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Despite rapidly advancing communication technology, videoconferencing remains a relatively new telecommunication method. Most of the general public, including the hearing-impaired, are unaware of the benefits and ease of use of multimedia telecommunication devices. These multimedia devices not only allow people to communicate using an audio signal, but also a video picture along with text and graphics. Multimedia telecommunication technology has the potential to eliminate the shortcomings of current communication devices for the hearing impaired.

Since the advent of the telephone in 1876, a troubling rift has grown between the telecommunication ability of the hearing impaired and the general public. The telephone, although invented by a man dedicated to the deaf, was a technological development that actually made communication on an equal basis more difficult for the hearing impaired. Because the telephone fails to provide the essential components of lipreading and gestures relied upon by the hearing impaired and audibility is often a major problem that cannot always be solved with an amplified telephone or handset, the telephone has proven to be frustrating to many hearing impaired and virtually useless to the signing deaf.

Then, 88 years after the invention of the telephone, mankind finally began bridging the communication gap between

the hearing impaired and the general public. The solution to part of the problems caused by telephones was addressed with the first of the TTY machines, now known as telecommunication devices for the deaf (TDD). These machines enable the user to type their message, which is then read by their communication partner, using conventional telelphone lines. Although these typing machines made communication less difficult for the hearing impaired, it is a lengthy communication process which is often made worse by the novice typist. Furthermore, the TDD remains useless to the deaf who use sign language because it presupposes a command of written language, which many pre-lingually deaf have significant problems with.

Facimilies and E-mail are examples of other methods available for communicating messages; however, these alternatives have their own problems. First, they require preparation of the message in advance, preventing rapid, two-way interactive communication. In addition, an undetermined length of time can elapse before a reply is returned, and it is unknown if the partner received the message until a response is obtained. It also requires both communication partners to be familiar enough with the method of communication to use it effectively.

As of July 26, 1993, when Title IV of the Americans with Disabilities Act (ADA) took full effect, all telephone companies were required to provide telecommunication relay services across the United States. These relay services

allow hearing-impaired and speech-impaired people to communicate with people who use standard phones through a communication assistant who can be reached through a toll-free number. The services are available 24 hours a day, 365 days a year. Relay services allow the hearing impaired and speech impaired to make personal and business calls similar to any telephone user. Yet, relay calls are still slowed down by the necessity of a TDD at one point within the connection. Furthermore, conversations are directed through a communication assistant and can make for awkward communication when one party is not familiar with the relay service. Additionally, communication participants may get a feeling of disengagement because they are not speaking directly to the person and may hesitate conveying all or parts of an intended message for the sake of privacy.

Videoconferencing Systems- Features

The vast technological advances made in communication products in recent years may well provide the solution to the communication difficulties of the hearing-impaired population. Videoconferencing systems utilized by large companies to make business more efficient and financially manageable are available in personal desktop systems for the home user. Videoconferencing can be described as the exchange of video, graphic and textual information, and sound among a number of locations. These multi-media telecommunication devices allow individuals to communicate with one another using audio signals and video pictures

along with various text and graphics accessories. Each of these factors is highly variable and can be modified to suit the needs of the individual user. To get a basic understanding of the capabilities of videoconferencing systems, here is a review of the standard features incorporated into most systems.

The audio signal is generally of importance to the hearing-impaired user. Sound is picked up from a microphone located close to the speaker(s) or the speaker can wear a headset microphone which delivers the desired speech signal and provides a reduction in background noise, which can often be troublesome to the hearing-impaired individual trying to communicate. Current videoconferencing companies are touting desktop systems with high quality audio performance that aids the hearing-impaired user.

Another important feature for the hearing-impaired user is the video signal. The video picture is picked up from a camera generally located on top of the monitor that provides the video pivture. The user not only gets a video picture of the person they are talking with, but also a separate, "loopback" picture of themselves with which they can monitor their visibility to the other side. The camera allows for adjustments in the viewable area of the speaker. For those who are concerned with speechreading, the camera can be adjusted to focus mainly on the head of the speaker. For those using sign language, the camera can be adjusted to fit the "signing space" of the individual into the picture.

These adjustments can be easily made on the higher end systems.

The video picture depends much on the transmission speed and bandwidth of the connections utilized. Most home users employ a single basic rate ISDN line with a narrow-band system. The spacial and temporal resolution available using one ISDN line is less than desired, but nonetheless has shown to provide benefits to those with hearing loss. Also, broader band systems will provide better provide better picture quality. Futhermore, the more ISDN lines you add, the faster the transmission speed is, again resulting in better spacial and temporal resolution.

