International Journal of Multidisciplinary and Current Research

Research Article

ISSN: 2321-3124
Available at: http://ijmcr.com

Tele-Immersion Applications to Control Violation of Development Control Rules

Dr. T.N.Boob[a] and Abhijeet T. Boob[b]

[a]Principal, Dr.N.P.Hirani Polytechnic,Pusad Dist.- Yavatmal (M.S.)
[b]B.E. (I.T.), Student, Singhgad Engineering College, Pune

Accepted 20 March2014, Available online 01 April 2014, **Vol.2 (March/April 2014 issue)**

Abstract

Tele-immersion is one of the most impressive concepts and emerging technology which is aimed to enable users in geographically distributed sites to collaborate in real time in a shared simulated environment as if they were in the same physical room. It is an advanced form of virtual reality. The Tele -immersion technology uses a " Tele -cubicle" which is equipped with large screens, scanners, sensors and cameras. Applications of Tele-immersion are many folds which includes field of education, medical & technical. In a Tele immersive 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.In this context the main objective of this paper is to give an overview about this evolving research and its application in controlling the violation of development control rules which at present violated at large scale at urban places and difficult for the municipal councils officials to control it because of physical absence of the officials on site during construction. Use of tele-immersion application may prove to be an effective tool in making transparency in pri and post building permission process.

Keywords: *Tele-immersion, virtual reality, real-time information, Cave scope, development control rules.*

1. Introduction

1.1 What is Tele-Immersion?

The term 'Virtual Reality' (VR) was initially coined by Lanier, founder of VPL Research (1989). Other related terms include 'Artificial Reality' (Myron Krueger, 1970s), 'Cyberspace' (William Gibson, 1984), and, more recently, 'Virtual Worlds' and 'Virtual Environments' (1990s).

With the advent of high bandwidth networks and high performance PC.s multimedia applications have taken a new dimension. Virtual reality and internetworking have taken a plunge in the recent years. Jaron Lanier who helped lead in the development of virtual reality in the1980s is guiding an attempt to validate tele immersion movement.

Tele immersion was originally defined in1996 by Tom Defanti of Electronics Visualization laboratory, according to him it is the union of networked (VR) virtual reality and video in the context of significant computing and data mining. [1] Tele immersion may be the next major development in information technology. Now, one can visit an individual across the world without stepping a foot outside. Tele immersion enables users at geographically distributed sites to collaborate in real time in a shared, simulated, hybrid environment as if they were in the same physical room.

Tele-immersion is defined as collaborative virtual reality over networks, an extension of the "human/computer interaction" paradigm to "human/computer/human collaboration," with the computer, providing real-time data in shared, collaborative environments, to enable computational science and i.e. interaction between users, users and computer generated models and simulations are facilitated.

In a tele-immersive environment computers recognize the presence and movements of individuals and both physical and virtual objects, track those individuals and objects, and project them in realistic, multiple, geographically distributed immersive environments on stereo-immersive surfaces.

Tele-immersive environments will therefore facilitate not only interaction between users themselves but also between users and computer-generated models and simulations. This will require expanding the boundaries of computer vision, tracking, display, and rendering technologies. As a result, all of this will enable users to achieve a compelling experience and it will lay the groundwork for a higher degree of their inclusion into the entire system. This new paradigm for human-computer interaction falls into the category of the most advanced network applications and, as such, it is the ultimate technical challenge for Internet. Tele-immersion was one of the five key technologies identified as necessary for the future use of the next generation internet (NGI).[2]

2. History of Tele Immersion

During the early years of research on Tele-immersion by National Tele-Immersion Initiative or NTII and the University of North Carolina, users were required to wear a head device and special goggles to track the user's eye movements much like a virtual reality headgear.

To recreate the environment and depth, video cameras were used at the other end to track movements and capture light patterns to calculate the distances in the room. The images were then polarized and divided in order to present a different image to each eye at the rate of 3 frames per second. This is somewhat similar to the 3-D glasses we use in the movies.

