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The need of compression in Teleconference system

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Abstract: **Telepresence allow a person to feel as if they were present, to give the appearance of being present in a place other than their actual location. Telepresence requires that the users' senses be provided with stimuli as to give the feeling of being in that other location. Additionally, users may be given the ability to affect the remote location. In this case, the user's position, movements, actions, voice may be sensed, transmitted and duplicated in the remote location to bring about this effect. The information may be traveling in both directions between the user and the remote location. A popular application is found in telepresence videoconferencing, the highest possible level of video telephony. Since the advent of video conferencing technology, its major obstacles have prevented wide-scale adoption. These include network bottlenecks such as insufficient bandwidth and high network latency. So we recognizes the efficient bandwidth utilization is a primary goal for its video conferencing and telepresence solutions when we compress the signals transmit through the network ,then the the field may very useful to the public in many ways, I.tn his paper I wish to illustrate the need of compression in teleconferences.**

Keywords: Telepresence, Teleconference, Virtual conference ,Satellite conference

INTRODUCTION

Telepresence can be defined as the ability to share audio, data, and video with a distant site or sites as though the person were truly in the same room, across the conference table from you. In other words, the ability to have a meeting that is as good as being there. Telepresence refers. a set of technologies which allow a person to feel as if they were present, to give the appearance of being present, or to have an effect, by means of telerobotics, at a place other than their exact location. Telepresence requires that the users' senses be provided with stimuli as to give the feeling of being in that other location. And also users may be given the ability to affect the remote location that is the user's position, movements, actions, voice, etc. may be sensed, transmitted and duplicated in the remote location to bring about this effect. Therefore information may be traveling in both directions between the user and the remote location[1]. A popular application is found in telepresence videoconferencing, the highest possible level of videotelephony. Telepresence via video deploys greater technical sophistication and improved fidelity of both sight and sound than in traditional videoconferencing.

I. Sensory elements in Telepresence system

To provide a telepresence familiarity, technologies are required that implement the human sensory elements of vision, sound, and manipulation. A minimum system usually includes visual feedback. Ideally, the entire field of view of the user is filled with a view of the remote location, and the viewpoint corresponds to the movement and orientation of the user's head. In this way, it differs from television or cinema, where the viewpoint is out of the control of the viewer.

Fig 1. Telepresence meeting

In order to achieve this, the user may be provided with either a very large (or wraparound) screen, or small displays mounted directly in front of the eyes. The latter provides a particularly convincing 3D sensation. The movements of the user's head must be sensed, and the camera must mimic those movements accurately and in real time. This is important to prevent unintended motion sickness. Another source of future improvement to telepresence displays, compared by some to holograms, is a

projected display technology featuring life-sized imagery. Sound is generally the easiest sensation to implement with high fidelity, based on the foundational telephone technology dating back more than 130 years. Very high-fidelity sound equipment has also been available for a considerable period of time, with stereophonic sound being more convincing than monaural sound.

The ability to manipulate a remote object that is environment is an important aspect for telepresence users, and can be implemented depending on the needs of the user. Typically, the movements of the user's hands (position in space, and posture of the fingers) are sensed by wired gloves, inertial sensors, or absolute spatial position sensors. A robot in the remote location then copies those movements as closely as possible. This ability is also known as teleoperation. The more closely the robot re-creates the form factor of the human hand, the greater the sense of telepresence. Complexity of robotic effectors varies greatly, from simple one axis grippers, to fully anthropomorphic robot hands. Haptic teleoperation refers to a system that provides some sort of tactile force feedback to the user, so the user feels some approximation of the weight, firmness, size, and/or texture of the remote objects manipulated by the robot.

II. Telepresence Vs Video conference

A videoconference allows two or more locations to communicate in live manner that is, simultaneous two-way video and audio transmissions. This is accomplished by the use of a multipoint control unit or by a similar non-centralized multipoint capability embedded in each videoconferencing unit. Again, technology improvements have circumvented traditional definitions by allowing multiple party videoconferencing via web-based applications A telepresence system is a high-end videoconferencing system and service usually employed by enterprise-level corporate offices. Telepresence conference rooms use state-of-the art room designs, video cameras, displays, sound-systems and processors, coupled with high-to-very-high capacity bandwidth transmissions. The way of using the videoconferencing on a one-to-one, one-to-many or many-to-many basis for personal, business, educational use or services. In videoconferencing, teachers and psychologists conducting online sessions, personal videocalls to inmates incarcerated in penitentiaries, and videoconferencing to resolve airline engineering issues at maintenance facilities, are being created or evolving on an on-going basis.