An additional feature of videoconferencing system is the interactive whiteboard. This is a simulated chalkboard on the computer screen, which both end users can work on and manipulate. The whiteboard offers the important advantage of communicating with handwritten or hand-drawn materials. This can be text that either person types or imports to the screen or graphics of some sort that either person can manipulate. This also includes information that is "scanned" by one person and can be viewed by both parties. The whiteboard provides a medium by which communication breakdowns can be resolved quickly. If a confusion point occurs in the conversation, a quick typed or handwritten reference to the topic or misunderstood word can be made, and the conversation can continue.

Videoconferencing Systems- Connections

The greatest barriers to videoconferencing are the difficulties in establishing appropriate connections between conferencing systems. Effective videoconferencing hinges upon these connections. There are two primary network orientations, circuit switched, such as Basic Rate ISDN (BRI), and packet switched, as typified by Ethernet for local areas and Frame Relay for longer distance connections. Circuit switched have been used almost exclusively in videoconferencing until recently. However, conferencing with packet switched networks is rapidly gaining popularity.

Circuit switched systems (connections) make real-time interaction between parties possible. The equivalent of a wire circuit connects the communicating parties. The switched path is established for the entire conversation under a fixed bandwidth with any length of transmission permitted. Electromechanical or computerized switching offices are used. If overload occurs, it increases the probability of blocking, causing a network busy signal, but without effect on transmission once the connection is made. Circuit switching does not permit delayed delivery and cannot perform speech or code conversion.

Packet switching requires no direct electrical connection and also allows real time conversational interaction. The route is established dynamically for each packet. If the system becomes overloaded, there is increased delivery delay, although delivery time is still short. Lengthy transmissions are chopped into short packets

and the network can perform speech or code conversion. Small or large bandwidths are employed according to need. One disadvantage is that high traffic volume is required for economic justification.

BRI (circuit-switched) works well for the technologies typically used for audio and video in videoconferencing today. Furthermore, BRI is the natural technology for telephone companies to offer because it efficiently utilizes most of their existing copper wiring and digital network equipment, making for wide availability. At this point, BRI seems to be a sufficient solution for effective videoconferencing.

As the availability of fiber-optic connections increases, its feasibility as a connectivity option will increase as well. It has higher bandwidths and provides enormously greater transmission capability than copper wire. Moreover, these enhancements are realized at essentially the same costs in terms of physical size, material costs, and installation costs. Fiber-optic transport will continue to deliver increases in connection performance in the coming years, comparable with the advance of the microprocessor in the computer industry.

Videoconferencing- Commercially Available Systems

There are several commercially available systems that can be operated through a personal home computer. Intel, VTEL, Picturetel, CyberTron, VCON, Imagelink Technologies, and Eyetel are just a few of the companies that have

personal desktop videoconferencing systems available. Below is a selection of the systems available and some of their individual requirements.

The VTEL SmartStation 3.0 from the Enterprise series is a good choice for the home user. The SmartStation 3.0 requires a PC with a 486 or Pentium chip processor that is Windows 3.11 or 95 based. This system is compatible with other VTEL systems as well as with standards compliant products other manufactuers. VTEL products offer a wide variety of connectivity options including ISDN, ATM, and direct connect. This system follows the H.320 standards for videoconferencing. This system is easy to install and VTEL has technical support to help if you run into trouble.

Another system that is appropriate for the home user is the EyeTel InSight 2000. It requires that your PC has the Windows 95 operating system, 16 MB RAM, and a Pentium processor. It has a single PCI board that is easy to install. The InSight 2000 system is on the lower cost end, yet is still feature rich. The system is standards based and also has several connectivity options including ISDN, LANS, and internet. This system comes with an ISDN data modem.

The VCON Armada Cruiser 150 desktop videoconferencing system from the Escort series requires at least a 90 Mhz Pentium chip with a PCI bus, Windows 95 or NT operating system, and 16 MB RAM. The Cruiser 150 has an audio adaptor for various audio devices. This system allows fast access

to the internet via the onboard ISDN interfacing TCP/IP applications at 128 Kbps. This system is also on the easier end to install, requiring only one PCI slot.

Videoconferencing Systems- Potential Users

Now that I have addressed various systems that are available to the home user, I should discuss potential uses and/or users. There are many professions in which videoconferencing technology is being utilized. Corporate America has employed this technology to reduce travel costs. Teleconferences allow companies to make multi-media presentations without the costs of traveling to other companies. Hospitals and medical facilities are using teleconferencing so that multiple facilities can collaborate on patient cases, while jointly viewing x-rays or other viewable tests such as CAT scans or MRI tests.

