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Analysis on Multilingual Discussion for Wikipedia Translation

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Abstract—In current Wikipedia translation activities, most translation tasks are performed by bilingual speakers who have high language skills and specialized knowledge of the articles. Unfortunately, compared to the large amount of Wikipedia articles, the number of such qualified translators is very small. Thus the success of Wikipedia translation activities hinges on the contributions from non-bilingual speakers. In this paper, we report on a study investigating the effects of introducing a machine translation mediated BBS that enables monolinguals to collaboratively translate Wikipedia articles using their mother tongues. From our experiment using this system, we found out that users made high use of the system and communicated actively across different languages. Furthermore, most of such multilingual discussions seemed to be successful in transferring knowledge between different languages. Such success appeared to be made possible by a distinctive communication pattern which emerged as the users tried to avoid misunderstandings from machine translation errors. These findings suggest that there is a fair chance of non-bilingual speakers being capable of effectively contributing to Wikipedia translation activities with the assistance of machine translation.

Wikipedia Translation; Multilingual communication; Machine Translation; Multilingual Liquid Threads

I. INTRODUCTION

With the development of Information and Communication Technologies (ICT), knowledge is being shared wider and faster than before [4]. Yet language barriers remain a significant issue when users try to retrieve information written in different languages [6, 9].

Wikipedia provides an excellent example of the situation. For instance, there is a significant difference in the amount of information provided in each language. Due to such uneven distribution of articles among different languages, users have difficulties in cross-language information sharing [7]. Taking Japanese and English for example, it would be hard for Japanese users with low English skills to take advantage of the enormous body of English Wikipedia articles. At the same time, due to the small quantity of Japanese articles, the Japanese Wikipedia cannot provide much information to the Japanese users.

To overcome this problem, and to facilitate cross-language information sharing, Wikipedia contributors are currently carrying out translation activities on a volunteer basis. However, since Wikipedia articles are typically specialized on certain topics fields, such as culture or geography, a Wikipedia translator is basically required to be a bilingual speaker who has knowledge on those specialized topics. The number of such qualified translators is very small, and thus, another approach is desired.

In this paper, we propose an approach that makes use of machine translation technology. This approach is inspired by the fact that two kinds of users are numerous: first, there are many users who have knowledge on a specialized field in the source language. Second, there are also many users who have knowledge of the target language. By bridging these two populations by using machine translation, the former population will be able to transfer their specialized knowledge to the latter population in their native language. The latter population, which has knowledge of the target language, would then be able to paraphrase the source article into target language even if they lack the knowledge of the specialized field and the source language.

However, the difficulty of this approach lies in the simple fact that current machine translations cannot provide a perfect translation result [4]. While translation activities on Wikipedia articles typically require accurate understanding of every term in the source article, this could be quite difficult because the machine translated articles typically include lots of mistranslations and knowledge transfer between the two populations (namely communication between the two populations) could also be hampered by mistranslations. Since the latter population would possibly obtain the ambiguous information of the source article due to mistranslations, translation activities to create an appropriate target article could be quite challenging.

To explore the feasibility of machine translation to support translation activities of Wikipedia articles, we ran an experiment where participants carried out translation activities of Wikipedia articles with the assistance of machine translations. In this paper, we present some findings from analyzing the multilingual communication that took place in the experiment. The findings are important in understanding the communication process and to consider further support for their translation activities.

II. BACKGROUND: MULTILINGUAL LIQUID THREADS

Many tools, such as WikiBhasha, have been developed to support Wikipedia translation activities. However, most of these tools simply provide supports for translating written documents (namely the Wikipedia articles), and do not provide support for communication between contributors using different languages.

Since communication between contributors plays a significant role in current Wikipedia article creation, communication between contributors using different languages should also be well supported [2].

