

Transterpreting Multilingual Electronic Meetings

Milam Aiken, Ph.D., University of Mississippi, USA

ABSTRACT

Communicating in a non-native language during a traditional, oral meeting is difficult, but a Group Support System (GSS) along with online machine translation (MT) can increase the efficiency and effectiveness of the discussion. An experimental study shows that a group facilitator can use a Web-based translation service to support a multilingual meeting, but completely automated language support is likely to be more efficient for large groups.

Keywords: Machine translation; MT; multilingual meetings; group support systems; GSS; computer mediated communication; CMC; translation-mediated communication; TMC; transterpreting

1 INTRODUCTION

Diverse groups have a broader and richer base of experience from which to tackle a problem, and heterogeneous groups often produce better quality solutions to tasks than homogeneous groups [23]. Yet, one form of a diverse group, a multilingual group, often finds communication difficult due to the need to adopt a common tongue with which all meeting participants are not equally fluent. In addition to the need to compete for “air time” and the reticence of some participants, both common occurrences in oral meetings [21], a few group members might be anxious when trying to compose contributions, thinking they might be misunderstood [15]. Others could be embarrassed about making word-choice or grammatical errors.

However, discussions within a multilingual group can be translated for greater efficiency. For example, in the United Nations and other multinational bodies, interpreters provide oral commentary on what is said during a meeting in one of several “working” languages [18]. In addition, many informal, inter-lingual meetings between only a few individuals occur every day, and these are often supported by human interpreters, either on-site or remotely. For example, SpectraCorp [22] provides translation services in 150 different languages over a telephone at a rate of US \$1.65 per minute. But, phones are not always available or convenient, and spoken conversations suffer from the same problems of conventional, oral meetings, e.g., only one person can speak at a time, comments are not recorded, and a lack of anonymity can cause people to be shy and not contribute [1, 17]. In addition, speakers must pause as the interpreters process the information in their minds and relate the translation, further slowing down the process of the meeting [16].

Humans have also been used to interactively translate text in computer-mediated communication (CMC) through a process called “transterpreting”, “teletranslation”, or “teleinterpretation” [20]. In this procedure, a linguist can stand behind a typist and dictate translations, or the person could perform the translations and type at the same time. Translation-mediated communication (TMC) in a chat room or other form of electronic meeting such as a Group Support System (GSS) might decrease meeting time and increase satisfaction with the discussion [10, 11, 24]. However, little research has been conducted on TMC.

Here, we describe prior research on manually translated electronic meetings and then present the results of two experiments using teleinterpretation. Next, we suggest a new, automated technique to provide multilingual support, and finally, we discuss future research directions.

2 PRIOR RESEARCH ON TELETERPRETATION

MT was first discussed in the 1940s [25], but perhaps the first suggestion of integrating translation with an electronic meeting was about four decades later [14], and to our knowledge, only a few studies of meetings with teleterpretation have been conducted.

The first use of staff to provide translation support in CMC involved one German, one French, and two English participants in four different locations [4]. The meeting facilitator used *Babelfish* (<http://babelfish.yahoo.com/>) powered by SYSTRAN [26] to provide the translations among the languages. After the meeting, two objective reviewers evaluated the grammatical accuracy and understandability of all comments translated into English. Although the overall grammatical accuracy was only 50%, the evaluators were able to understand 95% of the text.

In the second meeting of the same study, two German and three English participants in four locations exchanged comments with similar support by a facilitator using *Babelfish*. Although there were several grammatical and phrasing errors, all group members stated that they could understand all of the translations and they could not distinguish between comments translated and those written in the language originally. In addition, the text submission rate was relatively high (31 comments in five minutes),

Another study [7] was conducted with two Chinese- and two English-speaking participants. Only one of the 15 English comments translated by the facilitator into Chinese could not be easily understood (93% accuracy), and the English speakers understood all of the translated Chinese comments.

While the grammatical accuracy of MT/staff-translated comments in electronic meetings has been relatively low, the group members were able to comprehend 93% to 100% of the comments. However, this understanding rate might not be good enough.

