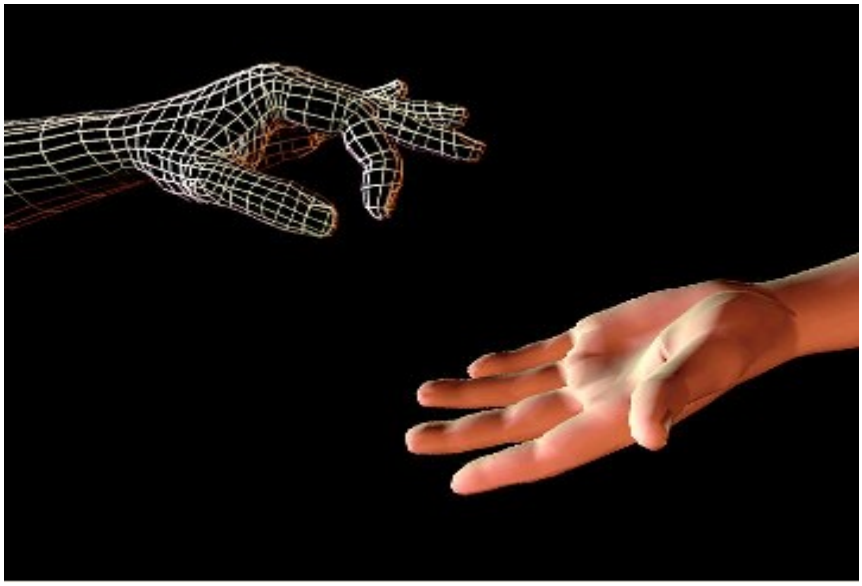
UNIVERSITY COLLEGE OF ENGINEERING

JNTU KAKINADA

DEPARTMENT OF COMPUTER SCIENCE

PAPER PRESENTATION ON

TELE-IMMERSION



Presented by:

M. Raja Shekhar(III/IV B.Tech) C. Punya Murthy(III/IV B.Tech)

Email: rajashekhar30@gmail.com
punyamurthyc.jntu@gmail.com

ABSTRACT:

Tele-immersion is an advanced form of virtual reality that will allow users in different places to interact in real time in a shared simulated environment. This technology causes users to feel as if they were in the same room. The tele-immersion technology uses a "tele-cubicle" which is equipped with large screens, scanners, sensors, and cameras. The tele-cubicles are linked together in real-time so that they form one larger cubicle. Through the virtual environment, participants are able to interact with other group members. Also, virtual objects and data can be passed through the walls between participants, and placed on the shared table in the middle for viewing. Tele-immersion has the potential to significantly impact educational, scientific, manufacturing, and many other fields.

- Interactive Scientific Visualization
- Molecular Engineering
- Virtual nuclear test.
- Education and Training
- Virtual classroom.
- Army training.
- Art and Entertainment.
- Virtual game
- Industrial Design,
- Architectural Review and Evaluation

Email:

- Remote design collaboration

All of these researchers use Internet 2.Internet 2 is the successor to the "commodity Internet", as the existing Internet is now known. Internet 2 is a collaborative project, overseen by the University Corporation for Advanced Internet Development, and worked on by 130 US universities and a number of government agencies and corporate sponsors.

TELEIMMERSION

Its 2010 and you have a very important meeting with your business associates in Chennai. However you have visitors from Japan coming to ink a mega business deal the same day. So you go to a room you call the holodeck. There, inside a simulated environment, you contact your business associates using information technology. You are able to conduct a meeting with them almost as if you in Chennai. You even shake hands with their holographic images, because they seem to be right there!

With teleimmersion you will interact instantly with your friend on the other side of the globe through a simulated holographic environment. This technology, which will come along with internet2, will change the way we

work, study and get medical help. It will change the way we live

Introduction: Teleimmersion is a technology that will be implemented with internet2 it will enable users in different geographic locations to come together and interact in a simulated holographic environment. Users will feel as if they are actually looking, talking and meeting with each other face to face in the same place, even though they may be miles apart physically. In a teleimmersive environment, computer recognized the presence and movements of individuals as well as physical and virtual objects. They can then track these people and nonliving objects, and project them in a realistic way across many geographic locations.

The three steps to constructing a holographic environment are:

- The computer recognizes the presence and movements of people and objects.
- The computer tracks those images.
- The computer projects those images on a strereoimmersive surface.

