Using Language-Retrieved Pictures to Support Intercultural Group Brainstorming

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ABSTRACT

Group brainstorming is a commonly practiced technique to enhance creative outcomes. A close observation of group brainstorming suggests that ensuring the abundance and diversity of stimuli available in brainstorming sessions is critical. Cultural differences in knowledge and perspectives are valuable sources for diversity, while cultural discrepancy in communication styles and language may impede knowledge sharing. My dissertation research aims to reconcile the tension between the benefits and obstacles of intercultural brainstorming with pictures that are triggered by verbal ideas. Pictures provide extra stimulation without explicitly interrupting normal communication. Pictures may also mediate concepts in a language-independent manner, which may complement the still imperfect machine translation and make cross-lingual brainstorming feasible.

Categories and Subject Descriptors

H5.3 Group and Organization Interface: Computer-supported cooperative work

General Terms

Design, Experimentation, Human Factors

Keywords

Intercultural collaboration, computer-mediated communication, group brainstorming, creativity support tools

1. INTRODUCTION

Group brainstorming is a teamwork technique for enhancing creativity commonly practiced in organizations. In group brainstorming, group members are encouraged to openly share ideas they think of without worrying too early about whether these ideas are useful or not. The goal is to accumulate an abundance of ideas first. Quantity may breed quality, so something useful and original may eventually come out through the process [3].

In theory, overhearing other people's ideas may help individuals expand their vision and imagination, allowing group members to synthesize new ideas that they can never think of individually by exchanging thoughts and combining different perspectives. However, the stimulating utility of overhearing other people's ideas depends on the quantity and quality of available stimuli (i.e., ideas shared in groups). When perceived evaluation pressure (e.g., worrying that peers won't like the ideas) is great, individuals may

not be willing to openly share their ideas [3]. When ideas contributed by group members are too few or too similar, the possibility for people to think of unique ideas may decrease due to low stimulation. Consequently, the group may fall into a vicious circle of cliché, generating only variations on the same idea.

Intercultural brainstorming groups consisting of group members with multicultural compositions have the potential to brainstorm better, because cultural differences in knowledge and perspectives may improve the diversity of ideas and stimuli available. However, the communicative barriers between different cultures could also be large. Non-fluency in using a second language to express ideas and withholding of ideas due to evaluation concerns could be common.

In my dissertation research, I propose to support intercultural brainstorming with IdeaExpander, a system that augments regular brainstorming with extra pictorial stimuli retrieved based on verbalized ideas [5]. As a communication channel, pictures are with properties different from language. In general, language may implement propositions compositionally to convey ideas precisely. Pictures, on the other hand, may provide a rich yet ambiguous visual context to enable diverse, multiple interpretations in a language-independent manner. The paper provides an overview about how language and pictures may be coordinated to cross language and communicative gaps in intercultural groups.

2. AUGMENTING BRAINSTORMING WITH PICTURES

It is observed that pictures may benefit intercultural brainstorming in several aspects.

First, presenting pictures to augment verbal ideas may provide extra stimulation. Pictures provide a natural way to present multiple topics at once (i.e., with a single picture). For example, a picture containing the concept of "car" may introduce other topics through the visual context, such as the color of the car, the street view and the traffic pattern etc. A language statement, on the other hand, typically has a narrower conceptual scope (e.g., "there is a red car"). With cultural differences in attention and perception (e.g., East Asians distributing attention to background objects, while Americans focusing more on the foreground [4]), a picture may be read and expanded in multiple ways and create a valuable basis for conceptual diversity.

Second, in terms of communicative styles, individuals from a collectivistic culture may be more sensitive to evaluative pressure from peers, and thus may be less comfortable to share their ideas openly. By using pictures as a communicative channel, one possible design is to provide a separate input interface for group members to enter ideas privately when sharing them precisely and

directly in language may be culturally inappropriate. The system then retrieves pictures based on both public and private ideas. The design allows people to influence others' ideation without making public statements.