There are many potential uses of videoconferencing systems for the hearing-impaired population. Homebound hearing impaired children can use this technology to communicate with their teacher and other school personnel. Elderly individuals with hearing impairment can use videoconferencing systems to contact physicians when they are too ill to get to the doctor's office or physically limited to the home. Hearing-impaired adults can use videoconferencing systems to make daily telephone communication easier by providing visual cues which are so helpful to the hearing-impaired, communication partner. These systems could also prove to be beneficial to families

with hearing-impaired children in residential school programs by allowing parents to not only talk to their children through a telephone or TDD, but also see them, even though they are separated by a great distance.

Since there are several apparent uses of videoconferencing systems for the hearing impaired, the question begging to be asked is why aren't more people using these systems? The primary reason is economics. These systems are not inexpensive. Furthermore, once you have a system setup, the physical connection line (BRI) is an additional monthly charge. Additionally, most people are unfamiliar with multi-media telecommunication technology. Much of the hearing impaired population needs better information concerning this new technology that can benefit them. One such professional that could fill that void is the audiologist.

Audiologists already inform their clients about assistive listening devices. This type of technology could easily be added to their area of expertise and passed on to their clients. Without information about how to purchase systems and what to do with them once you get one, most of the hearing impaired population will continue to be unfamiliar with this technology.

Conclusion

So, the next barrier to fall is unfamiliarity. Many people may not be accustomed to videoconferencing, but if it follows the path like much current technology, you will soon

enough. Once demand grows, prices will drop. Manufacturers theorize that basic videoconferencing capability will be a common capability of personal computers. They estimate that cost and price characteristics will be similar to those in place when CD-ROM drives became a typical part of the personal computer. As these barriers continue to fall, entertainment and social use of videoconferencing will likely become even more prevalent than business usage.

A Limited Selection of Current Videoconferencing Companies

EYETEL Technologies, Inc.
(219) 457-8200 Phone
(219) 457-8635 Fax
E-mail: e-sales@eyetel.com
Web Address: www.eyetel.com

VTEL Smart Videoconferencing Corporation
(800) 299-8835 Phone
(512) 490-2494 Fax
E-mail:not available
Web Address: www.vtel.com

VCON Telecommunications Ltd.
(301) 896-9405 Phone
(301) 896-9406 Fax
E-mail:info@vcon.com
Web Address: www.vcon.com

Picture Tel Corporation
(800)716-6000 Phone
(978) 292-3300 Fax
E-mail: webmaster@picturetel.com
Web Address: www.picturetel.com

Telecom Corporation
(408) 433-0910 Phone
(408) 428-7999 Fax
E-mail: webmaster@telecom.com
Web Address: www.telecom.com

Placid Communication Ltd.(England)
+44 1225 339900 Phone
+44 1225 443265 Fax
E-mail: sales@placid.co.uk
Web Address: www.placid.co.uk

White Pine Software, Inc.
(603) 886-9050 Phone
(603) 886-9051 Fax
E-mail: info@wpine.com
Web Address: www.wpine.com

Vocabulary

ATM- Asynchronous Transfer Mode

BSI- Basic Rate ISDN

Fiber Optic- connections that provide billions of bits of transmission per second.

H.320- Current videoconferencing standards

H.323- ITU-T recommendations for Real Time Protocols

ISDN- Integrated Service Digital Network; utilizes 2 "B" channels for data and voice, and one "D" channel for control signals

ITU-T- International Telecommunications Union-Telecommunications, an international organization responsible for adopting telecommunication standards

Kbps- Kilobytes per second

LANS- Local Area Networks

PCI- Personal Computer Interface

PC- Personal Computer

Processor speed- performance per clock cycle

RAM- Random Access Memory

TCP/IP- Transmission Control Protocol- Internet Protocol

TTY- Teletypewriter

TDD- Telecommunication Device for the Deaf

Windows- an operating system for a PC

A Selection of Beneficial References

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http://www.imtc.org/main.htm

The International Telecommunications Union
http://www.itu.com

3Com Corporation, USA
http://www.3com.com

Intel, USA
http://www.intel.com

Lucent Technologies
http://www.lucent.com

NetPhone, Inc., USA
http://www.netphone.com

PictureTel., USA
http://www.picturetel.com

RADVision, Israel
http://www.radvision.com

VCOM Telecommunications Ltd., Israel
http://www.vcon.com

VTEL, USA
http://www.vtel.com

White Pine, USA
http://www.wpine.com