3D reconstruction for teleimmersion is performed using stereo, which mean two or more cameras rapid sequential shots of the same objects, continuously performing distance calculations, and projecting them into the computer. Simulated environment to replicate real time movements. By combining cameras and Internet telephony, video conferencing has allowed real time exchange of more information than ever, without physically bringing each person into one central room.

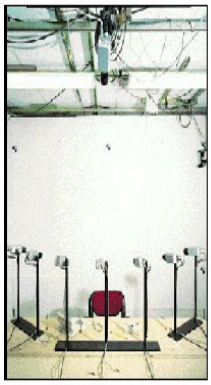
The History: It was way back in 1965 that the great pioneer of computer graphics, Ivan Sutherland, proposed the concept of the 'ultimate display'. It described a graphics display that would allow the user to experience a completely computer rendered environment.

In 1998, Abilene, a backbone research project, was launched and now serves as a base for Internet2 research. Internet2 needed an application that would challenge and stretch its networks' capabilities. The head of advanced network and services proposed teleimmersion at the application that could drive internet2 research forward. That is how the national teleimmersion initiative as formed in may2000, researchers at the Universities of North Carolina (UNC), the Universities of Pennsylvania and advanced network and services reached a milestone in developing this technology. A user sitting in an office at UNC in Chapel Hill, NC, was able to see life like, 3D images of colleagues hundreds of miles away, one in Philadelphia and the

other in New York. Today scientists are still developing this new communication technology. There are several groups working together on the national teleimmersion initiative (NTII) to make this wonderful technology available to the common men.

Components of a Holographic Environment:

Teleimmersive displays of earlier days required user to wear special goggles and a head device that tracked the view point of the user looking at the screen. At the other end, the people, who appeared as 3d image, where tracked with and array of 8 ordinary video cameras while three other video cameras captured real life patterns projected in each room to calculate distance. This enabled the proper depth to the recreated on the screen. So if an observer move here head to the left, she could see the corresponding image that would be seen if she were actually in the room with the person on the screen.



Views of cameras Teleimmersed environment

Scientists are developing new technologies support this type of communication. Apart of these new technologies is:

Telecubical: Users will communicate by using this technology. It consist of a Stereo immersive desk surface and two stereoimmersive wall surfaces. These three display surfaces join to form a virtual conference table in the centre. This will allow the realistic inclusion of teleimmersion into the work environment, as it will take up the usual amount of desk space.

Internet2: This will replace the current internet infrastructure. It is a consortium made up of the US government, industry and academia (180universities) that has been formed for creating tomorrow's internet. This new network will have a higher bandwidth and speeds that are 1000 times faster than today's internet. This high bandwidth, high speed network is necessary to

transfer the large amounts of data that teleimmersion will produce.

Bandwidth issues: Network bandwidth required to make teleimmersion work is one of the main concerns of this new technology. It is estimated that as much as 1.2 gigabits per sec will be needed for future high quality effects. This is much higher than the average home connection bandwidth. The exact amount of bandwidth needed for each scene depends on the complexity of the background. With time, the number of megabits used will fall as advanced compression techniques are established. Currently, the 'last mile' of network connections for top computer science departments in US use an OC3 line. This can carry 155 megabits per second and supports, at a basic level, a three way conversation. Although OC3 lines are 100 times faster than normal broadband, they are also more expensive.