Third, pictures are language-independent and thus people speaking different native languages may still influence each other through pictures. This is especially an important merit of using pictures because communicating across languages is arguably difficult and the current machine translation technology is still imperfect where translation errors are common. Pictures may provide a visual context to complement and support machine translation-mediated brainstorming. Showing a car picture to complement broken translations of statements about cars may more effectively stimulate ideation than having the translations alone, as the later would require people to take efforts to parse and understand.

3. THE PROTOTYPE

The idea of augmenting brainstorming conversations with pictures has been prototyped in [5]. Figure 1 shows both a screenshot and the high-level architecture of this prototype, which retrieves pictures based on the content of ongoing conversations. Participants use a chat window on the right side of the window, while the system displays pictures it chooses based on the conversation on the left. The main system components include:

Language processor. IdeaExpander monitors the chat to identify currently activated concepts in the conversation. Because brainstorming conversations include both on-task and off-task remarks, a machine learning classifier is used to determine whether a remark contains an idea or not.

Picture retriever. IdeaExpander uses keywords drawn from remarks classified as containing ideas to retrieve candidate pictures to show. The initial prototype used a labeled picture database specific to the tasks, but the end goal is to be able to use datasets such as Google images. The system matches remarks it classifies as containing ideas against the keywords of pictures to retrieve a relevant set of pictures.

Picture chooser. The system then chooses pictures that will optimize cognitive stimulation. Here, a utility score is computed that prefers pictures that may stimulate many ideas and ideas that are less likely to be generated.

An initial evaluation of the prototype shows that IdeaExpander improved productivity in a mono-cultural context [5].

4. CURRENT DIRECTIONS

The early prototype demonstrated that IdeaExpander is a technology that can be actually built and applied to support brainstorming. This prototype, however, focused solely on using pictures to provide extra stimulation, and did not look at other beneficial uses of pictures in the linguistic and social aspects.

One main next step of the dissertation research is to focus on using pictures to bridge language and communicative gaps, and enabling people to brainstorm in native languages. To implement this, I propose to combine IdeaExpander with machine translation tools, such as the services offered by NICT's Language Grid project [2]. In this cross-lingual version of IdeaExpander, ideas shared to the chatroom will be processed in two ways. First, the inputted ideas will be translated by machine translation. So people
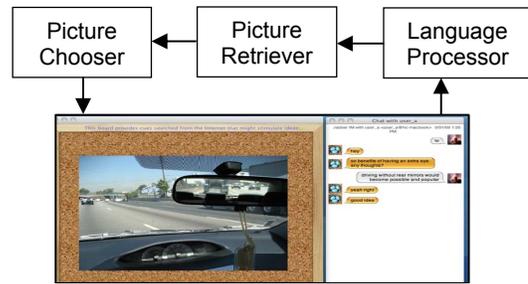

Figure 1. The system monitors the group conversation (right) and selects pictures to display to the group (left).

speaking a different language will see translated ideas. Second, the inputs will also be sent to IdeaExpander for retrieving relevant pictures as visual stimuli. How to search the set of pictures with multilingual queries is a technical issue related to multilingual information retrieval (cf. [1]). A simple solution sufficient for the purposes of prototyping and evaluation may be to index pictures with multilingual tags.

I propose to conduct an experimental study to examine of effects of IdeaExpander in the context of machine translation-mediated brainstorming. In the experiment, participants from two different cultures (e.g., American and Chinese) will brainstorm in dyads by talking either in a common language (e.g., English) or in their native languages (e.g., English and Chinese) that will then be translated by machine translation. Each dyad will work on two sessions, one with IdeaExpander and one without. The experimental design will empirically verify whether poor machine translation harms brainstorming or not, and if so, whether IdeaExpander helps to improve the performance.

Another direction is to investigate the effects of providing people two input areas simultaneously, one public and one private, for them to contribute their ideas. Ideas inputted to the public area will be sent to the chatroom without modification, while those inputted to the private area will only be used to retrieve relevant pictures to show. This will help to answer whether cultures differ in selecting where to submit ideas and whether conversational topics (e.g., sensitive issues) influence such behaviors.

5. ACKNOWLEDGMENTS

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