Remote Conversation Support for People with Aphasia: Some Experiments and Lessons Learned

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Abstract. This paper describes a system for supporting remote conversation for people with aphasia. We have constructed an initial prototype using Skype for video chat and the RemoteX plug-in for screen sharing over a network. Preliminary experiments conducted using the prototype have revealed that simply providing video chat and screen-sharing functions is not sufficient for supporting remote conversation with people with aphasia. We propose various simple communication tools to facilitate questioning and answering in the remote conversation, where a person with aphasia can reply by marking an appropriate portion of a window provided by the tool. Their effectiveness is demonstrated through experiments.

Keywords: remote conversation support, people with aphasia, screen sharing, video phone.

1 Introduction

Advancements in communication technologies allow people to communicate virtually anywhere at any time. People with communication handicaps, such as aphasia, however, cannot fully benefit from those technologies. For people with aphasia, an audio phone and text chat are difficult to use because their communication media depend on the use of language. A video phone allows us to see a person in a remote place. However, due to the limited image size and resolution, video chat is basically designed to show the face of a person. Thus, it is difficult, for example, to point at a thing such as a word on a piece of paper, which is easily accomplished in face-to-face communication.

To remedy this problem, we are investigating a way to enhance remote communication support over a network, targeted at people with aphasia. The remote conversation support system is based on a video chat system for audio and visual communication. In addition, we use a personal computer to share a variety of information over the network. The supporting information items for conversation are shown on the PC display and shared over the network. A touch panel display is also used on the side of the person with aphasia. We assume that a person with aphasia can point at an item displayed on

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the PC display by touching the screen. The position of the touch is sent over the network to the conversation partner's PC.

In order to acquire specific requirements for this type of remote conversation support, we have implemented an initial prototype using Skype for the video chat function, and the RemoteX Skype plug-in for the screen-sharing function. This paper first describes this prototype, and discusses preliminary experiments using the prototype. Through the experiments, we realized that simple screen sharing is not sufficient for remote conversation support for people with aphasia. Therefore, several simple communication tools to assist remote communication are proposed. Finally, experiments conducted to evaluate the effectiveness of the proposed tools are described.

2 Remote Conversation Support

2.1 System Overview

In order to demonstrate the possibility of remote conversation support, we set up an initial prototype as shown in Fig. 1. Skype is used as a video phone and the RemoteX plug-in is used for screen sharing. Using the screen-sharing tool, the conversation partner can share information to facilitate conversation. A hands-free microphone is used to make it easier to use the video chat. A touch panel display is also introduced on the side of a person with aphasia, so that the patient can point at the PC screen by touch.