In the current iteration of Wikipedia, a discussion page called "Liquid Threads" is a place for such communication (idea exchanging, knowledge sharing, and debates) between contributors using the same language.
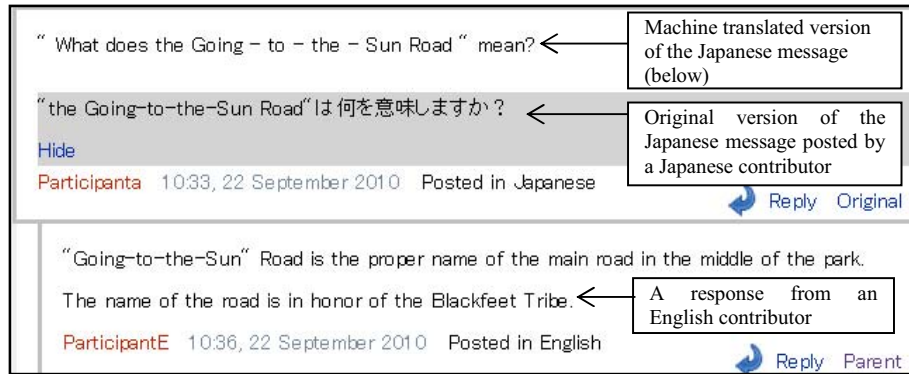
Figure1. Interface of Multilingual Liquid Threads

A multilingual version of the "Liquid Threads" (called "Multilingual Liquid Threads") has recently been released as a MediaWiki Extension. MediaWiki is an open source web-based wiki software application which runs Wikipedia, and was developed by the Wikimedia Foundation. MediaWiki Extensions allow MediaWiki to become more advanced by incorporating many open source projects such as the "Multilingual Liquid Threads".

The language resources in Multilingual Liquid Threads are supported by the multilingual language resource platform called the "Language Grid". The Language Grid is an online multilingual service-oriented platform that enables easy registration and sharing of language services, such as online dictionaries, bilingual corpora, and machine translations [1, 3].

Figure 1 is a screenshot of the Multilingual Liquid Threads. In this example, a Japanese contributor is asking an English contributor for clarification about the meaning of the phrase "the Going-to-the-Sun Road". As we can see from this figure, both the Japanese and English contributors can post messages in their mother tongues. And, since all the messages are automatically translated by machine translations, contributors can view all the messages in their mother tongues regardless of the languages used in the source messages. In the Multilingual Liquid Threads 55 languages are supported in total.

Figure 2 explains how the Multilingual Liquid Threads is situated in Wikipedia translation activities. By enabling multilingual communication with Multilingual Liquid Threads, users who have knowledge on a specialized topic in the source language may be able to help the translators (who have knowledge on the target language) clarify the unclear parts of the articles so as to lead them to successful translation of the articles.
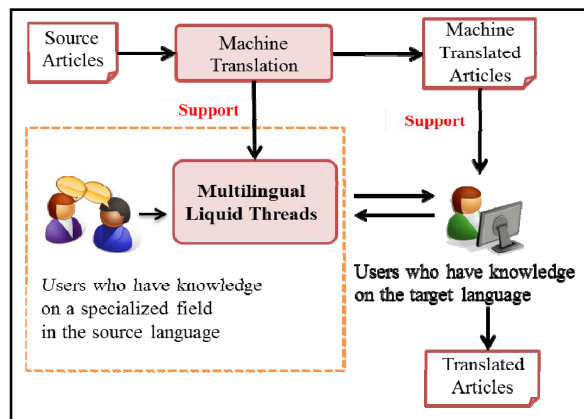
From next chapter, we will introduce an experiment that shows how Wikipedia contributors work collaboratively with the help of Multilingual Liquid Threads to perform Wikipedia translation activities.

III. CURRENT STUDY: THE WIKIPEDIA TRANSLATION EXPERIMENT

A. Objectives

In order to examine the values of Multilingual Liquid Threads, we decided to evaluate this system from several aspects as follows:

- *System utilization:*
  First, to evaluate the usefulness of the Multilingual Liquid Threads, we investigated how Multilingual Liquid Threads was used for discussion in Wikipedia translation activities.