Since these studies were conducted, MT accuracy has increased dramatically with the increasing use of statistical learning [8], and some researchers claim that machines can now deliver comprehensible simultaneous translation output [13]. For example, *Google Translate* (http://translate.google.com/translate_t?hl=en#) uses statistical MT and ranked first in several tests of 22 systems [19]. We are not aware of any studies using this online MT service in conjunction with an electronic meeting, however.

3. EXPERIMENTAL STUDIES

Prior studies using semi-automatic machine translation in CMC have been scarce and have suffered from small samples sizes, and many other meeting variables besides comprehension have not been investigated. For example, there has been no research on whether or not group members are willing to conduct the translations themselves rather than a staff member. In addition, little is known about how much time it takes to translate a comment and post the resulting text in a group discussion. To answer these questions, we conducted two separate studies.

3.1 Self translation and accuracy study

Each member of a multilingual group can use a Web-based translation service to translate foreign text on a shared bulletin board or chat room, but will they? An experiment was conducted to determine how many would actually perform this task.

3.1.1 Experimental background

We asked 21 undergraduate business students to participate in a multilingual meeting in which they were asked to provide their own machine translations of foreign text to English, and we asked 18 students to participate in a meeting in which MT results were provided by a staff member. Both groups generated ideas in English for 10 minutes about how to solve the parking problem on campus.

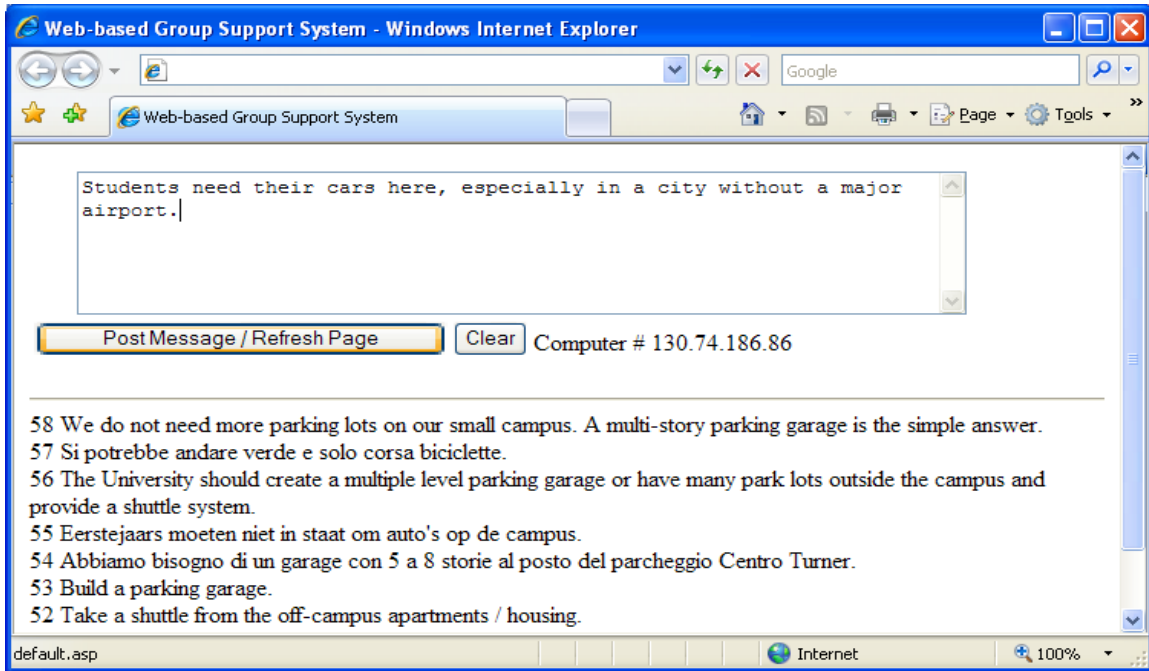


Figure 1: A mixed-language multilingual meeting screen shot

During the first (or member-translation) group’s GSS discussion, as the members typed their solutions toward the solution of the problem, the facilitator randomly added text from historical transcripts of meetings discussing the same problem, originally typed in English, but translated into five Dutch, five Italian, and five Spanish comments (see Figure 1). Participants in this first group were given a program that linked to *Google Translate* to obtain the English equivalent of these foreign comments, if they wished to get the meaning, and this program tracked which participant sought a translation as well as the time taken for its retrieval. The second (or facilitator-translation) group was given the original, historical comments written in English, in random sequence.