Telepresence refers to a user interacting with another live, real place, and is distinct from virtual presence, where the user is given the impression of being in a simulated environment. Telepresence and virtual presence rely on similar user-interface equipment, and they share the common feature that the relevant portions of the user's experience at some point in the process will be transmitted in an digital representation. The main functional difference is the entity on the other end: a real environment in the case of telepresence, vs. a computer in the case of immersive virtual reality.

Type of data	Data size(kbits)
chat	50
Text	200
Audio	700
Video	4700

Table 1. Representation of uncompressed data in Teleconference

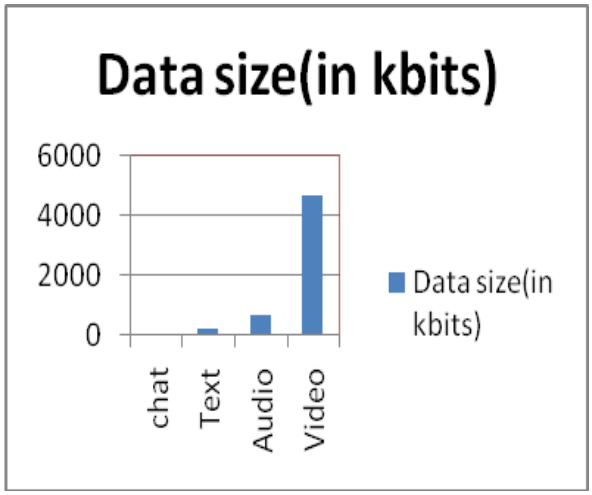
III. Need of Compression in teleconference

Video conferencing and telepresence systems are greately dependent upon bandwidth. The more bandwidth these systems are provided, the more quality is. The bandwidth tilization is important to consider the type of media that is being broadcast or shared. Today's video conferencing and telepresence systems focus on the ability to share audio, video, and data. Audio includes conversational speech from the participants of a conference , the sounds and music that may be played in a prerecorded medium, such as an audio file. Video media in a conference includes data streamed from a camera as well as prerecorded media, such as MPEG movies[2]. Finally, data such as MS PowerPoint files, PDF files, as well as proprietary applications are often shared iin meeting conducted via video conferencing and telepresence, thus creating a more fulfilling experience for the end-user. Unfortunately, the bandwidth is a limited and expensive resource, it is important for video conferencing and telepresence systems to efficiently use their given network resources.

IV. Band width utilization and Quality of audio and video

Video compression techniques have greatly reduced the amount of data needed to describe a video picture, and have enabled the video signal to be transmitted at a lower and less expensive data rate. The device used to digitize and compress an analog video signal is called a video codec, short for Coder/Decoder, which is the opposite of a mode (Modulator/Demodulator). Reduction of transmission rate means trade-offs in picture quality. As the transmission rate is reduced, less data can be sent to describe picture changes. Lower data rates yield less resolution and less ability to handle motion. Currently most compressed video systems use either T- I or half a T- I channel. In a T- I channel, video is compressed at 1.536 Mbps, which is the digital equivalent of 24 voice grade lines. With the proliferation of fiber-optic networks, some private video teleconferencing networks are taking advantage of high-quality 45 Mbps transmission[3]. Digital video compression technology has allowed video teleconferencing to become less cost prohibitive. It is not as cost effective as audio teleconferencing and audio graphics teleconferencing .

Normally the different type of data in teleconferencing need different data size when we send it through the network.they are illustrated in chart. From this table we find the video frames take much kbits in size



Uncompressed data size of teleconference system

In the case of live video that is video that is captured by a camera use H.264, today's most efficient standardized video compression algorithms. The H.264 codec takes advantage of well established video compression techniques such as intra and inter-coding, entropy coding, and interlacing. However their inclusion in the H.264 standard results in compression bitrates ranging from 28kbps to over 6Mbps. For audio compression using OGG is an open standard audio compression standard that rivals the quality and compression ratios of those of the now ubiquitous MP3 codec. Similar to MP3, OGG is a flexible codec that can accommodate a wide range of sampling and bit rates.

V. Role of ISDN Lines in Compressed Video Teleconferencing

Teleconferencing is most often employed utilising compressed digital video. This form of teleconferencing transmits video and audio simultaneously over Integrated Services Digital Network (ISDN) telephone lines. This delivery method allows for two-way video and audio interaction. The quality of video is determined by how much a given educational institution wants to pay for long distance charges. Using one telephone line is the least expensive method, but transmits the poorest quality video. Three lines are expensive, however, this increases the quality of the transmitted video. There is rarely a concern regarding the quality of audio transmission as it is nearly always strong. The context of the instruction is another determining factor when deciding on the quality of the video transmission. For instance, if the session was on small engine repair that requires a clear video signal, three ISDN lines would be desired. However, an English class would not require top notch video and one ISDN line would probably suffice. Copper lines were first used for digital telephone transmissions, however, the implementation of fibre optic lines has increased bandwidth.