However, because of the low refresh rate of the frames, the image appeared somewhat jerky. The project however was successful as on May 2000, several researchers located in the University of North Carolina were able to communicate with researchers from the University of Pennsylvania and Advanced Networks and Services using this technology.

The two groups were able to communicate inside a room with of lifelike and three dimensional representations of their colleagues more than a hundred miles away. Now Tele-Immersion is the next step to Internet video conferencing. This technology aims to produce a computer-generated central environment in which participants from anywhere in the world can interact as if they are in the same room. This technology goes far beyond the current technological combination of telephony and Internet by videoconferencing to exchange data.

3. Over view on Tele-Immersive Device Design Concepts

3.1 Desktop/Office-Sized VR Display Devices

To construct the tele-immersive office workspace, one would want affordable wall-sized high-resolution border-less displays with low lag and undiminished image intensity when viewed at an angle. Given that such a display does not exist today, we must rather learn from assembling new VR systems from available components.[1] Several devices, each of which addresses different major issues in the tele-immersion/VR human computer interface are:

- ImmersaDesk3 Plasma Panel Desktop VR
- Personal Augmented Reality Immersive System (PARIS)
- Personal Penta Panel (P3)
- Totally Active Workspace (TAWS)
- Cyber Ceiling
- CAVE scope

3.2 New Immersive Display Technologies

As compared to current 3-tube projector systems following new display technologies are available as new VR devices.

- Liquid Crystal Display (LCD) projectors and panels. They are achieving better resolution now (1280x1024), but have too high lag to be used for stereo unless two projectors are used with shutters.[3]
- Digital Micro-mirror Displays (DMDs). These are good resolution (1280x1024), and theoretically fast enough for stereo, but the supplied firmware does not support stereo.[4]
- Plasma panel displays. These are low-medium resolution (800x480) but probably fast enough to do stereo with the proper driver electronics. These displays have electronics mounted around their edges that make border-less multi-screen configurations a challenge.[5]
- Light Emitting Diode (LED) displays. These are low resolution right now (e.g., 208x272 and 320x192) but bright and border-less, in principle. [6]
- Digital Light Valve (DLV) displays. These new desktop projection displays have latency problems for stereo use; they can switch fast enough but do not go to black in the required time. A 2Kx2K resolution version has been built [7]
- Grating Light Valve (GLV) displays. Recently demonstrated in prototype form, this laser-driven micro electro mechanical display is capable of HDTV resolution at 96Hz, very promising for VR. Switching speeds are extremely low, allowing a linear array of deflectable ribbon picture elements to scan out an image [8]

3.3 Plasma Panel Desktop Device—A Design Exercise

Tom De Fanti developed a prototype device, called the ImmersaDesk3 to test the plasma panel technology currently available at 640x480 resolutions.

Fig. 1 *Source (1998, The ImmersaDesk3, Electronic Visualization Laboratory, University of Illinois at Chicago)*

The ImmersaDesk3 is configured so a user can position the screen at any angle from horizontal to vertical, forward or back, on the desk. The angle can be measured automatically so that the correct perspective view of the computer-generated images for the tracked user is presented. Cameras can be added to this configuration to make image/gesture recognition, tether-less tracking and tele-immersion experiments possible. Given its configuration flexibility, the ImmersaDesk3 is also amenable to the integration of haptic (tactile input/output) devices.