After the experiment, both groups were asked to rate their satisfaction with the meeting process on a 1 (very dissatisfied) to 7 (very satisfied) scale and the importance of translation accuracy during the meeting (1 = not important to 7 = important). The member-translation group also rated how much they enjoyed translating their own comments (1 = disliked, 7 = liked).

3.1.2 Experimental results

There were no significant differences between the member-translation (MT) and the facilitator-translation (FT) groups in terms of their satisfaction with the meeting process ($F=0.297$, $p=0.589$) and the importance of translation accuracy ($F=1.564$, $p=0.219$). In both groups, participants were significantly satisfied with the electronic meeting process, in concordance with most prior studies of similar groups [3], and they strongly agreed that translations should be accurate (see Table 1). Participants in the MT group were neutral about their satisfaction with the translation process. Further, meeting process satisfaction was significantly correlated with the importance of translation accuracy ($R=.413$, $p=.009$).

Table 1: Member-translation versus facilitator-translation group summary

	MT group (N=21)		FT group (N=18)	
	Mean	Std. dev.	Mean	Std. dev.
Satisfaction with the meeting process	5.95*	1.50	6.17*	0.79
Preference for member translation	4.19	2.09	-	-
Importance of translation accuracy	5.67*	1.43	5.06*	1.63

* Significantly different from neutral value of 4.00 at $\alpha = 0.05$.

Table 2: Percentage of comments translated in MT group (N=21)

Comment ID	1 Dutch	2 Dutch	3 Spanish	4 Italian	5 Dutch	6 Italian	7 Spanish	8 Spanish	9 Italian	10 Spanish	11 Dutch	12 Italian	13 Spanish	14 Dutch	Percentage
2															-
3													1		7.1%
4			1												7.1%
5															-
6															-
7					1							1	1		21.4%
8															-
9												1		1	14.3%
10															-
11															-
12															-
13															-
14	1	1													14.3%
15															-
16	1		1	1	1	1	1	1					1	1	64.3%
17									1						7.1%
18															-
19				1	1										14.3%
20															-
21		1				1	1	1		1					35.7%
22								1	1					1	21.4%
Percentage	9.5%	9.5%	9.5%	9.5%	14.3%	9.5%	9.5%	14.3%	9.5%	4.8%		9.5%	14.3%	14.3%	

Table 2 shows how many of the Dutch, Spanish, and Italian comments were translated by the first group. One participant translated 9 (64.3% of the foreign comments), but 11 (52.4% of the group) did not translate any. Comments 5, 8, 13, and 14 were translated by 3 (14.3%) participants, while comment 10 was translated by only one (4.8%).

Table 3: Summary of comments translated

Group Member	Total	Relevant	Translated
2	1	1	-
3	3	3	1
4	1	1	1
5	6	1	-
6	1	1	-
7	2	1	3
8	7	1	-
9	4	3	2
10	6	6	-
11	5	2	-
12	6	4	-
13	1	1	-
14	3	2	2
15	7	4	-
16	4	1	9
17	10	6	1
18	6	3	-
19	4	1	2
20	5	2	-
21	1	1	5
22	5	3	3
Total	88	48	29

Table 3 shows the number of relevant (those pertaining to the topic) and total comments written in English by each group member, and the number of comments translated. Participant 16 generated one relevant comment, while translating the most number of foreign comments, and group members 10 and 17 generated the greatest number of relevant comments (6), but did no translation during the meeting.

Table 4: Difference between comment insertion time and translation time

Comments		Entered time (hh:mm:ss)	Interval time for translation (in sec.)	
Comment #	Language		Average	Std. Dev
1	Dutch	14:15:19	88	23
2	Dutch	14:15:45	101	1
3	Spanish	14:16:08	134	22
4	Italian	14:16:42	157	3
5	Dutch	14:17:24	123	31
6	Italian	14:18:06	90	62
7	Spanish	14:19:09	58	62
8	Spanish	14:19:39	52	39
9	Italian	14:20:49	67	23
10	Spanish	14:21:26	37	-
12	Italian	14:22:18	34	11
13	Spanish	14:22:44	258	314
14	Dutch	14:23:06	46	36

Table 4 shows the average time intervals between the addition of the foreign comments by the facilitator and the time it was translated by those participants who wanted the meaning. Intervals ranged from 34 to 258 seconds, and with the exception of comment 13, the time taken for translation seemed to decrease.

