Created Realities Technology in Amateur Radio

Greg Jones, WD5IVD
Dept. of Technology and Cognition
University of North Texas, Denton, Texas
wd5ivd@tapr.org • http://created-realities.com

Abstract

This paper discusses the possibilities of Created Realities Technology in amateur radio. The paper discusses its use in education/learning, communications, and information presentation. The creation of meaningful 3D spaces for both communications and information presentation can add a new dimension to amateur radios presentation and teaching.

Introduction

The next generation of consumer information presentation will be in three dimensions. A paper by Brock, Kovacs, and Smith entitled "APRS in Hollywood - Integrating Real Time 3D Graphics with Wireless GPS systems" in the 2001 Digital Communications Conference proceedings discussed one aspect of this potential. Their paper discussed the possibilities of integrating real-time APRS systems with real-time 3D computer graphics. The current state-of-the-art in 3D rendering can be provided on currently sold consumer platforms. This approach will become widely available, since each year the number of personal computers equipped with the necessary hardware requirements will continue to expand.

If you have played Doom, Quake, Counter Strike, or numerous console games, then you have interacted with a real-time 3D rendered environment. Over the past ten years, PC gamers who played 3D games spent additional money to enable their computers to support 3D presentations. A typical gamer upgrades their computer almost every year to keep up with the latest gaming. Computer games have traditionally pushed the envelope of real-time computer visual presentation. What has changed in the last few years is that consumer grade computers have finally reached the price-point/feature-set to support real-time 3D rendered graphics. Last year over 70% of windows based personal computers sold contained the necessary hardware and computing power required supporting real-time 3D environments (Jon Peddie Associates, 2001). Older computers (within the last 3-5 years) can be upgraded with a graphics card for less than $100 to allow them to display 3D. Personal computers are not the only platform available. Console games like SonyPlay Station 2 and Microsoft Xbox support 3D graphics and both have support for TCP/IP. This provides over 50 million personal computers and game consoles to examine as possible presentation systems that can communicate using the Internet or radio.

The potential for 3D environments, or what I call 'created realities', is almost endless. After stepping down from TAPR and completing my PhD at the University of Texas Austin, I formed the Created Realities Group in 2001. Our concept has been simple – take current commercial approaches to provide contextually accurate software-derived 3D environments with existing off-the-shelf technology. Combine these created realities with collaborative groupware, unified communications, and other instructional tools to create a single delivery interface running on Windows, Mac, and Linux operating systems for use with education, business, and entertainment.

Distributed Education and Communications

Our current focus has been on creating a distributed education and communication systems. Distributed education can be defined as the acquisition of knowledge and skills through mediated information and instruction. Distributed learning is used in all areas of education including Pre-K through grade 12, higher education, home school education, continuing education, corporate training, military and government training. Research studies have been quite consistent in finding that distance learning classrooms report similar effectiveness results as reported under traditional instruction methods. In addition, research studies often point out that student attitudes about distance learning are generally more positive. Research on distance learning applications for Pre-K through grade 12, as well as in adult learning and training settings, strongly suggests that distance education is an effective means for delivering instruction.

Programming for distance learning with created realities provides the learner with many options both in technical configurations and content design. Educational materials are delivered primarily through live/interactive classes. The intent of our software is to replicate face-to-face instruction by creating a context for instruction using immersive 3D environments. The ability of the teacher and students to see each other may not be a necessary condition for effective distance learning, but audio and contextual reference can be a critical component for interactivity.

Most of today's distributed learning environments are designed to support interaction between one person and a computer with collaboration between multiple users being accomplished using non-immersive tools like electronic 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). 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. While the use of virtual on-line communities used for creating collaborative interactions are not new, there has been a scarcity of sophistication in the approaches taken by most educational systems. Ruess, Reed, Gill, and Fusco (2001) stated that reality level suffers for currently deployed environmental based educational systems. Much of the focus for educational delivery systems have been on web based VRML systems, which lack many of the performance qualities that are found in current commercial designs. Created Realities solves these issues and provides a way to more seamlessly provide information flow and increases interactions between participants. Djoudi and Harous (2001) stated in their T.H.E. Journal Online article that:

> Information and communication technologies, on which new training and learning media are based, have improved the transmission and access of data. But they have not facilitated significant interaction between the user and the information. This interaction is very important for someone trying to learn. Until now, new Internet technologies were taught to improve the speed of access and the quantity of information accessed.

How can this be used in amateur radio today ?

Now that we have gotten the basics out of the way, what does this mean for amateur radio. Several things come to mind as things to try first. APRS in 3D seems to be a natural concept to pursue. When the Brock, Kovacs, and Smith (2001) paper was published we had been six months into development of our 3D engine. I read their paper and thought to myself that we could support a real-time interactive system right now. The only problem being that building an APRS display is not on our development road map. If we can find the necessary people to form a working group, then something might be possible. If a programmer wants to do it on their own, they have a variety of pre-existing engines available supporting both OpenGL or DirectX APIs to select from. There are a score of 3D engines that can be licensed today. Engine licenses range from free to very expensive. Since a base-line APRS display system does not need highly advanced graphic flair, then the lower-end engines should be acceptable. Presenting the information in the 3D space is not that complicated. The hard part is creating an efficient means for the server and client to communicate and provide information from the database to all connected users. I would love to talk to anyone interested in developing something like this either using our engine or another approach.

