Musical implications of media and network infrastructures

Perturbations of traditional artistic roles

Atau Tanaka

20, rue Arthur Groussier
75010 Paris FRANCE
atau@xmira.com

ABSTRACT. *The influence of hypermedia on musical artistic practice is considered. Qualities unique to hyperlink listener interaction and network infrastructure are taken as the fundamental basis to define a musical language for the medium. Network topology creates a space distinct from the time-specific event space traditionally associated with musical performance. Hypermedia access makes the listener a participant in an evolutionary compositional process. This situation puts in question traditional roles of composer and performer. Two network music works are discussed, an installation that juxtaposes network and acoustic space, and a net.audio project where the composer's role becomes one of creating an empty musical shell.*

RESUME. *L'influence de l'hypermédia sur la pratique musicale artistique est présentée. Les qualités uniques de l'interaction entre l'auditeur par hyperlien et l'infrastructure en réseau sont prises comme le fondement essentiel pour définir un langage musical pour ce médium. La typologie du réseau crée un espace différent de celui spécifique au temps – associé traditionnellement à l'interprétation musicale. L'accès à l'hypermédia permet à l'auditeur de participer au processus évolutif de composition. Cette situation met en question les rôles traditionnels du compositeur et de l'interprète. Deux œuvres musicales en réseau sont examinées ; un dispositif qui juxtapose l'espace du réseau et celui de l'acoustique, ainsi qu'un projet net.audio où le rôle du compositeur devient celui de créateur d'une coquille vide musicale.*

KEY WORDS: *interactive music, shared process, network community, process based composition, streaming audio*

MOTS CLES: *musique interactive, processus partagé, communauté en réseau, composition centrée sur le processus, audio streaming*

Actes de H2PTM'01 : Hypertextes hypermédias, nouvelles écritures, nouveaux langages
Lavroisier, 2001. pages 241-250

1. Introduction

Varying experiments in network music have been carried out and previously reported [TAN 99]. Most efforts have concentrated on recreating models of existing musical practice over a network infrastructure – through the organization of remote concerts, or musical instruments spanning a wide-area network [BRO 00]. The work presented here inverts the previous approach. Instead of adapting networks for music, the current work investigates how musical ideas can be conceived that exploit and underscore fundamental technical and humanistic characteristics of the Internet. Two works are presented, "Constellations", a gallery installation; and "MP3q", a web-based listening environment and shared online sound space. Both works are essentially contentless, functioning via HTML links to invoke live streams of audio from sites across the Internet. Much as a traditional musical piece is represented in a notational score, the composition in the case of these two pieces exists as hypertext. It is only at the moment of listening that the piece is manifested in sound following actions of the listener. In addition with MP3q, the interactive nature of the Internet is exploited to allow listeners to become active participants by making musical contributions.

1.1. *Constellations*

Constellations is an installation piece that connects the physical space of a gallery to the imaginary space of the internet through sound and image (*fig. 1*) [TAN 99b]. Visitors in the gallery navigate an onscreen universe of planets, invoking audio to stream into the gallery. The planetary system is the interface to a library of sound files existing on servers throughout the internet. Each planet represents an excerpt from a different composer. The sounds coming from the network space resonate in the acoustical space of the gallery.

Five computers are distributed in the gallery space, each running a copy of the client program. A graphic similar to a planetary solar system rendered real time in 3D provides the visual interface. This is connected to a network audio capability to stream and mix multiple sound files from the internet. Each planet represents a link to a sound file URL. These sounds are in MP3 (MPEG 1 Layer 3) format [BRA 94], and stream in real time into the gallery.

The visitors' actions navigate them through the network space. Selecting a planet causes that planet's associated sound to begin streaming in. The visitor can select multiple planets, causing multiple files to be streamed. Navigation in the planetary space creates mixing based on relative planetary distribution. Each of the five computers has its own speaker system, creating a spatial acoustical network in the gallery.