3.2 Translation time study

In the previous study, one facilitator provided machine translations and posted them into the discussion. However, different people might not be equally adept at using *Google Translate*, and we wanted to find out how long it would take to post a translation after a foreign comment appears on a computer screen.

Table 5: Comments translated manually and automatically by *Google Translate*

Num	Language	Original text	Google English Translation
1	Russian	Хотите потанцевать?	Want to dance?
2	Chinese	你是從那裡來的？	You are coming from there?
3	Korean	어디서 오셨어요?	Where you from?
4	Vietnamese	Một thứ tiếng thì không bao giờ đủ.	One language is never enough.
5	Latvian	Es nesaprotu.	I do not.
6	Hebrew	אני אוהבת אותך	I love you
7	Greek	Χαίρομαι για την γνωριμία	I am glad to know.
8	Arabic	أكتبك يا صديقي	I write, please
9	Arabic	هل تتكلم اللغة العربية؟	Do you speak Arabic?
10	Japanese	いくらですか	How much
11	Romanian	Vă doresc o zi plăcută!	I wish you a nice day!
12	Polish	Wróć przędko do zdrowia!	Go back to health soon!
13	French	Voudriez-vous danser avec moi?	Would you dance with me?
14	Czech	Prosím mluvte pomaleji	Please speak slowly
15	Danish	Vil du tale lidt langsommere?	Would you talk a little slower?
16	Finnish	Missä on vessa?	Where is the toilet?
17	Bulgarian	Оставете ме намира!	Leave me alone!
18	Dutch	Mijn hovercraft zit vol palingen	My hovercraft is full of eels
19	Ukrainian	Давно не бачились	Long time no see
20	Italian	Da dove vieni?	Where are you from?

3.2.1 Experimental background

A sample of 30 undergraduate business students separate from the prior study were asked to provide translations of 20 random comments in 19 languages (see Table 5) selected from Omniglot (<http://www.omniglot.com/language/phrases/>). The students used a program that sequentially presented each foreign phrase on the screen as the user pressed a button. The students then copied and pasted the foreign comment to *Google Translate* (see Figure 2), obtained the translation (using the automatic language detection feature), and transferred the English text back to the application. The application measured the time between copying and pasting the source and the translation. After each comment, the students rated the process using a sliding bar on a 1=very dissatisfied to 7=very satisfied scale.

In the second phase, we asked another set of 29 undergraduate business students to use a similar application that, after they pressed a button, automatically sent each of the 20 foreign comments to the Web-based translation site and retrieved the English result with no copying and pasting. Students rated their satisfaction after each translation with the same 1=very dissatisfied to 7=very satisfied scale.