- *Ability to transfer knowledge:*
  Next, to see whether multilingual communication was helpful to their translation activities, we investigated how frequently the users were able to successfully transfer knowledge through the Multilingual Liquid Threads.

- *Influence on communication pattern:*
  Finally, to see whether and how the system affected the contributors' communication behavior, we observed their multilingual communication pattern throughout their translation activities using Multilingual Liquid Threads.

B. Setting

Task

Three Japanese and two Americans participated in our experiment. The participants were asked to engage in a translation activity using the Multilingual Liquid Threads. Their translation task was to translate the English Wikipedia article "Glacier National Park" into Japanese collaboratively. The Japanese participants were mainly in charge of translating the article into Japanese. The Americans were in charge of helping the Japanese by answering their questions and clarifying the word meanings when requested. All of the communication during the task took place in the Multilingual Liquid Threads. Note that we didn't restrict the language they were able to use.

Figure2. Wikipedia Translation Activity
with Multilingual Liquid Threads

Table1. Participants

No.	Nationality	Other Language
A	Japanese	English (High-intermediate)
B	Japanese	English (Intermediate)
C	Japanese	English (Low-intermediate)
D	American	Japanese (Very Little)
E	American	Japanese (Very Little)

Two Americans and three Japanese were recruited for this study. The two Americans were English monolingual speakers with very few Japanese skills. Two Japanese had medium-level English knowledge with a TOEIC score lower than 750, and one Japanese had a TOEIC score higher than 750, but was still not proficient in writing English. Since none of the Japanese had much knowledge about the Glacier National Park, none of the Japanese participants could perform the translation task independently.

Apparatus

In this experiment, the participants were provided with Multilingual Liquid Threads and some additional dictionaries services including the "National Parks Wikipedia Dictionary" and the "Page Dictionary".

We created National Parks Wikipedia Dictionary in advance for this experiment. Titles of English articles that are related to the U.S national parks were extracted and registered into this dictionary. Different language versions of every single article's title were extracted to construct parallel multilingual entries. This specialized dictionary aims to assist translators with better translation result in a specialized topic (namely the U.S National parks). A special dictionary service called Page Dictionary was provided as well. Since multiple contributors worked together on the same article, it was important to assure the consistency of translated terms throughout the article. Page Dictionary is a free-editing dictionary that was implemented in every article so that users can collaboratively create a best-suited dictionary for each article.

To mimic the actual translation activities, we did not restrict the participants from using any language resources on the Web. For example, resources such as Wikipedia and online dictionaries were also available to the participants.

Procedure

The experiment lasted for five days, four hours per day. Prior to their translation activities, the Japanese and American participants were given an instruction on the experiment. (1) All participants were given an introduction about the task. (2) All participants were shown a demonstration to learn apparatus of Multilingual Liquid Threads and Page Dictionary. (3) Every day's working procedure was explained as follows:

Table2. General Working Procedure

Step	Japanese participant	American Participant
1	Task allocation	Read over the original article and get ready to answer questions.
2	Translation	Answer questions when requested
3	Proofreading	Answer questions when requested
4	Interview	Interview

Step1 Since different participants would work on different parts of the article, Japanese participants had to decide the translation task allocation by themselves using Multilingual Liquid Threads before they started to translate article.

Step2 Japanese participants could ask questions at any time during the translation work. Any American or Japanese participant could answer questions. Furthermore, there was no format for an answer and multiple answers were available simultaneously.

Step3 As well as at step 2, both Japanese and American participants could edit the Page Dictionary at any moment and hold discussions on entry creation through Multilingual Liquid Threads.

Step4 At the end of the experiment, every participant was interviewed. Feedback about multilingual communication with Multilingual Liquid Threads was collected.