Figure 1. *Constellations at the Webbar, Paris, 2000.*

1.2. *MP3q*

MP3q is a musical piece viewed on a standard web browser (*fig. 2*) [TAN 00]. It is a client/server system – the browser based client, connecting to a UNIX server. MP3q streams and mixes multiple channels of MP3 audio from different servers on the net. An abstract cube-like structure comprised of text (URL's) can be manipulated by the viewer. The multiple streams are mixed according to displacement and movement of the URL-cube. It is an open system – visitors are also able to contribute their own MP3 sounds as links to be integrated into the system.

The URL cube is in 3D motion following the movements of the mouse. Gliding the mouse horizontally and vertically to allows the listener to navigate and zoom in and out. Clicking on a URL invokes or stops streaming of MP3 sounds while gliding creates a dynamic mix, much as in Constellations. An "add" button allows the visitor to contribute their own sound link to the MP3q project. It need simply be an MP3 file available on a web server somewhere on the internet. By typing the URL and clicking the "send" button, the user's sound becomes part of the MP3q system, and is seen on the text URL cube.

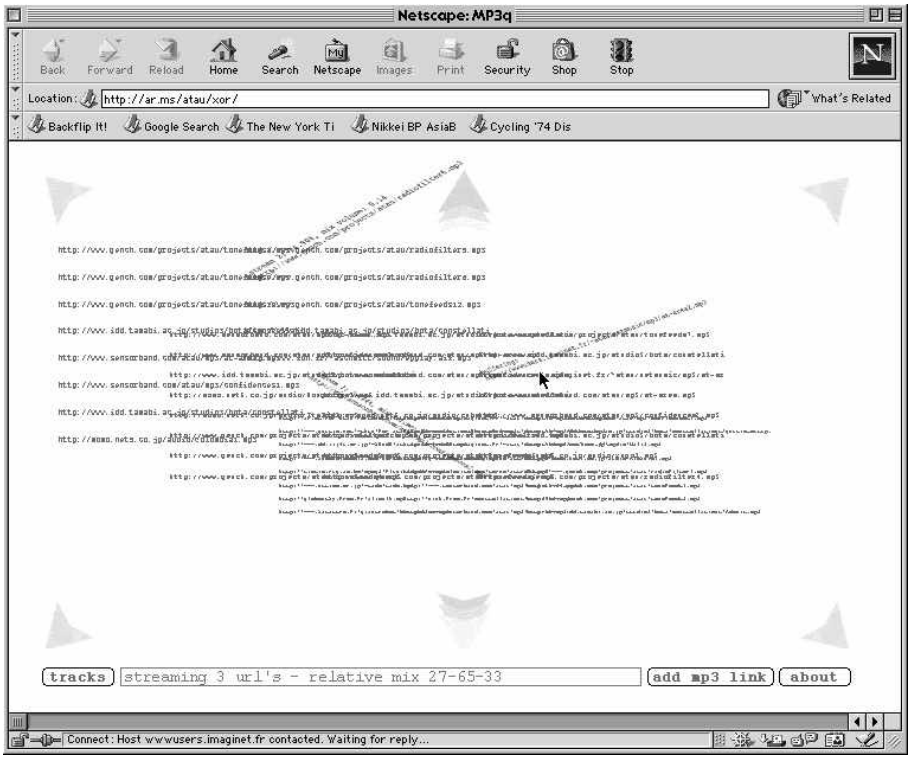

Figure 2. *MP3q*

2. Methods

2.1. *Development platform*

Constellations and MP3q were both developed in Macromedia Director and both share the core MP3 mixing engine, programmed by the author. The choice of a commercial multimedia authoring program was appropriate for the creation of artistic works that involved user interaction to combine sound, graphics, text, and network access. Director's programming code, Lingo, is a scripting language that allows sophisticated object oriented programming, while maintaining a high-level access to media control. The finished project is cross-platform, and can be compiled as a standalone program (as in the case of Constellations), or as a downloadable file (as in MP3q) to be viewed from within a browser given the appropriate plug-in.

2.2. *Server models*

Although the two works discussed here share the core sound engine, they differ in the client/server models they implement. Constellations is based on a server-less, or distributed server, model. Each sound hyperlink displayed on the client screen makes direct access to any server anywhere on the Internet, as indicated by the URL and streams the audio directly and simultaneously from that server. MP3q on the other hand, exists in a tight client/server relationship where any given client is continually in contact with the central project server. The server provides the hyperlink list dynamically to the client at each “track” request. Once a list of URL’s is served to the client, the client reverts to the distributed server mode of Constellations, streaming multiple channels of audio from servers at any location on the Internet.