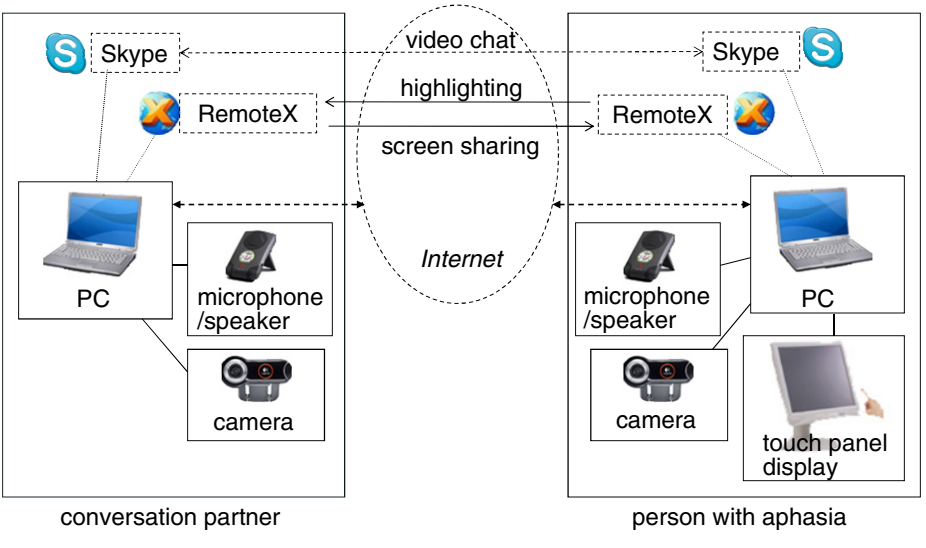

Fig. 1. Overview of remote conversation system

The PC screen (desktop image) on the conversation partner side is sent to the PC of the person with aphasia ("patient"). With RemoteX, the entire desktop is transferred to the remote PC, including a window for Skype. Since this might confuse the patient, we adjusted the position of the RemoteX window on the remote PC (on the patient

side) so that only the portion of the desktop that is intended to be shared appears in the remote PC display, and the rest of the desktop of the conversation partner's PC (including the window for Skype) is off the screen on the patient's side.

Though the RemoteX plug-in also allows a remote user to control the remote PC, we decided not to let the patient control the PC at the conversation partner's side in order to simplify operation. The patient only observes the desktop of the conversation partner's PC. In order to communicate which item on the shared desktop the patient is interested in, the patient is asked to use a pen tool (included with RemoteX) to mark the corresponding area in the window. Marking is done by touching the touch panel display.

2.2 Preliminary Experiments

With this initial prototype, we conducted a remote conversation experiment with people with aphasia. The participants can basically understand spoken words, but have difficulty expressing their thoughts verbally. The conversation is conducted in the following way. First, a conversation partner considers a question to ask, and prepares the contents to be displayed on the PC, which contains possible answers to the question. The conversation partner, then, asks a question verbally and shows the contents containing possible answers in the PC screen. The contents will also be shown on the patient's PC screen (by RemoteX screen sharing), and the patient can answer the question by marking the word (or item) displayed on the screen with the pen tool. The conversation partner can then recognize the answer to the original question by seeing which word or item is marked.

As for the contents to support conversation, we used a vocabulary data file called 'Rakuraku-JiyuuKaiwa'[1]. This vocabulary list categorizes words useful in supporting conversation with people with aphasia. Since the vocabulary list is available on the Internet, we used a web browser to show a list of words. We also utilized 'communication notes' that consist of many paper cards on which various (personal) topics and frequently used words are written. We digitized the communication notes of the experiment participants and made them accessible from the web browser locally. In addition, we used search engines to search the Internet for appropriate web pages for the conversation. In this case, the conversation partner uses the search engine to obtain more detailed information on the current conversation topic. When the appropriate web page is found, the page is then shared with the patient's PC.

The preliminary remote conversation using the prototype described above revealed that simply sharing the PC screen is not sufficient for supporting remote conversation with people with aphasia. One of the reasons is that it is somewhat cumbersome to prepare a list of possible answers. The vocabulary list is designed to be used for this purpose, and is useful for starting a conversation by selecting a topic from the list. As the conversation progresses, the vocabulary list itself often fails to cover all the topics. The Internet offers a wealth of information, but it takes time to search for the appropriate web page during the conversation. While the conversation partner searches the Internet, the conversation with the patient stops, and this disrupts smooth communication.

Table 1. Categories of typical questions

Type of Question	Tool	Functions to be Provided
Yes-No question	Yes-No tool	The window containing Yes / No or not-understood buttons.
Asking the degree of something	Scale tool	The scale bar is shown.
Asking from among several items	Choice tool	Several text areas for a conversation partner to type in during the conversation.
Asking about a place	Map tool	The web-based map system (such as Google, Yahoo) to be presented is shown.
Asking about a date	Calendar tool	A blank calendar is shown.
Asking about a time	Clock tool	A clock without hands is shown.
Asking about the number of times	Number tool	A group of numbers is shown.

2.3 Conversation Support Tools

In order to facilitate the conversation, we categorized the typical conversation into several types [2], and devised a simple tool for each conversation type as shown in Table 1. These simple tools are written in HTML and are intended to be used with a web browser. The person with aphasia can answer the question by simply marking the relevant portion of the tool shown in the web browser using the RemoteX pen tool.