IV. RESULTS

A. System utilization

First, we investigated how Multilingual Liquid Threads was utilized for discussion in Wikipedia translation activities. All the messages during the experiment were collected and analyzed.

Finally we got 273 messages in total. These messages consisted of 56 threads. A thread is defined as a collection of messages that were discussing the same topic. There were threads which contained only monolingual discussions among Japanese/English participants as well as those which contained multilingual discussion between Japanese and English participants. Messages from American participants were all posted by English, while most of the messages from Japanese participants were posted by Japanese (Only one of them was posted in English by Japanese t A). Note that the content of the English message posted by Japanese A was not directly related to translation activities. A post-interview suggested that the incentive of such behavior from Japanese A was that he thought English messages could express goodwill towards the American participants.

According to the interview, American participants viewed messages in English. Japanese participants basically viewed messages in Japanese, while for messages translated into Japanese, they viewed the original English messages concurrently as assistance for understanding.

To see how the Multilingual Liquid Threads was used during the translation activities, each thread was classified into one of the 4 categories:

- *Translation Task Allocation*
  Threads discussing translation task allocation.
- *Translation Policy*
  Threads discussing policies such as capitalization rules of proper nouns which aimed to build standard translation processes.
- *Article Proofreading*
  Threads clarifying unclear parts of the article and correcting translation errors.
- *Dictionary Checking*
  Threads discussing Page Dictionary creation.
- *Others*
  Threads which do not belong to any of the categories listed above.

Figure 3 shows the categorized result of threads. As shown in Figure 3, the majority of the discussions (73.2%) were devoted to article proofreading.
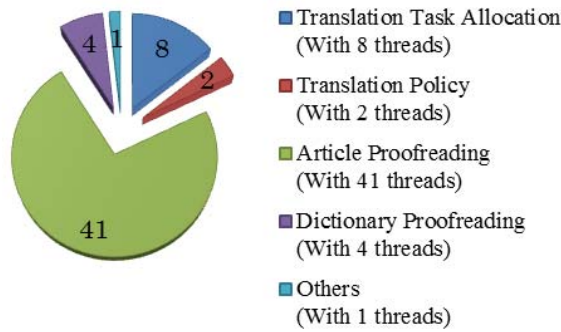
Figure3. Thread Count of Discussion (N=56)

- ■ Translation Task Allocation (With 8 threads)
- ■ Translation Policy (With 2 threads)
- ■ Article Proofreading (With 41 threads)
- ■ Dictionary Proofreading (With 4 threads)
- ■ Others (With 1 threads)

Since discussions on article proofreading were mainly on correcting the mistranslated parts and clarifying the ambiguous terms used in the article, it appears that Multilingual Liquid Threads was mainly used for reducing ambiguity and conveying accurate meaning of the terms used in the article.

B. Ability to transfer knowledge

Second, we investigated whether multilingual communication through Multilingual Liquid Threads was actually beneficial to the users in terms of knowledge transfer. In the following, we observed how frequently the users were able to successfully transfer knowledge through the Multilingual Liquid Threads.

All the threads that contained multilingual communications were subject to analysis. As a result, we got 32 threads in total. Table 3 gives a statistics overview as follows.

Table3. Multilingual Thread/Message Count

Multilingual thread count / (All threads)	32 / (56)
Message contained in multilingual threads count / (All messages)	213 / (273)

To see how successful they were in transferring knowledge through the Multilingual Liquid Threads, we used the acknowledgements (such as "I understand", and "I see") as a rough indicator of success in knowledge transfer.

Table 4 gives an example of such successful cases. For readability, note that all the Japanese messages were translated into English. In this thread, knowledge about the meaning of the phrase "Going-to-the-Sun" was presented and the knowledge receiver (namely Japanese participants) gave a message of "it was understood" to present successful mutual understanding.