They built this system around the Fujitsu PDS4201U-H Plasmavision display panel. The Plasmavision has an active display area of 36x20 inches (in a 16:9 aspect ratio); the entire panel is 41x25x6 inches and weighs 80 pounds. The panel is too heavy for users to shift easily, so they mounted it on hydraulic supports with a hand crank to adjust the angle.[9]

3.4 Personal Augmented Reality Immersive System (PARIS)

Twenty years ago, Ken Knowlton created a see-through display for Bell Labs using a half-silvered mirror mounted at an angle in front of a telephone operator. The monitor driving the display was positioned above the desk facing down so that its image of a virtual keyboard could be superimposed on an operator's hands working under the mirror. The keycaps on the operator's physical keyboard could be dynamically relabeled to match the task of completing a call as it progressed. Devices that align computer imagery with the user's viewable environment, like Knowlton's, are examples of augmented reality, or see-through VR. More recently, researchers at the National University of Singapore's Institute of Systems Science built a stereo device of similar plan using a Silicon Graphics' monitor, a well-executed configuration for working with small parts in high-resolution VR [10]. Neither of these systems provides tracking, but rather assumes the user to be in a fixed and seated position.

3.5 Cyber Ceilings, designed for the Last Unused Projection Surface

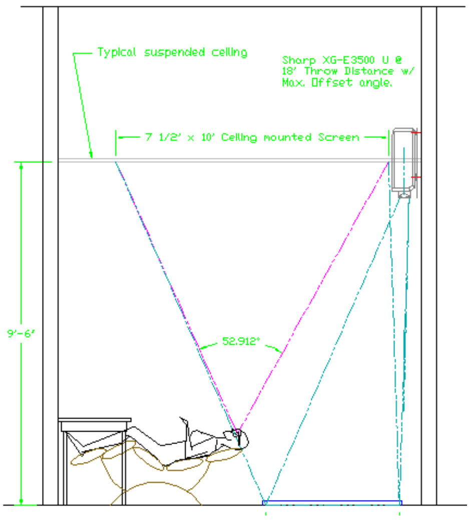

Fig. 2

In trying to fit large screens and VR into offices, use of overhead space or the ceiling is conceivable, and has distinct advantages in hospital patient settings, assuming the room can be made dark enough. The drawings below indicate some options for ceiling-mounted front projection with a mirror on the floor, and a smaller, rear projection overhead display. Different lensing can alter the projection distances in the former example. The chair shown in Fig. 2 is a commercially available executive motorized recliner, but could be replaced by a bed in a hospital setting shown in Fig. 3. This configuration has the benefit that the user may not need to be tracked since body position is fixed and head rotation is not accounted for in projected VR environments.

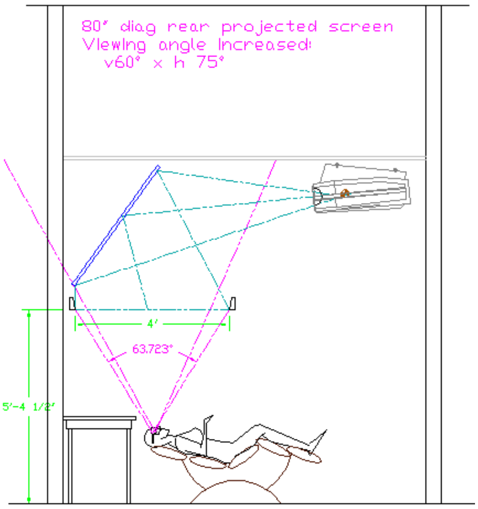

Fig. 3

Source (Schematic of Cyber Ceiling. Image courtesy of Greg Dawe, Electronic Visualization Laboratory, University of Illinois at Chicago, 1999)