Each tool is stored as an HTML file in the conversation partner's PC. The Google Chrome browser is used to display the HTML file, because the Chrome browser allows us to create a short-cut icon to show the HTML file without any address bar or menu bar. We placed short-cut icons on the conversation partner's desktop to make it easy to use the tools.

1. Yes-No tool

The Yes-No tool is intended to be used for a simple Yes-No type question (Fig. 2). This tool presents three buttons for answering 'Yes,' 'No,' and 'not understood.' The last button was necessary to clearly indicate that the question posed by a conversation partner is not understood by the patient.

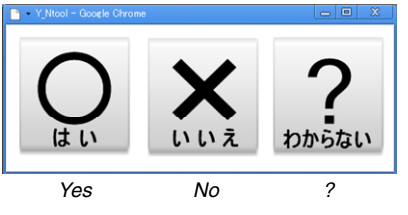

Fig. 2. "Yes-No" tool

When the conversation partner asks a question that can be answered by yes or no, the partner brings this window to the front. The same window will appear on the patient's PC display, and the patient can reply by marking the corresponding part of the window with the pen tool.

2. Scale tool

The scale tool (Fig. 3) is intended to be used for answering questions such as "How much do you like it?" The scale bar is shown on the screen, and the patient is

expected to respond with the degree by marking the corresponding position in the scale bar.

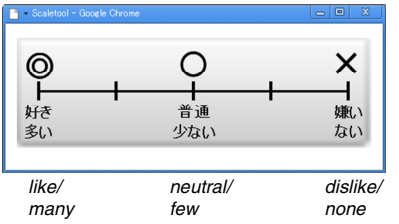

Fig. 3. Scale tool

3. Choice tool

The choice tool is used for preparing a list of possible questions on the fly. This is simply an HTML document with several text area boxes. The conversation partner types a possible answer in each text box. Fig. 4 shows the choice tool, which contains four choices. The patient will mark the item using the pen tool to answer the question.

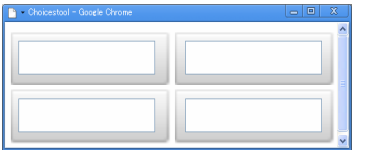

Fig. 4. Choice tool

4. Map tool

A map is very useful when talking about places. There are several map services available on the Internet. We made a simple tool to make it easier to utilize the map service (specifically Yahoo! Japan Maps). One of the problems in using a map is to communicate in which direction the map is to be scrolled. Since a patient cannot directly control the partner's PC, s/he cannot scroll the map by him/herself. Instead, eight arrows are placed around the map as shown in Fig. 5. When the patient wants to scroll the map, s/he marks the corresponding arrow. Then, the conversation partner scrolls the map on his/her PC. This may sound

Fig. 5. Map tool

somewhat cumbersome, but if the conversation partner leads the conversation well by confirming the scrolling direction each time the patient marks an arrow, the conversation can be conducted smoothly.

5. Calendar/Clock/Number tool

In order to talk about the date, the calendar tool is designed as shown Fig. 6. It has areas for selecting year and month along with the monthly view of the particular month.

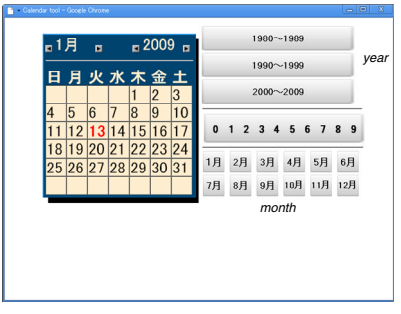

Fig. 6. Calendar tool

Fig. 7. Clock tool

Similarly the clock tool is provided as shown in Fig. 7. The patient is expected to draw the clock hand on the figure to respond with the time. In addition, the number tool is provided for questions involving numbers (Fig. 8). In this example, the partner can ask a question such as “How many times a month do you go?” by putting a word in each box.

