Interactive Sound Design on the Web: Featuring Beatnik™ Technology

by Elise Baldwin, Pat Roberts and George Wadsworth
of Convivial Design

media

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Until a little less than two years ago, the Internet was silent. As in, no sound. One at a time, audio tools for the Internet developer began cropping up, but initially, the phrase "audio on the web" was synonymous with drastic loss of sound quality. Preliminary audio tools focused on compression schemes that could be applied to WAV or QuickTime sound files, thereby reducing download times and enabling streaming of audio data from designated servers.

MIDI Meets Digital Audio Production

Historically, developer tools for audio on the Web have been segregated into three categories: tools for streaming audio data, tools for MIDI composition and/or playback, and more recently, tools for interactive sound effects. The different goals involve different technologies and tool choices, but what about the designer that wants to have a strong musical presence plus interactive sound effects?

On the MIDI side of production, several tools have emerged that allow developers to encode MIDI information and users to access it via a downloadable plug-in. However, standardizing the playback of MIDI files on the user's end has proven nearly impossible, due to the variables of sound cards and MIDI assignations on each user's setup. For more information on MIDI playback configurations and issues, please see "Creating MIDI for the Web" by Jeff Essex (http://www.audiosync.com). One of the main attractions of Beatnik as a development tool is that an RMF file (Headspace's proprietary file format) will play back exactly the same on any machine with the installed plug-in and a Power PC or Pentium processor. In addition, the RMF will be approximately one-fifth the size of the corresponding MIDI file, assuming that no custom samples are used.

Beatnik is currently the most versatile tool for development and delivery of both sound effects and musical compositions on the web. Preceding the release of Beatnik , there were few tools supporting a hybrid environment where custom MIDI

instruments could be created from digital audio samples, allowing for complete synchronization and interaction with General MIDI. As early as QuickTime 2.0, this mixing of digital audio and MIDI sources was possible, but clumsy and lacking in development tools.

The Beatnik editor provides two banks of MIDI sounds for the designer to use in their soundscapes, one general MIDI, the other custom Beatnik samples. There is also a third available bank, into which composers can bring their own sound files or samples to create unique soundscapes. The Editor serves as a sampler when linked to a OMS-compatible sequencer (we've used Opcode's Vision and Emagic's Logic); the compositions are built, and exported from the sequencer as a Standard MIDI file. The MIDI file is then converted into an RMF file inside the Beatnik Editor.
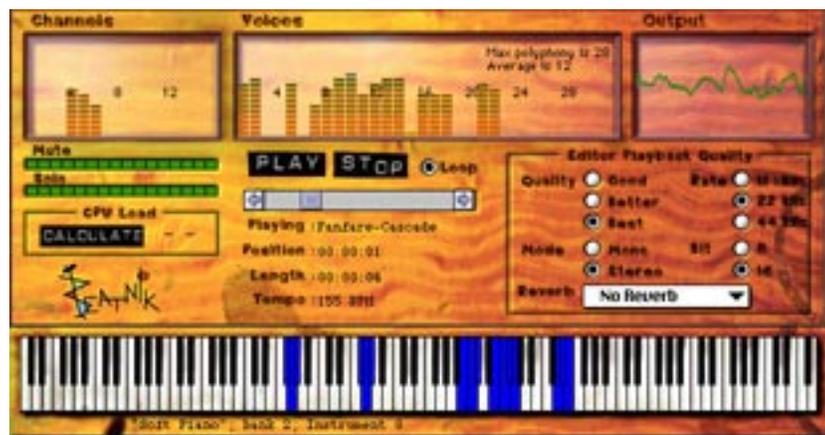
Beatnik Editor Interface

While the sound resolution and bit depth of samples is determined in the production of an RMF, compact file sizes generally make high resolution sounds accessible to low-bandwidth users. As an example, Headspace's RMF sampler contains over 18 minutes of red-book quality music, but has a download size of only 1.2 MB, because the compositions draw from the same library of samples. Beatnik is currently the only tool for the Web that can converge both digital audio data and MIDI samples within the same environment, support custom samples and JavaScript interactivity, playing consistently on any platform. In addition, Beatnik presents a solution for a frequently overlooked issue: asset security on the Internet. The Beatnik Editor can be used to watermark any RMF file. This indelible fingerprinting process ensures owner propriety and copyright security of a composition once published on the Internet.