Another concept to pursue is to teach amateur radio classes on-line in real-time. This concept fits into our current strategic roadmap, since we are currently developing for educational distributed learning. A club or individual could hold on-line classes for amateur radio. There are plenty of systems that could support this, but the created realities approach is to provide a single interface that provides all necessary tools for teaching on-line peer-to-peer classes (audio, overheads, e-mail, chat, context, etc). The ability to present amateur radio theory using 3D models could be very interesting. A course could be taught live one time, captured in the database along with all the student interactions, then later delivered to any student that wanted to take the class when it wasn't being offered live. One example of a current project we are developing is to provide on-line contextually accurate language learning (Jones and Squires, 2002). If we can provide language learning on-line, then teaching amateur radio class should be simple.

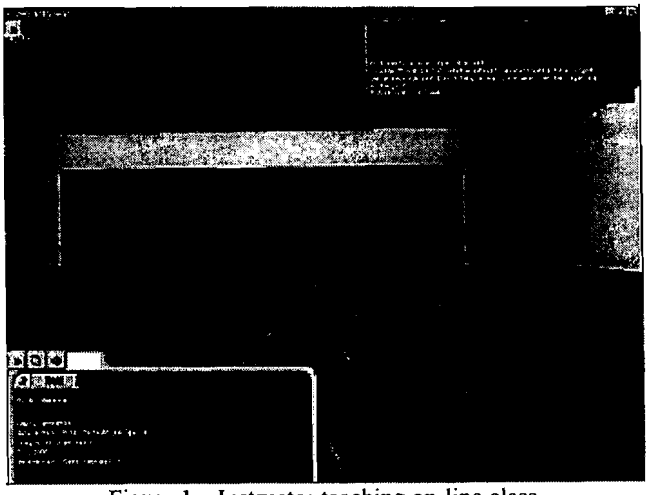

Figure 1 – Instructor teaching on-line class.
(prototype avatars being used)

How about holding virtual amateur radio club meetings. The created realities software would provide an excellent interface for hosting on-line amateur radio meetings. Even the invited guest speaker can do their presentation using audio, overheads, video, etc. We use our software to make presentations and hold work group meetings that include participants from around the world. The bandwidth requirements are low enough to allow participants using 28.8kbps dialup to be involved. One of our goals has always been to deliver low-bandwidth interfaces that can be scaled up to faster connections. Amateur radio interest group could meet on-line to discuss topics or hear presentations. We could even host the ARRL and TAPR Digital Communications Conferences entirely on-line saving the cost of travel :-) Then again meeting people meeting in person and getting away from home has its advantages.

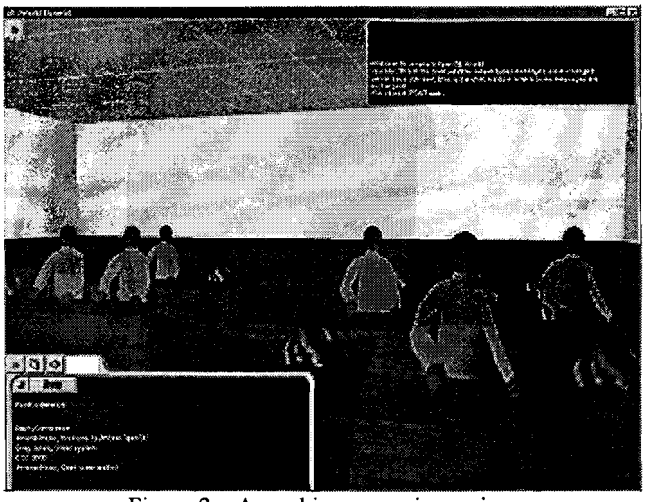

Figure 2 – A working group in session.
(prototype avatars being used)

We have been talking to several museums about creating virtual spaces for museum tours and exhibits (Jones & Christal, 2002). Instead of visiting a museum on-line, how about presenting ham shacks or W1AW ? A ham could have a chat with someone and instead of just hearing their voice come out a speaker, they are actually in the other hams shack – or at least a created version of one. A tour could be given of the W1AW station and the AI (Artificial Intelligence) giving the tour can customize the tour based on feedback received from the participant.

Conclusion

I have touched on just a few of the possibilities of information presentation in 3D space for amateur radio. The use of created realities to present immersive interfaces brings an entirely new level of interaction with it that is beyond 2D web pages or information. The ability to promote active engaged learning and allow a full range of peer-to-peer interactions allows participants to communicate as if they were in face-to-face dialog without the bandwidth requirements of retransmitted systems like video.

References:

Davie, L. E., & Wells, R. (1991). Empowering the learner through computer-mediated communication. *American Journal of Distance Education, 5 (1)*, 15-23.

Djoudi, M, & Harous, S. (2001, November). Simplifying the learning process over the internet. *T.H.E. Journal Online: Technological Horizons in Education.* Retrieved December 20, 2001, from http://www.thejournal.com/magazine/vault/A3738.cfm.

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. (2002). Enhancing instructor and learner interactions using created realities technologies. Retrieved July 20, 2002, from http://created-realities.com.

Jones, J. G. and Squires, T. (2002). Combining speech recognition and created realities VXInteractive™ system to create authentic spoken language learning. Retrieved July 20, 2002, from http://created-realities.com.

Jones, J. G. and Christal, M. (2002). The future of virtual museums: on-line, immersive, 3D environment. . Retrieved July 20, 2002, from http://created-realities.com.

Communication in Virtual Worlds. Panel session presented at the Vlearn3D 2001, Knowledge Spaces and Information Landscapes virtual conference. Retrieved January 10, 2002, from http://www.vlearn3d.org/conference/panelthree.html.

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