take?'. It appeared on the Cambodian child(C2)'s screen as 'A position that is this good?' in Khmer. C2 did not understand. Since she sat next to TL2, she suddenly turned to him and TL2 noticed that she could not understand the question. He switched his tool into English language mode and tried to speak with her in English. She understood. The translation in English was shown as 'Which role should I take?'. TL2 noticed the mistranslation so he suddenly fixed it by saying 'Not me, but you'.

In this situation, they both tried to communicate, using gesture when C2 turned to TL2, alternative translation on TL2's screen, and then English.

5.2 Asking Others

Many times, the MT tool failed to enable users to communicate, especially for the user of low resource language (Cambodian children). There was only one Cambodian staff to support three Cambodian children in three different groups.

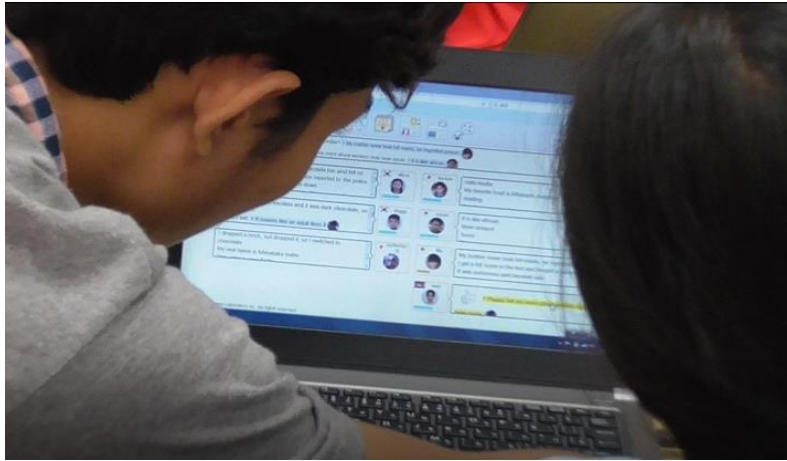


Fig. 6. Cambodian staff helped a Cambodian child by reading English translation instead of Khmer translation.

In the interview, the Cambodian staff stated that “They only understood Khmer language and the translations on the screen in Khmer weren't correct. It was almost correct if English was translated into Khmer. But they typed in Korean or Japanese so this is the problem for translation, I think. The kids need more help from me in this activity” As shown in Fig. 6 and the interview, Cambodian staff helped the children to understand messages by switching the interface to English and reading English texts instead of Khmer.

When the translated messages were incomprehensible, the communication changed from MT among participants and team leader to face-to-face with a human interpreter. When the bilingual staff helped, he normally used one of two options.

We asked how he helped them when the Khmer message was difficult to understand. He answered, “Sometimes I checked in English, if I still did not understand because of translation from Japanese or Korean to English, I asked the team leader to explain it to me in English”.

First, the bilingual staff read the messages and tried to understand the message by reading the message translated into other language. For example, the Cambodian staff, who could speak both Khmer and English, helped the Cambodian kid by reading messages in English and translated for her, since English translation had higher quality and thus easier to understand.

If the staff still could not understand the message, he asked the team leader directly in their shared language and translated his understanding to the kid.

6 Understand Culturally Dependent Context

Sometimes, the children sometimes could not understand each other when the messages or words depended on the culture of the originator. At the beginning of the the

workshop, our staff showed brown rectangular block, as shown in Fig. 7, to the children and asked them what did they think this block looked like.



Fig. 7. A clay block was shown to the children.

One of the Japanese used KISSY tool to say that it looked like 'Anko' or Japanese style red bean paste. People from a different culture could not understand the comment, because red bean paste in the other countries does not look like a block. Moreover, the Khmer MT translation was 'ស្ទុះសណ្តែកបែបជប៉ុន' which means 'something made by Japanese'. Khmer speaker could not understand the whole translated phrase.

Since the MT translated message was incomprehensible, face-to-face communication was needed and a human interpreter was also needed to help the children create mutual understanding of the object. As shown in Fig. 8, the Cambodian staff helped the Cambodian participant to search for photos of *Anko*. It helped them understand why the Japanese participant referred to the object as red bean paste.



Fig. 8. Cambodian staff helped the Cambodian child to search for 'Anko' picture

Another similar situation arose when the name of thing that exists in one language meant something different in another language. During the self-introduction period, when the children were talking about movies, even though MT could translate the movie names correctly, many movies have specific names in different languages. As a consequence, the users had trouble understanding which movies was being referred to. In this case, as well, they solved the problem by searching for images or posters of the movie to show the others.