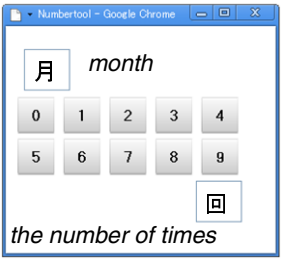

Fig. 8. Number tool

6. Drawing tool

In addition to the various tools described above, a free drawing tool is provided (Fig. 9) to convey information that cannot be expressed well verbally by a conversation partner. The conversation partner can draw a picture as in a typical paint application. This tool is universal in the sense that it can be used like other types of tools such as Yes-No, or scale tools.

Fig. 10 shows how these tools are used in the conversation. The patient is supposed to mark the corresponding portion on the screen by the pen tool provided by RemoteX.

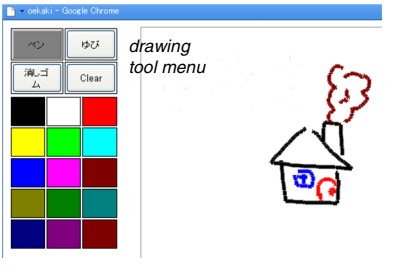

Fig. 9. Drawing tool

Fig. 10. Sample usage of tools

3 Experiments

3.1 Method

In order to investigate the proposed tool, we conducted the following experiment. Three persons with aphasia participated in the experiments as shown in Table 2. The-experiments were conducted in connection with the Abiko City Welfare Center for the Handicapped and Ritsumeikan University, which are about 500 km apart. As explained in the previous sections, we used the Skype video chat system for audio-visual communication and the RemoteX plug-in for screen sharing. The two places were connected by the Internet.

In order to investigate the effectiveness of the proposed tools, we used the A-B design. Basically method A involves only a Skype video chat system. However, since it is very difficult to conduct remote conversation using just video chat, we also utilized a drawing tool if necessary. Method B introduces the tools proposed in the previous section. Each conversation lasted about half an hour to one hour. First, method A was tried, and then one week (or more) later, method B was tried. The conversations were recorded and analyzed later.

3.2 Results

We counted the number of questions asked in each trial. The number of uncertain answers by a participant and the number of repeated questions were also counted. The results are shown in Table 3.

Table 2. Participants

participant	gender	age	symptom	drive for communication
P1	male	51	non-fluent aphasia (severe)	high
P2	male	59	non-fluent aphasia (severe)	low
P3	male	71	transcortical motor aphasia (moderate to severe)	low

Table 3. Experiment Results

participant	P1		P2		P3	
method	A	B	A	B	A	B
duration	42 min.	52 min.	58 min.	47 min.	24 min.	50 min.
number of questions asked	58	96	73	104	33	105
number of uncertain answers	11	4	8	3	0	0
number of repeated questions	8	4	5	1	2	0

The number of questions per minute for each trial was calculated and shown in Fig. 11. In the method A trial, we ended up using the map tool temporarily for the conversation involving questions regarding places for participants P2 and P3 in order to carry on the conversation. For participant P3, a calendar tool was also used temporarily for method A. Even when we take these factors into consideration, we can infer that the proposed tool allows us to ask more questions. This is because less time was needed for composing the questions with the proposed tools available.

As for uncertain answers, the proposed tools could reduce their number. The tools, in a sense, present an answer form to be filled out by the patient. Thus, the ambiguity in the answers can be reduced. As a result, the number of repeated questions can also be reduced. Uncertain answers were not observed for participant P3. This may be because P3 tended to be passive in conversation, thus, most of the questions were yes-no or multiple choice types. This is reflected in Fig. 12, which shows the ratios of the individual tools used in the experiment. For P3, most of the questions were yes-no types. Also note that all the tools were utilized in the experiment as shown in the graph.