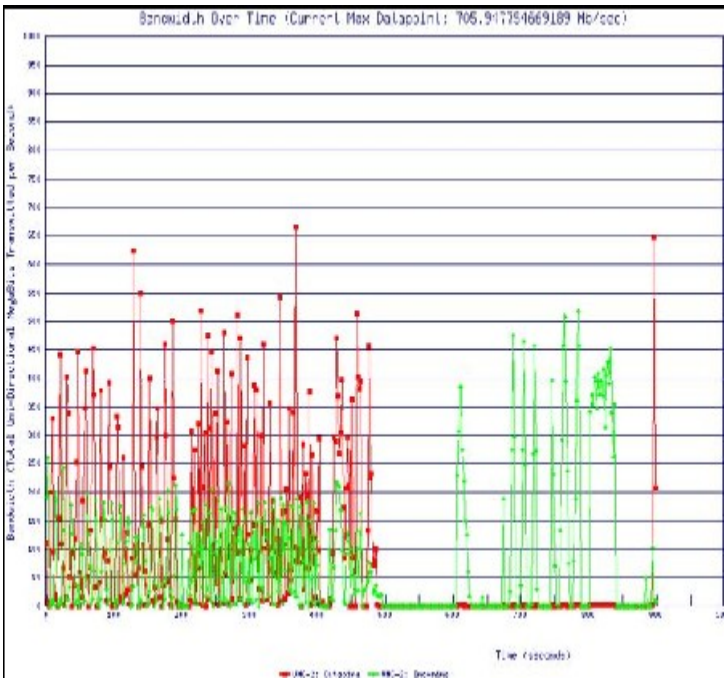


Fig-Bandwidth over time – bandwidth utilization graph

Initially, bandwidth-intensive application will have to be limited to the larger organizations that can afford high connection speeds. The amount of data sent to render this telepresence will also require fast processing power. This will need to be available as required on the internet. A new network called the Grid could be a solution. The Grid will use distributed computing. There are not enough supercomputers to ideal with the enormous amount of data that will rush through the net in the future. As a solution, new network will connect their PCs so they can share processing power and hard disk space. They will be locked into a grid-effectively creating one supercomputer.

Display technologies: stereo immersive displays would have to present a clear view of the scenes being transmitted.

Haptic sensors: would allow to touch projections as if they were real.

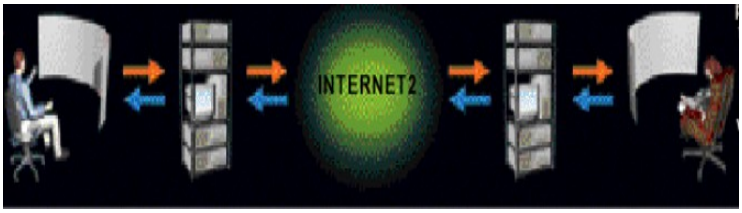
Desktop supercomputers: would perform the trillions of calculations needed to create a holographic environment. A network of computers that share power could also possibly support these environments.

How Teleimmersion Works:

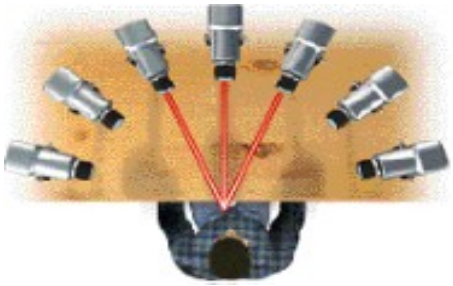
In this simplified scheme for how a future teleimmersion scheme might work, two partners separated by 1,000 miles collaborate on a new engine design.

Following the flow of information teleimmersion depends on intense data processing at each end of a connection, mediated by high performance network.

From the sender: Parallel processors accept visual inputs from the cameras and reinterpret the scene as a 3-Dimensional computer model.



To the receiver: Specific rendering of remote people and places are synthesized from the model as it is received to match the point of view of each eye of a user. The whole process repeats many times a second to keep up with the user head motion.

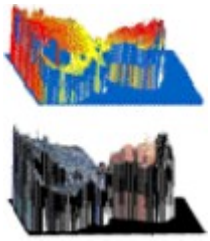


Array of cameras

Generating the 3-D Image: 1.An array of cameras views people and their surroundings from different angle . Each camera generates an image from its point of view many times in a second.

2. Each set of the images taken at a given instant is sorted into subsets of overlapping trios of images

Views taken by cameras



Disparity map

3.From each trio of images, a “disparity map” is calculated, reflecting the degree of variation among the images at all points in the visual field. The disparities are then analyzed to yield depths that would account for the differences between what each camera sees. These depth values are combined into a “bas relief” depth map of the scene.

4. all the depth maps are combined into a single viewpoint independent sculptural model of the scene at a given moment. Process of combining the depth maps providemaps opportunities for removing spurious points and noise.

Final View

Teleimmersion and Virtual Reality: Teleimmersion may sound like virtual reality but there are major differences between the two technologies. While virtual reality allows you to move in a computer-generated 3-D environment, teleimmersion can only create a 3d environment that you can see but not interact with. However, interaction is possible by combining the two technologies.