Table4. Example of Successful Knowledge Transfer Cases (Japanese messages were translated into English)

Msg. No.	Original Language	Presenter	Message
1	Japanese	Participant A	What does the "Going-to-the-Sun Road" mean?
2	English	Participant E	"Going-to-the-Sun Road" is the proper name of the main road in the middle of the park. The name of the road is in honor of the Blackfeet Tribe.
3	Japanese	Participant A	It's a proper noun, isn't it? It was understood. Thank you very much.
4	English	Participant E	Correct, it is a proper noun.

We examined all the 32 multilingual communication threads and found that 65.6% (21/32) of all the threads satisfied the requirements for successful knowledge transfer. An observation suggested that each of these 21 threads consisted of a series of questions and answers and began with a Japanese participant issuing a question.

As a result of successful knowledge transfer, a complete and comprehensive Japanese Wikipedia article was created throughout this experiment, which has been uploaded into actual Japanese Wikipedia and is available to access by any Wikipedia viewer.

The result suggests that Multilingual Liquid Threads was basically useful for conveying information between American and Japanese users in our experiment. This result is quite interesting because previous research on machine translation mediated communication has emphasized the difficulties of conveying accurate meaning of the original messages [5].

C. Influence on communication pattern

To see how the participants were able to convey accurate meaning of the article, we analyzed their multilingual communication in further details. We focused on those 21 threads which succeed in knowledge transfer.

To see how the information was transferred through a series of questions and answers, we developed a coding scheme that captures the communication style of each thread. The categories used for the analyses are presented in Table 5.

Table5. Message Category

Category	Definition	Example	Freq.
Propositional Question	A question that could be answered with "Yes" or "No".	[Q] Does "game" have a meaning of Animal?	19.7%
Non- Propositional Question	A question which needs informative answers instead of "Yes" or "No".	[Q] What does "raid squirrel caches of the pine nuts" mean?	6.0%
Direct Answer	A response which answers to the question directly.	[Q] What is "concession facilities"? Is this one kind of stores? [A] Yes. "Concession facilities" are stores that sell things to tourists.	21.4%

Informative Answer	A response which typically contains more information than requested (in the question).	[Q] Does "game" have a meaning of Animal? [A] Game means wild animals, including birds and fishes, such as are hunted for food or taken for sport or profit. Game is being used as an adjective to describe the fish species found in the lakes and streams.	22.2%
Proposal	A response which contains a proposal to the questioner.	[Q] Thank you very much. Now I understand what Wilder Complex is. But it's a little difficult to choose an appropriate Japan term which corresponds to Complex. [A] My own personal dictionary offers 複合体 or ふくごうたい for this noun "complex". Is this Japanese word too technical?	6.0%
Acknowledgement	Feedback showing that message is understood/accepted.	Thank you very much! It was understood.	17.9%
Other	Uncodable communication.	This is a thread about a question of Wildlife and ecology	6.0%

All the messages were classified into one of the seven categories listed above.

The statistics in Table 5 suggests that the number of propositional questions is three times larger than that of non-propositional questions. Interviews from the Japanese participants revealed that they tried to ask questions in the propositional style to avoid mistranslations by machine translator. However, despite such concerns of the Japanese participants, it appeared that the American participants tended to answer the questions in an informative way; they tended to provide more information than required by the Japanese questioner, even when simple "Yes" or "No" answers were sufficient. Indeed, Table 5 shows that the number of direct answers did not largely surpass the number of informative answers.

The following excerpt is an actual example of a Japanese participant asking a propositional question followed by an informative answer given by an American participant. Note that all the Japanese messages were translated into English for readability.