3.6 Personal Penta Panel (P3) or Dilbert's Dream

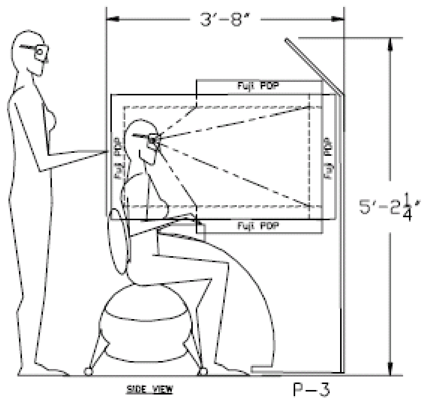

Fig. 4 *Source (P3. Schematic by Greg Dawe, EVL, 1998)*

Dilbert's Dream is conceived as an office cubicle whose walls and desk are made from border-less stereo-capable high resolution panels, not, unfortunately, obtainable in the current millennium. Alternatively, they have proposed a "desktop" cubicle. The Personal Penta Panel (P3) is a box made out of 42" diagonal plasma panels. The user places his/her tracked head and hands into the box of screens and is presented with a surround (non-stereo) view shown in fig.4. Such a device would be useful for all but very close viewing, even in non-stereo, as we wait for the needed technological improvements in panels.

Scott Adams, creator of Dilbert, recently suggested that this kind of device may be harmful to programmers! In his article “Gene Fool” in Time Magazine,[11] he explains: “But unlike the sterile boxes of today, every cubicle will be a technology wonderland customized for the occupant. Flat-panel screens on each wall will give the impression you are in a hot air balloon floating over the Alps. Noise-cancellation technology will block out the surrounding sounds while providing a symphony within the cubisphere. The computer will continue its evolution to a full entertainment center, providing a constant supply of first-run movies, live nudity, gambling and video conferencing. The engineer’s chair will be soft and warm, conforming to the body and providing simulated motion and vibration to match the entertainment. The cubicle experience will be so much better than life on the outside, engineers won’t want to leave. That could be a problem.

Pending the availability of suitable plasma, LCD, or LED panels, we have built screens into a rear-projection desktop structure to simulate the Totally Active Work Space (TAWS)— the ultimate Dilbert’s Dream or cub sphere. TAWS is largeenough for two colleagues to share the workspace when need be. EVL has been modifying its LCD shutter glasses to run at 160Hz, so that four lenses (in two sets of glasses) can operate almost flicker-free at 40Hz each. This capability, which we call duo-view, allows two tracked users of the same display to see the image in correct perspective and size, essential for sharing a workspace. Research into screen materials is needed because the de-polarization that comes from looking at screens at very oblique angles creates ghosting that is more an issue with duo view than normal stereo.

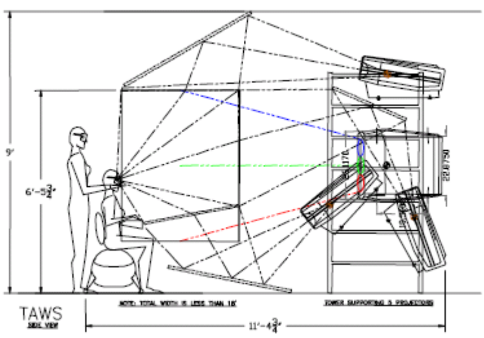

Fig. 5*Source (TAWS. Schematic by Greg Dawe, EVL, 1998)*

3.7 CAVE scope: Simulating Variable Resolution Displays

All projection-based VR devices trade off wide angle of view for resolution. Human vision is acute only for a very narrow angle, the ~five degrees of vision falling on the fovea. It would be desirable, therefore, to have adaptive resolution displays that, given eye tracking, could match human visual acuity in the area of the screen in this five degree angle of view. In stereo, graphics engines currently achieve a resolution of 1280x1024 spread across 5 to 10 feet, a *rather less-than-crisp* display. Software techniques can be used to render more detail in the area of interest, but resolution itself cannot improve. The projectors now available are not built to handle the dynamic horizontal scanning fluctuations needed for variable resolution display, and neither are the display engines. CAVEscope, however, provides a way to simulate variable resolution in a projection VR setting.

