Internet-based 3D Graphical MOO Software that Supports Distributed Learning for both Sides of the Digital Divide

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Abstract: This interactive session will demonstrate a 3D graphical on-line multi-user software system that the Department of Technology and Cognition at the University of North Texas has been pilot testing during the Fall of 2002 and Spring of 2003 to enhance instructor and student interactions for classroom and on-line courses. The Created Realities Group's 3D graphical MOO has provided students with a wide range of interactions within a single interface. The on-going research is examining if on-line 3D created environments can generate interactions similar to those that require the new high-end Internet connectivity, using communications bandwidths closer to those found used by web-based educational delivery systems. This interactive session will show the technology, its use, and will discuss thoughts resulting from the ongoing pilot testing.

Most of today's most popular distributed learning environments are designed to support interaction between one person and a computer (i.e. web pages). Collaboration between multiple users is accomplished over the Internet using non-immersive tools like e-mail, shared files, or text-based chat. In non-computerized work settings people interact in a rich environment that includes information from many sources (telephone, whiteboards, computers, physical models, etc) and are able to use these simultaneously and move among them flexibly and quickly. (Stanford Computer Graphics Laboratory, 2001) As broadband Internet access continues to increase (DSL, CableModel, etc), so does the potential for delivering high-end interactive user interfaces. These new approaches that provide the needed interactivity to facilitate more engaged on-line learning require access to these newer, faster Internet connections. However, access to these faster Internet connections can be either hard to get or cost-prohibitive for many rural and inner city students (Jones, 2001). This is commonly referred to as the Digital Divide (Benton Foundation, 2001). As computer technology and networking become increasingly important to economic and social success, many people in inner cities and isolated rural areas are failing to acquire the new technology as rapidly as their more affluent neighbors (Benton Foundation, 2001).

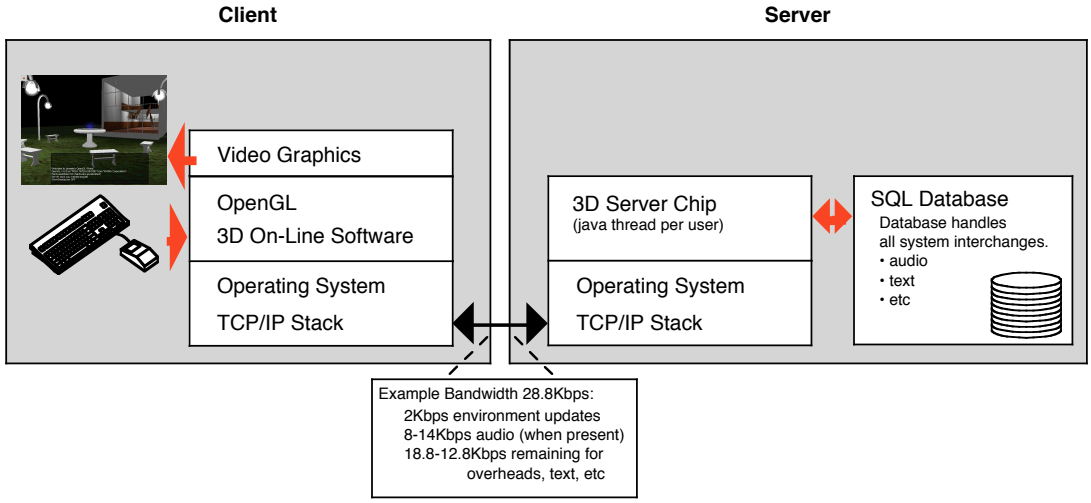
While much of the earliest pedagogy has confined the Internet to use as a virtual and expanding library (Harris, 1995), 3D on-line virtual environments as a next generational distributed learning tool are being studied to better understand its relation to existing distributed learning systems (i.e. world wide web) and the impact of immersive informational/environmental design on student and instructor interactions. The creation of a useful and integrated virtual classroom for distributed learning has long been an elusive goal. There have been numerous attempts over the years to build user interfaces to deliver realistic environments that create a context for communications, but few have reached wide use and adoption. The concept has always been a compelling one for education; however, the problem has been the availability of technology that could attain the seamless peer-to-peer interactions at a price to make its integration successful. The technology has greatly improved over the last three years such that 3D on-line environments can now provide realistic, immersive learning environments that deliver required education materials while fostering learning communities. The current generation of on-line 3D virtual environments has the ability to provide face-to-face interactivity as well as deliver the components provided in traditional web-based methods over thin-client access technology. (Jones, Hastings, & Christal, 2003)

MUDs (Multi-User Domains/Dungeons) have been around for over two decades now (Holmevik & Haynes, 2000). Richard Bartle of Essex University in the United Kingdom developed the first MUD in 1979. MOOs (Multi-User Object-Oriented) have been used for learning, training, and collaboration since the early 1990's. The MIT Media Lab demonstrated that virtual meeting spaces have significant potential for training and collaboration (Bruckman, 1992).