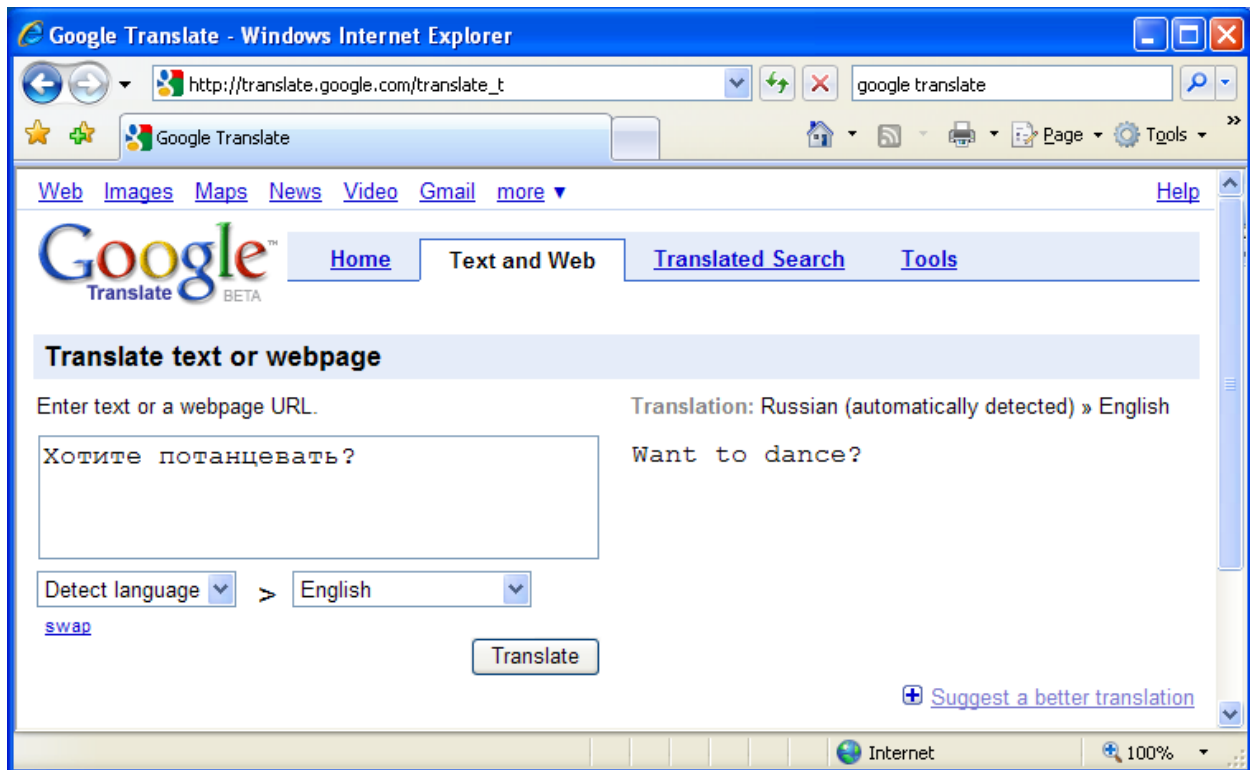


Figure 2: Google Translate with automatic language detection

Table 6: Summary of time needed to perform machine translations
(Manual: N=30, Automatic: N=29 subjects – 20 comments each)

	Mean	Std Dev	Min	Max
Manual (copy and paste)				
Time (seconds)	23.965	33.679	6.051	661.531
Satisfaction	5.672	1.498	1	7
Automatic (no copy and paste)				
Time (seconds)	0.408	0.288	0.109	2.703
Satisfaction	4.808	1.825	1	7

3.2.2 Experimental results

As shown in Table 6, students took about 24 seconds on average to manually translate each comment, and they took only about half a second with automatic translation. Excluding the first three translations, the average manual translation time was only 19.3 seconds, however. Even with the minimum manual time and maximum automatic time, the automatic process was about twice as fast.

In both phases, there appeared to be a learning effect. The first comment in both cases took the longest to translate (see Figures 3 and 4), and the times generally trended down after that. However, the average manual time never fell below 14 seconds while the maximum average automatic time was about 0.8 seconds. Except for the first two comments, the average automatic translation time ranged between .3 and .5 seconds.