In integrative terms, the RMF format is completely JavaScript compatible, thereby making it interactive in an object-oriented and triggerable manner. With JavaScript, the audio can be manipulated in a variety of ways, including changing volume pan or

pitch, muting tracks, or even changing instrument assignations. For example, any screen area can be assigned to play or alter a specific RMF file, or even more impressive, to activate single or multiple tracks in a composition. In this way, the RMF format makes for very compact site assets: a site may have several multitrack mixes, each associated with a different page, and yet the tracks for all may reside inside one RMF file. This also gives the artist great breadth creatively, to mix and match different tracks, making new combinations, and to cross page changes with seamless musical accompaniment. At present, one drawback is Beatnik's limited JavaScript capabilities in Microsoft's Internet Explorer, but Headspace is working on a full implementation. Sun has also licensed Headspace's technology for use in Java, adding to Beatnik's prospects as a long-term standard.

## Beatnik Production Examples

Convivial Design's Site Map in URL Mode

When designing our own site (http://www.convivial.com), we decided that we wanted each of the five main locations in our site to have a distinct composition. We wanted the compositions to continue playing during page changes and to be part of the sonically interactive site map (http://www.convivial.com/SiteMap.html)

Convivial Design's Site Map in Mix Mode

The conceptual design of the site map is complex, having in addition to a map's normal URL functions, a "mix" mode. The mix mode makes all of the tracks used in five distinct mixes available to the player, to be activated or not. This additive mix is saved when the user leaves the site map and returns to it later. To achieve these goals, the RMF file is embedded in a separate, virtually invisible HTML frame. Once loaded, the file is always available via JavaScript commands, and plays continuously as the browse changes pages. Both the persistent, hidden frame and the current visible frame contain JavaScript commands, allowing one-time loading for lines of often used code. This arrangement works extremely well in terms of download time as well as user experience.
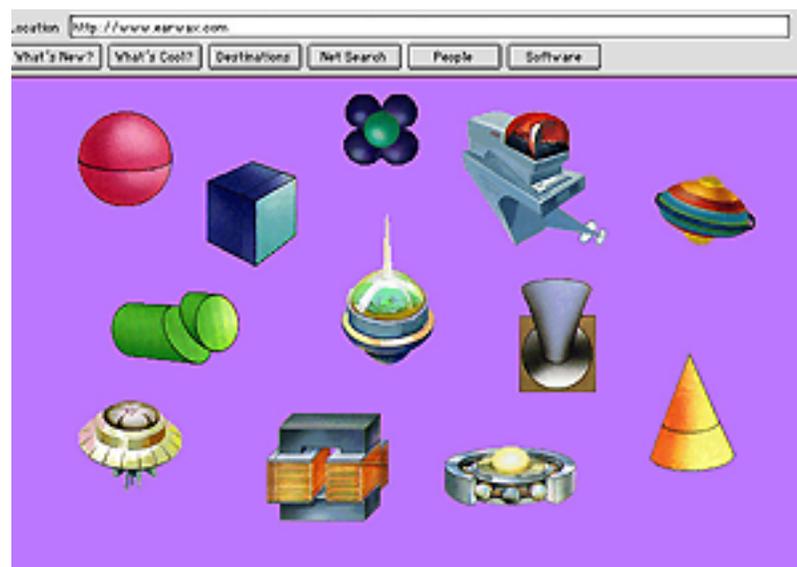
Earwax Productions' Button Bonanza Page

One of our clients, Earwax Productions (http://www.earwax,com), was drawn to the idea of a spatially controlled composition, in which the relative track volumes of a multi-track MIDI mix would be designated by the cursor position on the user's screen. In this way, the user can manipulate any of the twelve tracks that comprise the piece, and customize their own mix through movement.

To achieve this functionality, we set up a system of audio focal points that are invisible to the user, but respond to the proximity of the cursor. The distance to a point increases or decreases the volume of the affiliated track relative to the other tracks, which are all dynamic in the same manner. If the cursor is directly over one of these focal points, all other tracks fade to zero volume, and the track is played solo. If the cursor is placed at the center of the screen, all twelve tracks play at equal volume. Again, this site uses hidden frames to the advantage of the user experience. As the user enters the spatial composition page, one frame loads with the RMF file accompanying that page. After the page finishes loading, while the user is playing the first RMF file, the other frame begins loading the RMF file used for the next page in the site. This enables a more seamless experience between pages of a site.