There have been attempts to provide on-line 3D environments over the past ten years, but the primary barrier to success has been the cost and availability of personal computers equipped with 3D graphics adapters. The first wave of 3D graphical MUDs began in 1999 with the release of Everquest developed by Verant (Sony, 2002). Since then more entertainment titles have been developed. These software titles reflect the number of personal computers capable of supporting or being upgraded to support these advanced 3D graphic interfaces. In 2001, over 70% of PCs with Windows OS shipped supported a 3D video graphics adapter (Jon Peddie Associates, 2001). The ability to provide the instruction/interaction via 3D graphics which are created among distributed clients holds great potential for lowering the cost of technology delivery and the amount of bandwidth required to deliver the instruction. Research continues today on how to take advantage of 3D on-line environments. Goodson-Espy, Espy and Cifarelli (2001) examined the possibilities of teaching mathematics over internet-based 3D massively multi-players role playing game.

The created realities concept is to take current off-the-shelf commercial approaches that provide contextually accurate software-derived 3D environments and then overlay collaborative groupware, unified communications, and other instructional tools to create a single distance/distributed educational delivery interface. The use of state-of-the-art real-time rendering on consumer PC platforms allows students and instructors to have a 'lean-forward' (engaged) seamless peer-to-peer educational experience. (Created Realities Group, 2002)

The benefit of creating a 3D rendered environment is that it is highly bandwidth efficient. Since the learning environment is rendered and not retransmitted the initial bandwidth is minimum and can easily support those without access to faster Internet connection, but can grow to accommodate higher-bandwidth and more multi-media objects as access to faster Internet occurs over time. Users can interact (chat, audio, e-mail, conference, overheads, etc) with other students and the instructor inside environments in real-time using a 28.8kbps modem connection to the Internet. This is possible because a rendered textured geometry of an object is much smaller than a high-resolution photo or video transmission. Thus, fast performance over thin-client Internet connection is ensured by small file sizes and incremental rendering that only renders active visible areas on the visitor's screen. (Jones, Hastings, & Knezek, 2002). Figure 1 shows the typical configuration of client/server interaction.



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References

Benton Foundation. (2001). Digital divide basics. Retrieved September 14, 2001, from http://www.digitaldividenetwork.org/content/sections/index.cfm?key=2.

Bruckman, A. (1992). Identity workshop: Social and psychological phenomena in text-based virtual reality. MIT. Available via anonymous ftp from ftp.media.mit.edu/pub/asb/papers/identityworkshop.{ps.Z,rtf.Z}.

Created Realities Group (2002). Overview of the Created Realities Group VXInteractive Distributed Learning System. Retrieved September 14, 2002, from http://www.created-realities.com.

Goodson-Espy, T., Espy, S.L., & Cifarelli, V. (2001). Warrick's secrets: Teaching mathematics through an internet-based 3D massively multi-players role playing game. Proceedings of the 2001 SITE conference page 1080-1084.

Harris, J. (1995). Educational telecomputing projects: Interpersonal exchanges. The Computing Teacher, 22(6), 45-48.

Holmevik, J.R. & Haynes, C. (2000). MOOniversity: A student's guide to online learning environments. Beedham Heights, MA: Allyn & Bacon.

Jon Peddie Associates. (2001). Software tools and applications series: 3D visualization and simulation market study. Retrieved August 15, 2001, from http://www.jpa.com/studies/vizsim/index.html.

Jones, J. G. (2001). A Study of Communications between Subject Matter Experts and Individual Students in Electronic Mail Contexts. (Doctoral dissertation, The University of Texas at Austin, Austin, Texas).

Jones, J.G. , Hastings, S, & Christal, M. (2003). The future of virtual museums: On-Line, immersive, 3D environments. Manuscript submitted for publication.

Jones, J.G., Hastings, S., & Knezek, G. (2002). NSF ITR 02-168: Enhancing instructor and learner interactions using created realities technologies. (Available from Dr. Greg Jones gjones@coefs.coe.unt.edu).

Sony Online Entrainment: About Everquest. (n.d.) Retrieved September 9, 2002, from http://everquest.station.sony.com/about.jsp

Stanford Computer Graphics Laboratory. (2001). Stanford Interactive Workspaces Project. Retrieved January 5, 2001 from the World Wide Web: http://graphics.stanford.edu/projects/iwork/