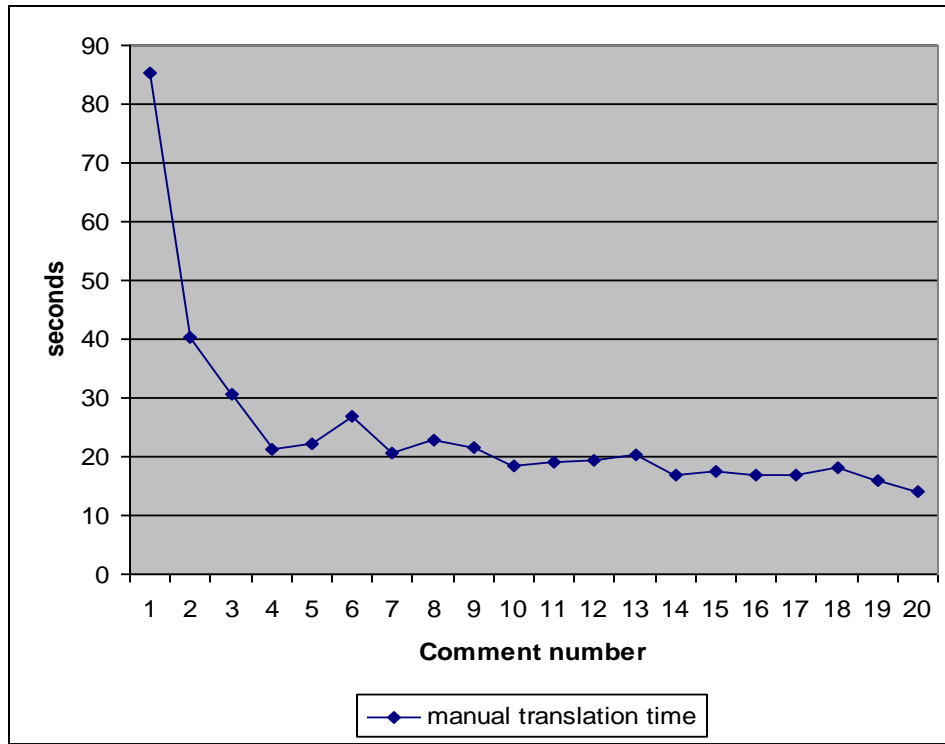


Figure 3: Manual translation time per comment

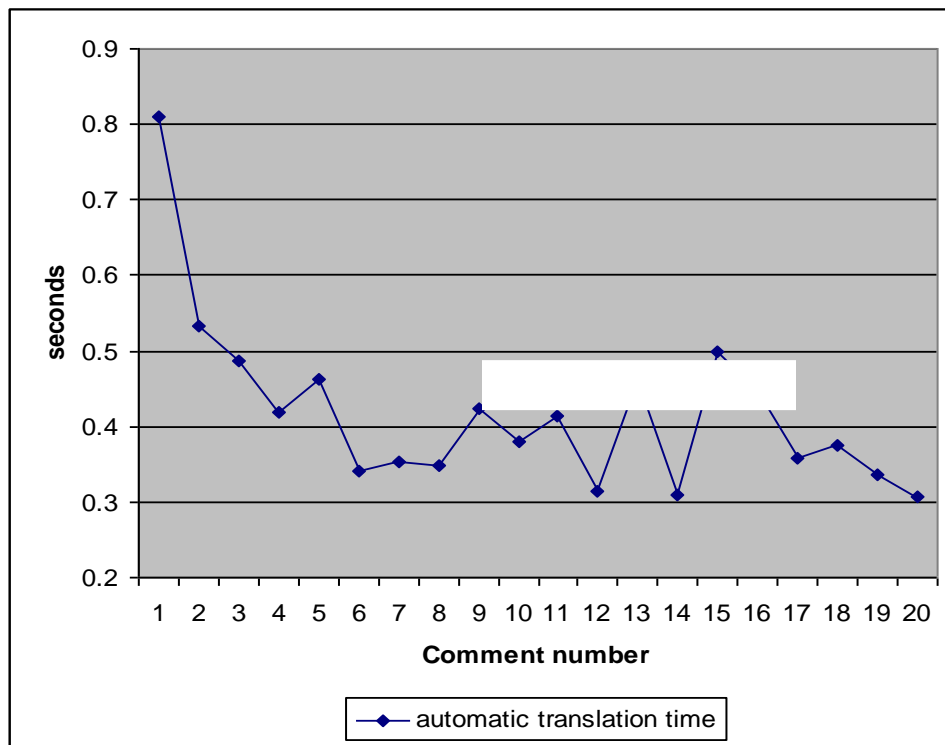


Figure 4: Automatic translation time per comment

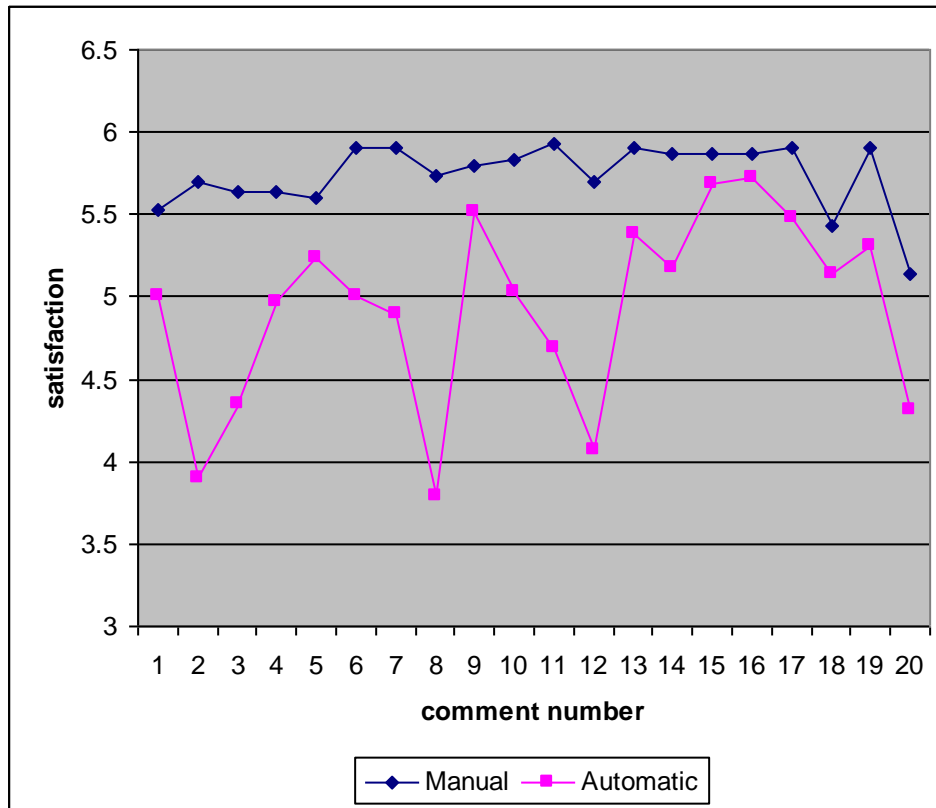


Figure 5: Manual and automatic process satisfaction over time

Surprisingly, there was no major decline in process satisfaction over time with either process (see Figure 5), perhaps because the experiment did not last long enough and did not have adequate comments to translate. In addition, the manual process was generally rated as significantly more satisfying ($T = 6.77$, $p < 0.001$), perhaps because students enjoyed the active involvement of copying and pasting. Saving time with automatic translation did not appear to affect students' perception of process satisfaction.

3.3. Experimental summary

Translations of foreign text inserted into an electronic discussion can be confusing to group members [12], and our first experiment shows that participants of a multilingual meeting are not likely to take the time to obtain the meaning of comments written in a different language. Groups can be separated by language (i.e., each member sees the comments in his or her preferred tongue only), but it can be difficult for a facilitator to provide MT- or human-based translations while keeping the text in the same order.

The second experiment shows that a facilitator is likely to take at least 15 to 20 seconds to translate a foreign comment into each language used during the meeting and will be overwhelmed with the task once the group size reaches 5 or 6 with more than 2 or 3 languages [20]. For groups with many participants, this process would necessarily bog down unless numerous translators were incorporated. More staff can be added to alleviate the translation burden, but coordination becomes even more difficult as they lose track of which comments were translated and which were not.

Thus, it seems clear that unless groups are small and involve only 2 or 3 languages, such as in the case of the teleinterpretation studies cited earlier, MT-assisted facilitator translation is not feasible, and human-interpretation

assisted translation is even less practical. Fully automated MT-supported electronic meetings are necessary for large meetings using many languages.

4. AUTOMATIC TRANSLATION-MEDIATED COMMUNICATION

The first fully automated electronic multilingual meeting system was developed in 1992, but it supported translation only between Spanish and English. Studies using the system showed quick translations and comprehension ranged from 81% to 100% [2].

With the advent of *Google Translate* using statistical machine translation, a new fully automated TMC prototype called *Polyglot* (see Figure 6) has been developed that translates between any of the 41 languages supported by the Web site [6]. Although accuracy varies by language and the complexity of the source text, results of ongoing comprehension tests have been encouraging.