- **[Question]** *"The one of the The west and northwest are dominated by spruce and FIR and the southwest by redcedar and hemlock; the areas east of the Continental Divide are a combination of mixed pine, spruce, FIR and prairie zones." Is the "redcedar" same as "red cedar"?* Posted by Japanese Participant C
- **[Answer]** *Essentially, yes. Specifically, the mean the Western Redcedar. The Western Redcedar is very different from the Eastern Redcedar which is a type of Juniper and is more bush like.* Posted by Japanese Participant E

In the excerpt above, a simple response as "Yes, it is." should have been enough to answer the question. To see when such an informative response was provided, we further classified the responses of propositional questions into one of the four categories:

Table6. Reponses for Presentations of Proposition

The answer to a propositional question (Yes or No)	Proportion of Direct Answers (Thread Count)	Proportion of Informative Answers (Thread Count)
Yes	14.3% (3/21)	*66.7% (14/21)*
No	0	19.0% (4/21)

Table 6 suggests that the respondents always provided sufficient/additional information when they had to say "no" to the questioner's expectation. More interestingly, the respondents provided additional information even when the questioner's expectation was right.

To figure out the incentives of putting so much effort in providing sufficient information to the questioners, we interviewed the respondents (American participants) for their reasons. American participant D mentioned that:

"Sometimes even when I understood the question, I was still worrying about the possibility of Japanese participants raising the questions inappropriately. I mean, they might actually be confused about another part in that sentence? So in case of this situation, I decided to provide useful information as much as I could".

It seems that the respondents tended to provide more information than requested because of their low confidence in machine translation; they were not sure if they have really understood the questioner's intention because of the potential/possible problems which might have been created due to mistranslation or inadequate English ability of the questioners.

The result reminds us of Yamashita's study [5] where respondents also offered additional information (rather than answering to his/her partner's question) when talking over machine translation. The interesting finding which differs from their study is that the Japanese participants in our study asked questions quite frequently while participants in their study seemed to be reluctant in asking questions. This may in part due to the differences in the tasks used in these studies. Since their task did not require accurate information transferring between the participants, they just ignored the (mistranslated) parts that did not make sense to them. Meanwhile, our task required accurate information transfer, and thus the participants could not ignore the mistranslated parts; they had to ask for clarification when they were not sure if they had understood the meanings correctly.

When a question was issued, it meant that the questioner did not understand a term or wasn't sure if his/her understanding was correct. The respondents thus tried to provide as much information as possible so that the questioner could fully understand the term. Since accurate information transfer was their first priority, providing unnecessary or redundant information was not a big issue for them.

V. CONCLUSION

In this paper we reported on the study of introducing Multilingual Liquid Threads. This system enables monolingual speakers to collaboratively translate Wikipedia articles using their mother tongues. In our experiment using this system, we observed

both system performance and human behavior in multilingual communication.

First, a trend of discussions on article proofreading was found. Since article proofreading typically refers to correct the mistranslated parts and clarify the ambiguous terms used in the article, we concluded that Multilingual Liquid Threads was mainly used for reducing ambiguity and conveying accurate meaning of the terms used in the article.

Secondly, statistics revealed that most multilingual discussions seemed to be successful in transferring knowledge between different languages by building mutual understating through multilingual communication. This is quite important since it suggests that Multilingual Liquid Threads was basically useful for conveying information between American and Japanese users in our experiment.

Finally, communication patterns were analyzed to find out how knowledge transfer was achieved successfully. It appears that respondents (namely American participants) typically tried to provide as much information as possible so that the questioner could fully understand the term mentioned in the question, since accurate information transfer was their first priority. Thus providing unnecessary or redundant information was not a big issue for them.

These findings suggest that there is a fair chance of non-bilingual speakers contributing to Wikipedia translation activities with the assistance of Multilingual Liquid Threads. However, currently the system is expecting for further improvement to enable more efficient multilingual communication, because more propositional questions and less informative answers could still be expected to reduce communicative effort for contributors. As one of the reasonable approaches, building up a more usable interface for this system to enable a simple way of asking questions is being considered. For instance, question templates could be helpful to reduce effort of considering the format of asking questions. A fixed format could reduce mistranslations during multilingual communication. This could possibly result in more efficient knowledge transfer and benefit users finally. Furthermore, after completing system upgrading, an evaluation involving actual Wikipedia contributors is going to be carried out in the near future.

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