2.3. *Interface*

In Constellations, the links are represented as graphical objects onscreen – “planets” in rotational motion. Each planet represents a musical unit that has the potential of becoming part of the total mix at any given time. The software responds to a user click by displaying the URL and making an HTTP request to initiate sound streaming from the server in question. With MP3q the client makes CGI requests to a single server to invoke server-side PERL scripts. These scripts execute UNIX file system commands and return the result to the client. There are three levels of interaction between client and server carried out in this fashion. Upon entering the MP3q site, the UNIX file listing command (ls) is sent to the main server, and a tracklist is generated according to the directory listing on the server. Tracks are a series of links - a list of URLs that point to MP3 files across the Internet. Selecting a track sends the UNIX (cat) command to read the playlist. The server returns the playlist contents to the client, and a cube displaying the URL's is generated in vectorized text. Clicking on the URL texts then initiates sound streams in a way similar to Constellations. The planetary space of Constellations is replaced in MP3q with an abstract text mass.

In both works, the visual space responds to user action – the user navigates among the planets or through the text mass. The aural mix of music is dynamic and reflects the visual orientation. In Constellations, planets that are closer to the center of the screen are louder than those that have moved off screen. In MP3q the URLs in closer layers and central to the screen are louder than those in background layers or at the edges of the screen.

2.4. *Generality*

The dynamic mixing of simultaneous streams is a unique capability of the sound engine created for these two works. If the listener selects multiple URLs, the engine responds by initiating multiple asynchronous data streams from different servers. Since each server is simply fulfilling an HTTP request, no special intelligence is

necessary on the server side to allow audio streaming. This allows streams to originate from any server on the Internet, without being cognizant of the special nature of the client. Upon arrival at the client, the multiple sound streams then are mixed by real time amplitude scaling based on the graphical state of the interface. The ultimate "music" heard by the listener, then, is a live blend of the simultaneous multiple streams.

2.5. *Object model*

The client software is constructed using object oriented programming. A base *class* defining a musical unit, is defined. Any objects created using this class has information regarding its associated URL, its playing state (on/off), and volume, among others. In Constellations, a *subclass* is created that inherits these properties, and adds a graphical property that is the rotating planet, along with information on its color, angular velocity, and screen location. In the case of MP3q, a similar but distinct subclass is defined that displays each object as part of the text mass and manages 3-d rotation and zooming in response to user action. In both cases, these subclasses are defined once at development time. At run-time, they are instantiated as many times as necessary, based on the number of items in the hyperlink list. With MP3q, this list is completely dynamic, and is returned by the server in response to a CGI request from the client.

2.6. *Participation*

MP3q implements another component not found in Constellations, that of listener participation. The listener is able to contribute new MP3 hyperlinks by typing a URL and submitting it to the server. The typed text is sent to the server as an argument to the submit CGI call. The PERL script on the server handling this request then integrates the submitted URL into the master hyperlink list, and updates the server side playlist file. The updated playlist is sent back down to the client, where the new link becomes part of the text mass onscreen. Since the new link is written to a file on the server, any subsequent accesses to the piece from other clients will include the new link, making the piece is entirely dynamic.

3. Discussion

3.1. *Accessibility*

Although the tools and techniques utilized in the realization of these projects are similar to those used in the development of commercial multimedia products, the artistic nature of these pieces create a fundamental difference of intended goals regarding accessibility. While in consumer products, interface design is judged by "user friendliness", in these pieces this was not a criterion. Instead, the abstract nature of the interface should hold the potential to give the listener/user the power of

intuition, one that is not strictly deterministic as in commercial software, nor totally aleatoric as may be in process pieces. The goals of the interfaces in Constellations and MP3q are that they should give the user the inquisitive sense to explore further, as well as the sensation of shared space where they are not the sole actor. This hopefully creates a new relationship between the music and listener. Inasmuch as streaming MP3 is exploited, the programs created for these pieces are not classical music player software that replicates a CD player onscreen [WOS 98]. The listener instead encounters an acoustic situation with which they are invited to enter the creative process.