Compressed video conferencing is a relatively inexpensive option for educators since no special production studios are required. It can include multiple media inputs so long as they can be converted into a video signal. When using multiple inputs, switching to the sources can become confusing and frustrating for the instructor[4]. An audio video switcher with an external operator is a good way of making sure that the correct image and audio are being transmitted. This does increase the cost of teleconferencing. However, if a technician is required to be present throughout the transmission he/she could be trained to operate the audio/video switcher. My experience with multiple input teleconferencing over ISDN lines has shown me that a video switcher operator who is adept at anticipating the needs of the instructor can prove extremely effective. This frees the instructor from technological constraints and allows him/her to focus purely on instruction. This can also help to minimise, or cause the seamless appearance of, the existence of the technology. This is particularly necessary when the instructor has a class or group at the host site. However, the instructor must pay special attention to not disregard the students at the remote sites. This is more of a design element that is discusses and described later in the this paper. Despite the advantages of using an operator, most compressed video users in education limit the multimedia inputs so it can easily be controlled by the instructor.

Compressed video, if required, can allow the host site to control the camera and audio at the remote locations using a control touch pad. The remote site camera can be preset to show a medium close-up of each of the students at the remote site. This eliminates the need for a technician at the remote sites as any teacher or caretaker can turn the system on. However, if any technical problems occur before or during transmission, the remote site may miss the session. Because of this uncertainty, many teleconferencing sessions ensure that a technician is present.

Touch operated microphones seem to be the best option for controlling the audio flow. Using this system soon becomes habit for the participants. Vermont Interactive Television, (VIT) integrated voice activated switching into their system. This allows the video source to be automatically selected in accordance to the highest audio level. If used militantly the system can work well with the touch microphones. This induces a smooth conversational flow to the session. However, human error can break up continuity[5]. As examples, if a participant leaves the microphone on and taps the table, or if the instructor was to start coughing into their microphone, the video signal switches to those accidental audio sources. The flow is soon disrupted and VIT quickly determined that this became frustrating and confusing for the instructor and learners. Compressed video can have some technological constraints such as a one second audio delay which occurs because of the time it takes for information to compress, travel, and decompress.

Video constraints are most common when dealing with motion because so much information is being processed every time movement occurs. This problem decreases if several ISDN lines are used. The instructor must consider this when designing a teleconferencing session so that the problem is not excentuated. Image break up, ghosting or image softness occurs with high visual information flux. The decreased frame rate, or number of video images per second, can be compensated for by avoiding rapid motion, wearing plain TV friendly colours, and hanging a pastel curtain, or using a plain background. The codec is used to convert analog signals into digital signals for both transmission and relieving. Codecs, like most other communications technologies, are decreasing in price. Therefore, compressed video teleconferencing a viable option for all educational institutions interested in distance education.

VI. Satellite Teleconferencing

Satellite technology is expensive and requires numerous technicians and operators to oversee production. It seems that satellite technology will soon be matched with full motion video by other teleconferencing mediums. Satellite broadcasts accommodate full motion video at 30 frames per second. Satellite conferencing is maximized when supported by broadcast quality cameras, switching equipment and, most importantly, tapes for roll-ins and recording[6]. Roll-ins are defined a videotape used for playback purposes. Currently the cost of laying ground connections to remote locations is less cost effective than the cost of relieving a satellite transmission. One of the major advantages of teleconferencing is its potential to reduce the cost of group meetings. Savings come primarily from reduced travel costs.

VII. Conclusion

Compressed video is a more effective instructional medium over satellite conferencing. This will be considerably more relevant when bandwidth is increased in the near future. However, the location of learners, which fuels distance education, is the critical factor in determining which teleconferencing systems works best. Compressed video and satellite teleconferencing are occasionally used in conjunction. Working to build networks which suit the learners' needs should provide adequate availability to educational programs. Teleconferencing enables more and more people to consider furthering their education. "Just in time training" is now common in the work place and can often be facilitated by teleconferencing. Another advantage to teleconferencing is providing access to education for those who can not access it through the more traditional avenues. "Interactive television will eventually provide easily accessible and affordable means of connecting classrooms with a faculty of education, promising to bring closer together educational theory, research and practice

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