7 Tool Navigation and Instruction

During the workshop, the children could use different software or different windows in the KISSY tool. The tool includes many functions for example, *ideaboard*, *chatroom*, etc. Working as a team requires that everyone be on the same page for collaboration to succeed.

In the workshop, TL2 had just finished creating a new question on ideaboard but one Korean child(K1) was using a webpage outside the KISSY tool. Since K1 was not on the chatroom page, she did not know what was going on and which page should be viewed at that moment. TL2 told an English-Korean interpreter(I3) to tell K1 “Go to the next question”

As shown in Fig. 9, the team leader wanted everybody to look at the *ideaboard* after he finished entering a question. Because K1 was not viewing the *chatroom* screen, it was impossible for her to read messages even if TL2 sent a message to the chatroom for everybody to navigate to *ideaboard*. In this case, direct face-to-face communication or communication via human interpreter was needed. Because MT cannot cope with this kind of situation, an alternative communication channel was used, and an interpreter was needed.



Fig. 9. Interpreter (I3) , on the left-hand side, helped team leader (TL2), the man on the right, to talk to (K1), the girl who is using a PC on the left, about what to do next.

Sometimes, the team leader communicated non-verbally by showing the page on the shared screen and pointing to the page so the children could follow him on the same page.

In another example, when the users were not familiar with the tool or when the users faced difficulties with the tool, they shifted to face-to-face communication, as in Fig. 10.

At the very beginning of the workshop, while the other children are voting for the idea they like. C2 was still not sure what to do. TL2 had to point at her screen and ask her “Can you choose one?” verbally in English.

In this case, users could not communicate using MT in the KISSY tool. Hence, conversation in shared language was needed when there was no human interpreter.



Fig. 10. Team leader (TL2), on the right sitting next to the shared screen, communicated directly to the Cambodian Child (C2), the girl next to him.

8 Substituting Machine Translation

In many situations, MT was not used. This section describes situations wherein other communication methods were preferred over MT.

8.1 Using Common Words and Signs

In the workshop, when there was a common word among all languages or there was a simple word that could be understood by everyone. For some words, i.e. “Okay” or an object that everybody understood such as “Soba”, “Sushi”, face-to-face communication was often used.

Non-verbal communication was also used. For example, pointing index finger down at the keyboard meant “Vote!”, and clapping hands expressed that something has been done. This kind of gesture can be easily understood by every member.

8.2 Involving Physical Objects in Communication

When the communication involved physical objects, MT was used less often. The following situation is from the video taken in the morning of the third day of the workshop.

Team Red had a short meeting before working separately. In the meeting, before team leader (TL1) explained the work plan of that day using a physical board with written papers on it, he called a Korean-Japanese interpreter(I1) and a Khmer-English interpreter(I2) to help him. Then he explained the work, mostly in Japanese and sometimes in English, while pointing on the board from time to time. I1 translated what TL1 said from Japanese to Korean for Korean Children in parallel. TL1 spoke English later but not for all messages in Japanese.

Instead of using MT, TL1 decided to ask for interpreter's help and speak directly in this mother language. In this case, using machine translation would make the use of gesture and the physical board difficult, especially when the MT tool requires typing.

However, not using MT can cause the inequality in successful receipt of messages. In this situation, I2 could not speak Japanese so he had to wait until TL1 spoke English to him. TL1 spoke much shorter sentences in English due to his limited ability to communicate in English and this prevented C1 from understanding the whole meeting while the Japanese and Korean children could understand more quickly about what was going on.

9 Discussion

From our investigation of KISSY 2017, problems exist that are deeper than the conversation and translation level.

9.1 Low Language Resource User Support and Problem Detection

Good collaboration should have team members equally and actively participate in the conversation and activity. In KISSY, the low language resource users, the Cambodians, faced the biggest barrier to participation.

One problem was the quality of Khmer MT. Since the language is low resource for translation, the messages translated from and to Khmer are difficult to understand and sometimes incomprehensible. When the messages on the screen do not make sense, it is difficult to know what are people talking about and it is almost impossible to talk or express one's idea in this situation.

Another problem as a consequence is, it is difficult to detect the problem when a user needs help. If the children know they need help and ask for help, their problem can be solved easier, but many times they did not recognize they needed help. During the workshop, many times the team leaders had to identify who needed helps and then ask the interpreters to help the children. The interpreters also looked around and checked if any of the children needed help. However, if help is not promptly available, it will raise difficulties with their participation.

9.2 Human Interpreter Task Overload

When the children had to solve their understanding problems whether by using alternative communication methods or asking the interpreter for translation help, the communications were usually one-to-one. Unfortunately, KISSY multilingual chat is inherently not suitable if the goal of communication is one-to-one.

At the workshop, when the team leader and the Cambodian child wanted to communicate one-to-one, the Cambodian interpreter was called to help with the translation.

