The Use of Mobile Communications for Live Video Data Transfer by the Hearing Impaired

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Cellular digital phone and computer technologies are coming closer to gether as manufacturers work to combine the mobile phone and computer within a single and portable package. By using a mobile digital phone and a PC with a small video camera, communications among the hearing impaired is made possible. Live video clips of sign language and finger spelling allows hearing impaired persons to communicate interactively by viewing these video clips, no matter where they are or where they go.

Telecommunications and Computers

Use of mobile phones is rapidly expanding in Japan. About 47 percent of the youth and adult population currently use mobile phones (Ministry of Communications and Posts, 1998). Use of portable computers is also increasing. Twenty-nine percent of all families in Japan use computers at home. Thirty-four percent of JapaneseÅ@corporations have the capacity to connect to their intranet systems from outside phones (Ministry of Communications and Posts, 1998).

All schools for the hearing impaired have more than one computer. Though actual computer use varies from school to school, it is a part of daily instruction as well as data management among teachers and administrators.

Japan has set national educational goals for the 21st Century. They include access to the Internet as a primary indicator of progress in preparing students for the "information age."

In a recent paper (Ministry of Education, Science, Sports and Culture 1996), the following statement appears: "In an advanced information and telecommunications oriented society, the essential point regarding computer usage is that computers should not be used as stand alone units, but linked into a communications network."

In 1997, 7.7 percent of Japanese elementary schools, 12.5 percent of junior high schools, 17.3 percent of senior high schools, and 11.2 percent of special schools were connected on the Internet (Ministry of Education. Science, Sports and Culture, 1997). Overall, 91 percent of the public do not have access to the Internet. By the year 2000, 95 percent of the nation's public schools are expected to obtain Internet access.

Table 1 Internet Connection

	Schools	Connected	Ratio
Elementary	23,851	1,747	7.3
Jr. High	10,470	1,304	12.5
Sr. High	4,160	719	17.3
Handicapped	917	103	11.2
Total	39,398	3,873	9

Mobile Computing and Telecommunications

For sending or receiving information over the mobile phone network, it is essential that a PC have at least 64 Mbyte memory and a PC card slot for the adapter, which connects the PC to the phone. A small video camera is also required. A phone on its own is sufficient for video communication and short message services. But, to exploit its full potential for data transfer, one will need a portable computer with 64 Mbyte memory, a PC Card , and appropriate software.

Adapters

Many portable computers include a slot for PC cards (formerly known as PCMCIA cards), which allow for extra functions such as network capability, video capturing, and the addition of hard-disk space.

Modems/PC cards

The final necessary component is a way to connect the computer to a phone. For digital phones, one will need a PC Card. Some cards allow connection to both mobile and standard phone networks. Prices are rather high, and start at about $100 for connection to a mobile network only.

If a user has an analog phone or simply want to connect a portable computer to the standard phone network, he will need a modem to convert the digital data to analog format, just like those used to connect a desktop computer to the phone line. Fax/modems are a well-established technology, so prices are very competitive. They are available as either a standalone device to be attached to the computer port or as a PC Card.

Software: CU-SeeMe

A video-conferencing program, called CU-SeeMe has been developed by Cornell University's Information Technology organization. CU-SeeMe is intended to provide useful conferencing at minimal cost. Receiving requires only a PC with a screen capable of displaying 16 grays and a connection to the mobile phone or the Internet. Sending requires the same equipment plus a nifty camera called QuickCam which can cost as little as $100 to add on. Each participant can decide whether to

be a sender or receiver, or both. CU-SeeMe can be used to set up video conferences, collaborate with others and exchange live video and text over mobile phones.

Method

Design and Procedures

This study was an exploratory-descriptive design based on an on-site video conferencing experiment and observation. An experiment was conducted for hearing impaired adults using two mobile digital phones and PCs with video cameras. The cameras were attached to the portable computers. The PC computers were Toshiba "Libretto", 3 ounces in weight with a 7 inch TFT monitor, 32 Mbyte memory and 1 Gigabyte internal hard disc. Windows95 was used as the operating system.

The video clips were 320*280 pixels with no audio function. (For the hearing impaired, audio was not required.) Transfer speed was about 2 to 3 frames per second. Video quality, therefore, was far from smooth.

Participants

At a local workshop for the hearing impaired and their families, interested people were asked to join a client-to-client live video experiment. Children, young adults and housewives with hearing impairments were among the participants. Prior to the experiment, sample sentences for personal introduction were provided, such as "How do you do?", "What's your name?" , "What kind of work do you do?", et. etc. Using these sentences, two hearing impaired people were asked to sit in front of the notebook computers in separate rooms and communicate via sign language.

Data Collection

After the participants tried the system, they were asked to fill out an evaluation concerning how they liked this method of communication. The responses varied. Some reported that they were excited about having a new mode of communication available. Some reported negatively about the size of the video picture and data transfer speed. Most participants expressed that the video image should be smoother. Participants' responses were more or less anecdotal.

Discussion

Because this was a retrospective study, its difficult to generalize. There were no control subjects or experimental subjects in the study.

From a very subjective point of view, poor resolution and low frame rate detract from a sense of realism in cellular phone video conferencing.

However, replication of this study is possible, and we demonstrated that the results were not by chance or sample specific in their occurance. If video data compression technologies continue to advance, we could have larger video frames and smoother video clips within the next couple of years.

The following are some pointers for keeping the remote participant's attention during a video conference.

1. Remember that most subtle expressions will either be lost or exaggerated.
2. Avoid excessive sign movement.
3. When initiating a conversation among several participants, use hand signals to highlight who is speaking.
4. Keep pictures or images used during conversation on screen for an extended period of time.
5. Do not move pictures once they have been positioned.
6. Wear low contrast clothing (subtle colors).

Second generation cellulars will likely be pocket-sized digital phones with full data communication capabilities, including Internet, e-mail, telefax, short message service (SMS) and personal organizer functions. In the very near future, digital phones will offer unique features such as wireless imaging and optional multimedia cards for extra data storage.

Conclusion

Though the hearing impaired who participated in the experiment did not express full satisfaction with the quality of video clips, it was reported that consistent use of the telecommunication technologies could facilitate communication in the deaf community. Communication aids, such as mobile phones and computers uniquely combine several validated technologies in a synergetic way.

Despite the complexity, further integrated, smaller and more powerful devices will become available to augment communication. The wireless connection of computers will make systems even more acceptable, reliable and suitable for the daily life of people who are hearing impaired. As this study indicates, systems should be improved so as to offer more viable communication solutions to the hearing impaired.

References

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