Multilingual Collaboration in Electronic Meetings

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INTRODUCTION

Groups in which participants do not speak the same language frequently find communication difficult. Yet, multilingual meetings are common as a form of collaboration. To overcome this language barrier, banks, government agencies, hospitals, the courts, and many other institutions have relied upon human translators to enable meeting participants to exchange ideas and opinions. For example, the United Nations General Assembly's discussions, conferences within the European Union, multinational corporations' business negotiations, and many other meetings are conducted almost daily, requiring large amounts of interpreters' scarce expertise and time.

In addition to the problems of translation efficiency and effectiveness, these meetings have the same limitations as those involving a single language: (1) only one participant can speak at a time, (2) comments must be transcribed manually for a permanent record, and (3) many group members do not participate because of shyness or because other speakers monopolize the conversation.

Group support systems (GSS) have automated the meeting process and improved the productivity of groups needing to share ideas (Dennis, George, Jessup, Nunamaker, & Vogel, 1988). By integrating machine translation (MT) with a GSS, multilingual groups can enjoy the same benefits as monolingual groups. This paper summarizes research conducted using automatic and semi-automatic natural language translation in electronic meetings and shows how a multilingual GSS (MGSS) can improve communication and collaboration.

MULTILINGUAL MEETINGS

Meetings involving more than one language (e.g., English and Spanish) typically incorporate human translators who work either synchronously (simulta-neous interpretation) or asynchronously (consecutive interpretation). Using the first approach, an interpreter sitting in a soundproof booth listens using a headset to the speech in one language from the meeting room and translates the speech into a different language, speaking into a microphone connected to the headsets of selected participants in the meeting. With multiple interpreters, a speech or discussion can be translated into several languages almost simultaneously. Using the asynchronous approach, an interpreter takes notes or transcribes the comments from one language as they are spoken. When the speaker pauses or finishes, the interpreter then delivers the speech again in another language.

Besides the cost (an interpreter might charge 0.16 to 0.40 cents per word, depending on the target language) and problem of scheduling (interpreters with skills in the required language translation-pairs might not be available at the desired meeting time), even skilled interpreters can make errors because of poor perception of the source language (the speaker might slur words, speak softly, have an unusual accent, etc.), lack of familiarity with slang or technical terms peculiar to the meeting topic, or just human fallibility. Further, multilingual meetings suffer from the same problems as monolingual meetings in terms of productivity and participant satisfaction.

GROUP SUPPORT SYSTEMS

Group support systems (also called electronic meeting systems or groupware) automate traditional, oral meetings by allowing group members to type and view comments on computers connected via a network (LAN or WAN). These systems improve the efficiency and effectiveness of meetings primarily by: (1) allowing participants to submit and view all comments simultaneously, (2) automatically recording all submitted comments, and (3) providing anonymity (no participant can determine who wrote a particular comment). As a consequence of these

provisions, studies have shown that for groups of more than seven participants who share ideas with a GSS, meeting times are shorter, more comments are generated, better quality comments are contributed, group members participate more and more equally, and participants are more satisfied with the meetings (Nunamaker, Briggs, Mittleman, Vogel, & Balthazard, 1997).

The use of the technology has become widespread, and one leading commercial GSS product, *Group-Systems* (www.groupsystems.com), currently is used on every continent except Antarctica. However, with some exceptions (e.g., Aiken, Hwang, Paolillo, & Lu, 1994a; Lagumdzija, 1996; Lim, Raman, & Wei, 1990; Mejias, Lazeneo, Rico, Torres, & Vogel, 1996; Morales, Moreira, & Vogel, 1995), most electronic meetings and nearly all research in the area have been conducted using English-speaking groups (Pervan, 1998). Even though English is used in many locations throughout the world, most people prefer to use their native language when communicating, and some means should be provided to accommodate multilingual groups using a GSS.

MULTILINGUAL E-COLLABORATION

The idea of translating typed comments within an electronic meeting was first proposed by Gray and Olfman (1989). The first completely automatic, multilingual GSS was developed in 1991 (Aiken, Martin, Reithel, Shirani, & Singleton, 1992), followed by another version (Aiken, Martin, Paolillo, & Shirani, 1994b) developed with the goal of improving translation accuracy. In these fully automatic MGSS meetings, participants were able to type in one language and submit the comment while translations automatically appeared on other terminals. Based upon software configuration, group members could be allowed to view comments only in their language (e.g., Spanish) or comments in a mixture (e.g., Spanish and English). In the latter approach, if a translation was inaccurate and a participant knew a little of the other language, he or she could possibly make a more accurate guess as to the correct meaning of the comment.

A third, semi-automatic version (Aiken, Rebman, Vanjani, & Robbins, 2002) was developed with the goal of supporting languages other than only English and Spanish (33 different languages) and allowing group members to participate any where in the world via the Web. In this semi-automatic MGSS, a staff member played an active role in the translation process (cutting and pasting results from the PC-based MT program to the Web-based GSS software).

The final MGSS (Aiken, Wang, & Vanjani, 2003) was developed with the goal of making the system more portable, and was consequently, a completely Web-based system. In the newest version, both the GSS and the MT software are Web-based, allowing the staff members who participated in the translation process to be anywhere.

Automatic and semi-automatic GSS meetings are likely to have less accurate translations than electronic meetings served by human interpreters. As the group size increases and more participants submit comments nearly simultaneously, several interpreters are required to read a comment in one language, translate, and type again in another language. One study (Rebman, Aiken, & Cegielski, 2003) showed that undergraduate business students are able to type 36 "easy" words per minute (commonly occurring words with few syllables) and type 24 "difficult" words per minute. The final version of the MGSS, however, is able to translate and submit to the group 600 words per minute. In addition, a virtually unlimited number of the completely automatic MT programs could run during a meeting (even one per participant), making it possible to support even very large groups with a negligible lag in translation time. Thus, in terms of efficiency alone, the MGSS is superior.

Translation accuracy has been the major barrier to greater MT acceptance, but high accuracy might not be needed in a GSS meeting. For example, if one comment is not understood, there are likely to be other similar, if not redundant, adjoining comments that might be clearer or could aid the understanding of the earlier comment. In addition, a participant can submit a new comment asking for clarification from the group.

MACHINE TRANSLATION

Machine translation is the basis of an MGSS meeting, and its accuracy is vital to the success of the discussion. However, natural language translation is very difficult, and even expert humans are inconsistent. In addition, there are no universally accepted and reliable measures of translation accuracy (Balkan, Netter, Arnold, & Meijer, 1994). Some studies focus on the percentage of sentences with minor or major errors, some focus on the percentage of text that is understood

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