Sound Tools for the Web

MIDI Technologies:
    Beatnik http://www.headspace.com
    Yamaha MidPlug http://www.yamaha.co.jp/english/xg/index.html
    Quicktime Audio http://www.quicktime.apple.com
    Crescendo http://www.liveupdate.com/crescendo.html
    MIDI Manufacturer's Association http://www.midi.org

Streaming Audio Technologies:
    Liquid Audio http://www.liquidaudio.com
    Real Audio http://www.realaudio.com
    VOSAIC RadioStudio http://www.vosaic.com
    GEO Emblaze.Audio http://www.emblaze.com/atlantis/opening1.html
    Shockwave http://www.macromedia.com/shockwave
    Radio Destiny http://www.dice.net
    AudioSoft http://www.audiosoft.com
    Voxware http://www.voxware.com

Resources

Multimedia Sound and Music Studio, is a comprehensive guide for
multimedia audio production by Jeff Essex published in cooperation with
Apple Computer, Inc. Developer Relations Group for the Apple Media Program and
Random House Reference & Information Publishing. Jeff can be reached at
jeff@audiosync.com and his work viewed at http://www.audiosync.com.

Music on the Net--A Topographic Tour of the Online Music World by
Michael Tchong of ICONOCAST for Liquid Audio, Inc. For an online overview of the
Internet music market see http://www.amp.apple.com/resources/guidebooks.html
(Adobe Acrobat Reader 3.0 required).

Apple Media Program Interactive Media Survival Guides
http://www.amp.apple.com/resources/survival_guides.html

For adding streaming audio to a web site using Macromedia's ShockWave
with Streaming Audio (TM) see Simplified Streaming Audio for the Web by
Leslie Safarik and Laurence Tietz of StudioSoftware (Adobe Acrobat Reader
3.0 required).

The Future of Audio on the Internet

In regard to the future of audio development on the Internet, there is no doubt that
both MIDI and audio data streaming technologies will continue to evolve. Hopefully,
more tools will become amphibious in the process, able to incorporate both MIDI
and audio data information. This will allow artists and designers freedom of audio
content on the Web, as they will no longer need to choose one tool to deliver one
type of aural experience, but rather can manipulate different kinds of audio data
within one environment.

Another development to watch closely is the MIDI Manufacturers Association's
new specification for Downloadable Sounds (DLS). DLS will allow authors to create
downloadable samples for use in wavetable (sample-based) synthesizers, such as
those found on PC sound cards. Presently, the DLS Synth/Author software is
available only for Windows 95.

An important note for the future of Beatnik: Beatnik will soon cease to be a plug-in,
and will be fully incorporated into Java, the next release of which will support the
RMF file format. This is great news for audio content developers as well as their
potential audiences, ensuring that rich sonic experiences are to be had on the
Internet.

About the Authors

Convivial Design is a sound and time-based studio focusing on advanced research, interface design, user-feedback, sound and music, time-based media, digital storyboarding, graphics, and storytelling for film, video, CD-ROM, DVD and the web. As a design and production company Convivial creates compelling experiences and products.

Elise Baldwin
    Director of Sonic Experiences
Elise directs musical and sound design production at Convivial. Her background in theater design and independent film and video-making evolved into opportunities in the multimedia production industry where she has worked foremost as a sound artist, digital video editor, and interactive television producer.

Pat Roberts
    Creative Director and founder of Convivial Design, Inc.
As a designer and producer of interactive digital media experiences, she is adept at putting together creative teams and facilitating collaborative efforts between story, content, media elements and technology. In her role as Creative Director she thrives in applying conceptual designs to products, invents breakthrough production methodologies and encourages individuals to grow and flourish.

George Wadsworth
    Musician, Webster and Network Manager
George's work at Convivial Design includes web authoring, programming, sound design and composition. Drawing on an education in Information Systems and years of gigging with San Francisco bands, he brings a unique blend of technical and sonic knowledge to Convivial's multimedia productions.