The number of human resource or staffs is limited, especially for the minority languages. One-to-one communication without multilingual tool support increased the need for human interpreters. Because of the problems caused by MT and others, the Cambodian children needed a lot more help than the other children.

The Cambodian interpreter also reported that he could not manage to help all the children at the same time. Many times, the children need his help but saw him busy with others; the children did not want to disturb him and so waited until he was free. The time spent waiting delayed their participation.

10 Design Implication

10.1 Design implication to support communication with low MT quality

Image Browser in Multilingual Chatroom.

As mentioned with regard to culturally-dependent context, the participants tried to search for images and show them to the other participants to help their understanding. However, it was not convenient to search and share images since no shared display was provided, other than that controlled by the team leader. Adding a shared image browsing function to the tool could save time and raise user effectiveness. It would also encourage the users to use more photos or figures to express their ideas and to understand the others. This design guideline can also help to solve the problem of understanding the culturally dependent context that cannot be explained easily by words, for example, travel attractions, and ethnic foods.

Interpreter Calling Function with Prioritization.

One of the main problems for minority users was the paucity of MT and human resources, since MT quality is low for low resource-languages and it is difficult to find speakers of the minority language to support the children. Predicting the help needed would be a useful function as children often failed to notice that they needed help or were shy in asking for help. A prediction model could be made by timing the periods of inactivity of the participant. Raising the priority of users who have been idle or who need more help might be useful. Developing a language profile of each member of the team is also possible. If there are two children waiting for help but one of them can speak better English as a shared language with the team leader, that person might need less help. The flag for help can also be sent to the team leader since sometimes the team

leader checked the progress of minority users and tried to communicate directly or call for the interpreter to help them.

Showing Translated Result in Known Foreign Language in Parallel.

In the workshop, non-native English speaker staff helped the children to understand written messages by reading messages in English, instead of reading message in his own language with poor translation, and translating it to the children. Even though a user might have limited skill of second language, it is still possible that messages translated in second language could be more readable than low quality messages in the main language. Hence, showing both results, those in the user's language and those in the user's foreign language, could increase the probability of understanding messages.

10.2 Design implication for more convenient communication

MT for 1:1.

Even though collaboration tools should focus on group communication, sometimes one-to-one communication is also needed to run the team activity, as mentioned already with regard to human interpreter task overload. Providing 1:1 translations by stand-alone portable devices would be extremely useful if permitted by the group activities. Such a function would allow members to share messages directly without having to involve everybody. This will help to reduce the costs created by the human interpreters.

Graphic Signs and Keywords for Changing Method of Communication.

We already noted that sometimes users used common words and signs to substitute for MT. Better communication requires the greater use of a common language. Images yield better and easier understanding even if the users do not speak the same language. Thus, ideograms might be useful for multilingual collaboration without a shared language. For example, showing the chatroom logo to the children would ensure that they turned to the chatroom.

Having some basic shared keywords is another way to create easier communication. We can give a list of *keywords* with their translations and pronunciations in their languages to the participants before the workshop starts. The *keywords* can be those that are often used in the event, for instance, for KISSY, "Let's vote!" as "Vote".

11 Conclusion

We reported on a field study of machine translation (MT) usage in a social collaboration event for children. The children were asked to conduct a project using KISSY tool, an MT embedded system for multilingual communication.

In the workshop, participants and staffs faced various types of problems due to and related to the use of MT. They chose alternative communication methods when they could not understand the translated messages. The alternative methods involve using a shared language, screen sharing, drawing, gesture, picture, etc. When problems arose

due to cultural differences or culturally-dependent words, they turned to an interpreter for help and/or used web browsers to search for related photos to increase understanding or to confirm the understanding of the others. They also needed to communicate via face-to-face methods, when, for example, one or more users were not on the chatroom page, because they could not read the instruction messages.

Some problems have yet to be solved. Better support for low language resource users is still needed. The interpreters can become overloaded, particularly for low resource languages.

Finally, we drew a few design implications based on our study. We suggest that the future designs should consider the inclusion of image browsers to assist user understanding, a 1:1 translation function in addition to the group chat, an interpreter calling function with priority, and the use of common keywords or images, to be used together with MT. Showing the translation results in the user's second language in parallel with her/his mother language could also be effective if the user's first language is a low resource language or machine translation quality is low.

ACKNOWLEDGMENTS

This research was partially supported by a Grant-in-Aid for Scientific Research (A) (17H00759, 2017-2020) from Japan Society for the Promotion of Science (JSPS), and the Leading Graduates Schools Program, “Collaborative Graduate Program in Design” by the Ministry of Education, Culture, Sports, Science and Technology, Japan.

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