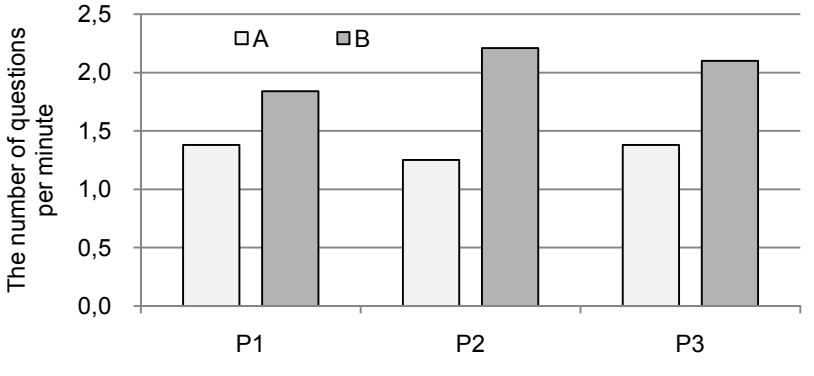

Fig. 11. Number of questions per minute for each participant

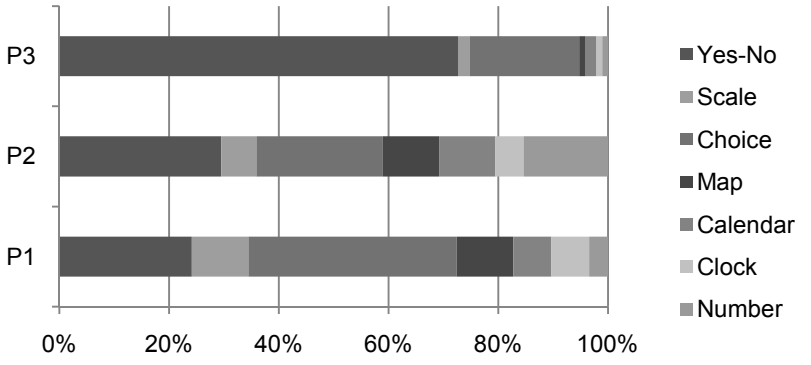

Fig. 12. The ratio of the number of usage of each tool

4 Discussion

The experiment results indicate that the time needed for preparing the questions can be shortened with the proposed tools. Thus, the proposed tools can increase the number of questions we can ask and more information can be obtained from the conversation within the same amount of time.

In addition, we observed that miscommunication can be reduced with the proposed tools. This is partly because the participant can easily understand the intent of the question when the proposed tools show a window (answer box) that the patient uses to make a reply. It can also reduce the number of repeated questions.

With the proposed tools, we can also ask more elaborate questions, for example, we can ask the degree of things. For instance, it becomes easier to ask "How much do you like the movie?" with the answer box containing the scale bar in which the participant can express his or her answer. These factors contribute to smoother remote conversation with people with aphasia.

One of the additional benefits of the proposed tools is that for a novice conversation partner, the proposed tools can act as a kind of template for conversation to be conducted. A novice conversation partner can compose questions with the tools to use in mind.

5 Conclusion

In this paper, we have proposed several tools to facilitate remote conversation over a network. The tools are simple HTML files to be used with a web browser. The experiments using a Skype video phone and its RemoteX screen-sharing plug-in suggest that the proposed tools are effective.

We are also developing a remote conversation support system that utilizes a word database [3]. We plan to integrate the proposed tools with the word database, which can be accessed over the network. In addition, in order to make it easier to use, we are designing a web browser-based system to replace the RemoteX screen-sharing tool.

Screen sharing is very convenient, but it has some drawbacks. For example, it is difficult to play the same video clip or audio file in the remote location. In addition, we cannot easily control which part of the screen is to be shared and when to share it. In the case of remote conversation with people with aphasia, the conversation partner often searches the Internet for information related to the current conversation topics. It is not advisable to share this kind of search process with the patient because it may provide too much information and confuse him or her. It is necessary to be able to easily determine which information should be shared and when. Taking these points into consideration, we plan to extend the proposed tools to support remote conversation for people with aphasia.

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