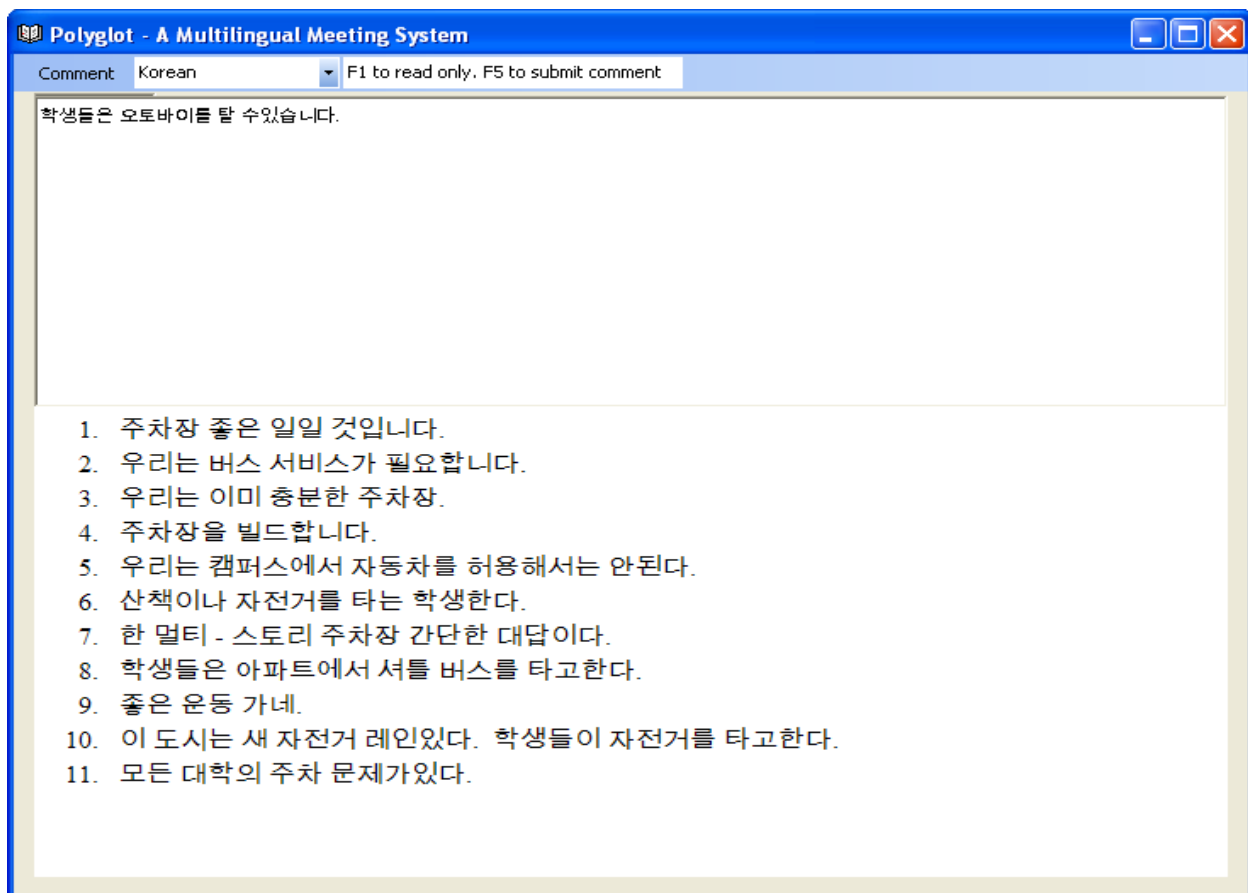


Figure 6: Screen shot of Korean participant's view of a multilingual meeting

5 CONCLUSION

Our first experiment showed that members of a multilingual electronic meeting will not translate more than a few comments written in a foreign language. More than half of the 21 participants did not bother to use the translator, and only one group member used the translator on more than 50% of the foreign comments. The second experiment showed that facilitator-supported translation of foreign text either through a human linguist or MT is not sufficient for a large meeting using many languages as the average time to translate a comment into another

language and post the resulting text back to the meeting software is about 20 seconds. But, each group member's computer can translate a submitted comment in about a half second per language and post the generated comments into the respective log files. Thus, it seems that fully automated TMC is necessary for large, multilingual groups.

The principle barrier to adoption of TMC has been the relative lack of accuracy in translations. Results vary by language and the sentence structure of the source text, but *Google Translate's* accuracy continues to improve as the system is trained with greater volumes of equivalent text. Future research will focus on measuring *Polyglot's* accuracy in a variety of meetings with as many languages as possible.

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