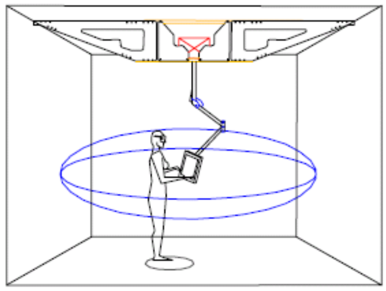

Fig. 6*Source (CAVE scope. Schematic by Greg Dawe, EVL, 1998)*

4. Tele-immersion application to control violation of development control rules

Thus the tele-immersion application is very useful in interacting with friend’s miles away in simulated environment, useful in Medical & Education field. Here authors suggest a comprehensive three-tier real time information and control system (CTTRTICS) model [12] modified based on tele-immersion applications concept as shown in Fig. 7, which will integrate many key activities in a systematic manner and is consciously directed towards the effective and efficient achievement of reducing the violation of building bye-laws and development control rules. The owners who desire to initiate the development activity have to appoint a qualified consultant for submission of his proposal to the “municipal council cell” comprising of executive engineer, deputy engineer and junior engineer. The municipal council shall also appoint a third party registered technical non-government organization consisting of Information Technology Engineer / Electronic Engineer, an architect. The planning proposal received from the owner will be scrutinized in the light of building bye-laws and development control rules and if the proposal is found as per rule, permission for development shall be granted. The document is then up loaded on internet. A third party registered technical non-government organization shall make all necessary arrangement that is high resolution camera on construction site and high resolution LCD display in to municipal council office to display the as actual construction images through tele-immersion application concept at foundation level, super structure level and completion level to the municipal council. If at any stage, the images of construction are in contravention to sanctioned uploaded plan, the municipal council through network application should immediately issue a notice to stop the work; if required, orders may be issued to demolish the illegal construction. If the construction is as per rule, municipal council should issue occupancy certificate on submission of completion certificate from the architect or engineer appointed by owner. Facilities like water supply, electricity supply, telephone service and aid from financial institutes can only be availed by the owner on producing the occupancy certificate generated by computer on line without human interference issued by the municipal council. The authorities providing the above facilities should be empowered to inspect the site through tele-immersion application installed in their office to satisfy themselves that the construction is as per the sanction planed; they can also reject the facility, if any contravention is found, while cross checking at the site. By this comprehensive system, the deviation may be detected in advance of their occurrence and may be avoided by appropriate and timely action.

To implement this comprehensive three tier real time information and control system effectively and transparently, the municipal council needs to utilize the information technologies such as high band width internet to make available the map submitted and sanctioned by them to the public through this real time approach. Updated information about what is happening while it is happening will be available to all concerned. Through this system public participation will increase to a great extent with high level of transparency in planning permission process. The suggested model can become an effective tool for monitoring and controlling the violation of building bye-laws and development control rules.

4.1 Suggested system to implement above concept

Authors suggest providing a high resolution (e.g., 1024x768 or 1280x1024) LCD display that one can move into the area of detailed interest construction site. Such a display would be like a portal into a higher-resolution space. It would be suspended in the projection-based VR space by a counterweighted mechanism, on a building construction site. One would navigate in the VR space as normal, with low-resolution surround vision, but pull the CAVEscope into place when high resolution examination is desired. The CAVEscope would be tracked so that it would present the proper perspective projection further scope. A miniature television camera mounted on the CAVEscope could enable tele-conferencing. Users can see building images during construction using CAVEscopes, CAVEscope combines the intuitive navigational capabilities of projection-based VR with the detailed view of the LCD portal, all under user control. CAVEscope should also be usable in an office setting with front projection VR on the office walls and desktop, such as has been proposed by the Advanced Network and Services-sponsored National Tele-Immersion Initiative. [13] Since the wall projections are used mainly for navigation and context, not for detail work, the quality of the projected images could be less than optimal, as long as the CAVE scope image is suitably bright and sharp. The images captured shall be displayed in the office of the municipal council and these images shall be automatically matched with sanctioned map. The system will generate report accordingly for further action.

