

# Networked Music: Bridging Real and Virtual Space

John P. Young

Peabody Conservatory of Music  
Johns Hopkins University  
1 East Mt. Vernon Place  
Baltimore, MD 21202 USA  
jpyoung@peabody.jhu.edu

This paper describes an exploration of utilizing the World Wide Web for interactive music. The origin of this investigation was the intermedia work *Telemusic #1*

experience of a dance club—a virtual equivalent can't be far behind. *Coney Island* (Bargar et al. 2000) was a milestone in integrating virtual scenery with responsiveness to audience participation. Taking a leap from this expensive demonstration of technology in the direction of more populist counterparts might lead us to the current crop of Massively Multiplayer Online Role-Playing Games (MMORPGs). These are the culmination of well-established communal constructs born on the Internet in the form of Multi-User Dungeons (MUDs), and their related brethren. Originally text-based, the trajectory of these shared realities has been towards ever-greater explicit visual detail, to the extent of even scanning one's likeness into the game, molding an avatar as an unmistakable extension of oneself. There is every reason to believe that these trends will continue, defining the state-of-the-art in consensual virtual reality. These game environments, though still aspiring to traditional, albeit fantastic, notions of realism, encompass many useful paradigms for less ambitious endeavors:

- Bidirectional communication between each interactor and the virtual space
- Independent and persistent existence of the virtual realm
- Consistent, perceptible rules governing interaction and feedback
- Aspects of emergent behavior—reaction of the virtual world incorporates, but is not limited to, direct manipulation
- Potential for coordinated collaboration with other interactors without requiring external channels of communication
- Evolution—the shared environment changes as a result of the sum total of interactions

These conditions describe many aspects of our perception of physical reality, but need not be implemented as a literal reflection thereof, with all the complexity that would imply. Taking as a point of departure the observation that music is deeply meaningful though fundamentally abstract, the features above can potentially be incorporated into a virtual environment arising from the same conceptual basis as our relationship to music.

*Telemusic #1*, a collaborative intermedia work by Randall Packer with Steve Bradley and myself, was

The research supporting *Telemusic #1*

implementation used by the MAX external objects is not available, and substantial portions of the software fall under restrictive copyright of the UC Regents. However, OSC, and OTUDP, its companion object for UDP-based network communication, are the only networking externals currently supported for the MAX environment, and they function quite well in this capacity. OSC will continue to be supported, but interoperability will be extended to the open-source projects Pd by Miller Puckette and jMax from IRCAM as well, for those who wish to have complete end-to-end transparency in their software.

This system was designed for maximum cross-platform compatibility. It has been successfully tested using Netscape Navigator under Windows, MacOS, and Linux, and Microsoft Internet Explorer (IE) under Windows. IE under MacOS does not work because IE:Mac unfortunately does not enable any communication between JavaScript and an embedded Java applet. The server application has been successfully tested under Windows, Linux, and MacOS X. Because most of the software is written in Java, it is quite portable, and every effort will be made to ensure full compatibility with common operating systems and browsers.

My collaboration with Randall Packer continues in the form of his next intermedia work, *Telemusic #2*. This piece will build technologically on its

predecessor by interpreting network traffic statistics gathered in real time to generate an organically textured musical atmosphere as a canvas for interaction. The software required will likely be based on two open-source projects: the Multi Router Traffic Grapher (Oetiker 2000), a tool for aggregating Simple Network Management Protocol (SNMP) queries, and Peep (Gilfix and Couch 2000), a framework for auralizing dynamic network conditions. Looking beyond the horizon, Packer sees *Telemusic #3* adding musically responsive visualizations to the environment to create a more immersive intermedia experience.

This research owes a great debt of gratitude to my friend and collaborator Randall Packer, whose wonderfully impractical ideas pushed me beyond the limits I would have otherwise set for myself.

The system described here has been designed for flexibility and extensibility, offering a framework which can support many potential applications in addition to those already noted. I sincerely hope that development and sharing of this software can inspire further creative use of the Web as a means of participating in live interactive works. The latest version and documentation can be found at <http://www.netmuse.org>.

Burk, P. 1998. JSyn – a real-time synthesis API for Java. *Proceedings of the International Computer Music Conference*. pp. 252-5. Ann Arbor, MI: ICMA.

———. 2000. Jammin' on the web – a new client/server architecture for multi-user musical performance. *Proceedings of the International Computer Music Conference*. pp. 117-20. Berlin, Germany: ICMA.

Bargar, R., F. Dechelle, I. Choi, A. Betts, C. Goudeseune, N. Schnell, and O. Warusfel. 2000. *Coney Island: Combining jMax, Spat and VSS for acoustic integration of spatial and temporal models in a virtual reality installation*. *Proceedings of the International Computer Music Conference*. pp. 149-53. Berlin, Germany: ICMA.

De Ritis, A. 1999. *Cathedral: an interactive work for the Web*. *Proceedings of the International Computer Music Conference*. pp. 224-7. Beijing, China: ICMA.

Gilfix, M., and A. Couch. 2000. Peep (the network auralizer): monitoring your network with sound. *Proceedings of the 14<sup>th</sup> Systems Administration Conference*. New Orleans, LA: USENIX.

Greuel, C., M. Bolas, N. Bolas, and J. McDowall. Sculpting 3D worlds with music; advanced texturing techniques. *Proceedings of the SPIE—The International Society for Optical Engineering* 2653: 306-15. San Jose, CA: SPIE.

Microsoft Research. 2000. MusicWorld. <<http://www.vworlds.org/music/>>. 1 May 2001.

Oetiker, T. 2000. MRTG—the multi router traffic grapher. <<http://ee-staff.ethz.ch/~oetiker/webtools/mrtg/paper/>>. 1 May 2001.

Yamagishi, S., and K. Setoh. 1998.