Applications: Teleimmersive holographic environment have a number of applications. Imagine a video game free of joysticks, in which you become a participant in the game, fighting monsters or scoring touchdowns. Instead of traveling hundreds of miles to visit your relatives during the holidays, you can simply call them up and join them in a shared holographic room. Doctors and Soldiers could use teleimmersion to train in a simulated environment. Building inspectors could tour structures without living their desks. Automobile designers from different continents could meet to develop the next generation of vehicles. Surgeons indifferent geographical space could experiment with virtual medical procedures before working on actual patients. Medical technologies that are physically inaccessible in some places could be used to save lives by manipulating virtual models, instance, offshore oilrigs and ships. In the entertainment industry, ballroom dancers could train

together from separate physical spaces.

Instead of commuting to work for a board meeting, business persons could attend it by projecting themselves into the conference room.

The list of applications is large and varied, and one thing is crystal clear- this technology will significantly affect the educational, scientific and medical sectors.

Medicine:

Teleimmersion can be immense use the field of medicine. The way medicine is thought and practiced has always been very hands-on. It is impossible to treat a patient over the phone or give instructions for a tumour to be removed without physically being there. With the help of teleimmersion, 3d surgical learning for virtual operation is now in place and, in the future, the hope is to be able to carry out real surgery on real patients. A geographically distanced surgeon could be teleimmersed into an operation theatre to perform an operation. This could patiently be life saving if the patient is in need of special care (either a technique or a piece of equipment), which is not available at the particular location.

Teleimmersion 'will give surgeons the ability to superimpose anatomic images rights on their patients will they are being operated on'. The argument against this is: how reliable is this technology? What would be the legal implication if the technology fails suddenly and the teleimmersed surgeon disappears in the middle of an operation, with the patient left without medical help? How accurate are the movements of the transported doctor when within an environment? Will the doctor be able to sense a patient's mood and feelings? These are difficult questions to answer and there are bond to be many skeptics.

Uses in Education:

In education, teleimmersion can be used to bring together students at remote sites in a single environment relationship among educational institutions could improve tremendously in the future with the use of teleimmersion. Already, the academic world is sharing information on research and development to better the end results. Teleimmersion will only promote this collaboration. This will be distinct advantage in surgical training. While it will not replace the hands on training, this technology will give surgeons a chance to learn complex situations before the treat their patients. With

teleimmersion in schools, students could have access to data or control a telescope from a remote location, or meet the students from other countries by projecting themselves into a foreign space. Internet2 will provide access to digital libraries and labs, opening up the lines of communication for students. Teleimmersion will bring to them place, equipment and situations earlier not available, helping them experience what they could have only watched, read or heard about earlier.

Future Office:

In years to come, instead of asking for a colleague on the phone you will find it easier to instruct your computer to find him. Once you do that, you will probably see a flicker on one of your office walls and find that your colleague, who's physically present in another city, is sitting right across you as if he is right there. The person at the other end will experience the same immersive connection. With the teleimmersion bringing two or more distant people together in a single, simulated office setting business travel will become quite redundant.

Video conferencing via internet is not a perfect form of communication. The image is closed to real time but there are delays that cause distorted video. Also, if someone walks out of the view of a camera the person is no longer visible. However, with teleimmersion, people will always remain in view of the camera and you will be able to look around their office just by looking at the display screen from different angles. Teleimmersion takes video conferencing to a higher level it is a dynamic concept, which will transform the way humans interact with each other and the world in general.

Conclusion:

When tele-immersion becomes commonplace, it will probably enable a wide variety of important applications. Teams of engineers might collaborate at great distances on computerized designs for new machines that can be tinkered with as though they were real models on a shared workbench. Archaeologists from around the world might experience being present during a crucial dig. Rarefied experts in building inspection or engine repair might be able to visit locations without losing time to air travel.

In fact, tele-immersion might come to be seen as real competition for air travel--unlike videoconferencing. Although few would claim that tele-immersion will be absolutely as good as "being there" in the near term, it might be good enough for business meetings, professional consultations, training sessions, trade show exhibits and the like. Business travel might be replaced to a significant degree by tele-immersion in 10 years. This is not only because tele-immersion will become better and cheaper but because air travel will face limits to growth because of safety, land use and environmental concerns.

Undoubtedly tele-immersion will pose new challenges as well. Some early users have expressed a concern that tele-immersion exposes too much, that telephones and videoconferencing tools make it easier for participants to control their exposure--to put the phone down or move off-screen. We are hopeful that with experience we will discover both user-interface designs and conventions of behavior that address such potential problems.

References: American Scientist magazine issue April 2001.

- Information Technology magazine August 2003.
- GRID Today magazine issue December 2002.