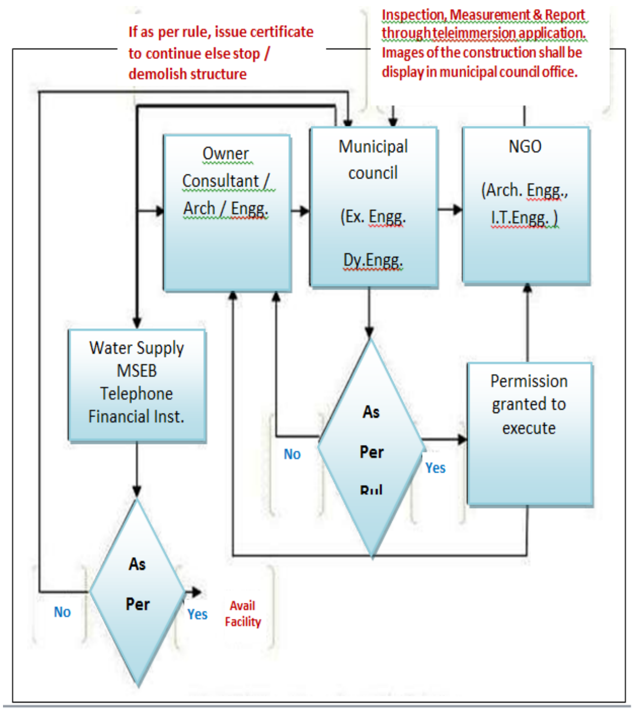

Fig. 7: Real time information & Control system based on Tele-immersion concept.

Conclusion

The Teleimmersion has the potential to significantly impact educational, scientific, manufacturing and other fields like Civil Engineering in general and controlling construction activity by the local authority (municipal council/ corporation) while seating in the office to control violation of development control rules and to make sustainable development of a town. The beauty of such technologies is that it allows widely separated people to share a complex virtual experience and full integration of virtual reality into the workflow. It may provided employment to I.T. professional too. The main problem with this concept may be its speed, bandwidth and cost of big cameras. Hence this application has more scope of research in the field of touch screen technology; tele conferencing micro processor based light weight cameras & display systems and satellite concept to overcome all this problems in future to come.

References

[1]. www.evluic.edu

[2]. J.E. Smith and F. W. Weingarten (eds.), Research Challenges for the Next Generation Internet, Computing Research Association, 1997, p. 20.

[3]. www.nec.com, www.angleview.com, www.electrohome.com

[4]. www.electrohome.com,store.infocus.com/lp420/index.htm, www.ti.com/dlp/docs/business/manufacturers/,

[5]. www.nec.com, www.fujitsu.com

[6]. www.lumagraph.com/lumatile.html

[7]. www.almaden.ibm.com/journal/rd/423/melcher.txt

[8]. D.M. Bloom, The Grating Light Valve: Revolutionizing Display Technology, SPIE Vol. 3013, Feb. 1997 pp 165-171.

[9]. Tom De Fanti, Dan Sandin, et al, Technologies for Virtual Reality Tele-Immersion Application issues of Research in Image Display and Global Networking, EC/NSF Workshop on research frontiers in virtual environment and human centered computing, Jun 14, 1999, Chateau de Bonas, France.

[10]. T. Poston, “The Virtual Workbench : Dextrous Virtual Reality,” G. Singh, S.K. Feiner, D. Thalmann (eds.), Technical Report TR94-132-0, Institute of Systems Science, National University of Singapore, August 1994, http://www.iss.nus.sg/iss/techreport

[11]. Scott Adams, “Gene Fool”, Time Magazine,Dec. 7 1998 pp.216-217

[12]. T. N. Boob, Dr. Y.R.M. Rao,“ Violation of Building Bye-Laws and Development Control Rules: A Case Study”, IOSR Journal of Mechanical and Civil Engineering (IOSRJMCE) ISSN : 2278-1684 Volume 2, Issue 4 (Sep-Oct 2012), PP 48- 59 www.iosrjournals.org

[13]. www.advanced.org/teleimmersion.html