3.2. *Contentless Music*

In neither Constellations and MP3q does the music actually reside in the piece itself. All sound is elicited through hyperlinks. Musically these pieces are empty shells, contentless compositions that, when called upon by the listener, leverage the infrastructure of the Internet to make sound. Constellations is not entirely "contentless" as it contains graphical content and a fixed playlist of links. The physical layout of five computers in the gallery also can be thought of as part of the compositional work that determines its character and ultimately its sound. MP3q is contentless to the extent that there is no musical content in the client, and the interface makes use of no graphical elements. The piece exists only as code that generates a display of hypertext links based on interaction with a server. The contributions from individuals are not stored anywhere on the client/server system: the musical data remains on the contributor's own web server, with only a link being stored on the MP3q server. Both MP3q and Constellations exercise a form of *displaced content storage*, where the actual sound data remains at the point of origin and is delivered only at the time of listening.

3.3. *Space*

Each of the two pieces takes a different approach to the notion of space [TAN 01]. Constellations is an investigation of the relationship and interaction between acoustic space and network space. Sound data spread out across the network can be streamed and mixed by a client program that abstracts and displays network space onscreen as a planetary universe. While not any attempt to accurately represent the actual topological distribution of servers across the Internet, the graphical display suggests the vast but intangible space of the network. Meanwhile the physical distribution of five client machines in the gallery space is a tangible disposition in acoustic space. Much as light can pass through different dialectics of air, water, and prismatic glass, sound in this case is the signal that traverses the boundary between these two spaces.

MP3q being a web site, does not confront the issue of real vs. virtual space, but instead deals with notions of private and public space. The Internet has gained an image as a vast public space where can access information and communicate with others independent of geography. Web surfing is, however, in fact essentially a

private activity – the user is most likely to be solitary, alone in front of their computer screen, detached from their immediate surrounding environment. In this sense, MP3q can be listened to over headphones, becoming an entirely personal experience. At the same time, the music being heard is the music of many different composers, originating from different points on the net. The listener becomes one of the composers upon submitting a link to the piece. This participatory dynamic creates a public space in which each listener/composer takes part.

3.4. *Authorship*

Using the network as the principal musical medium creates new musical social dynamics. In these two pieces, there is no notion of a musical event such as a concert at a precise point in time. There is no physical object such as a CD that embodies a finished composition. The audience's position is displaced with respect to traditional musical roles. Rather than being a passive listener, the public enters the creative process. There is no sound until there is action on the part of the listener, creating a dynamic of *active listening*. And with MP3q, distinctions between listener and musician become blurred as the public has the possibility to add sound links to the system.

If the contentless nature of the composition and shared dynamic of the network have implications for the listener and participant, they have an equally if not more profound effect on the composer. The role of the composer is shifted significantly with respect to traditional musical practice, putting in question the very nature of the title "composer". In these distributed musical systems, we are confronted with a works where the music is not exclusively that of one artist. Still, both Constellations and MP3q are artworks that were conceived and created by one person. The role of the artist, then changes, no longer the one prescribing every note or programming every sound, he becomes the instigator who puts in place an environment or situation, and potentially acts as a filter for an otherwise autonomous activity. Questions of authorship arise: Is Constellations or MP3q the creation of one artist, or are they works where authorship is shared by all those who have contributed sounds to them?

4. Conclusion

Efforts to transpose traditional publishing models to the Internet have raised legal questions. Music has been particularly affected, as formats like MP3 supposedly encourage copying and pirating of copyrighted music. Such activity is not the direct causal result of a format such as MP3, rather it is the problem created by the music industry trying to impose a commodities based economic model on a nonphysical infrastructure. If most MP3 player software takes the metaphor of a CD player and plays one song at a time, this is not a limitation of the infrastructure or of the file format, but rather a limitation of the imagination of the people creating the software and those using the programs. The two pieces presented here exploit network infrastructure and hypertext theory for musical ends. Constellations creates

a dynamic environment for articulations of network information in physical space. MP3q establishes a horizontal social space where traditional musical roles are democratized. These pieces are an artist's reflection of how musical practice is transformed by these mediums.

Acknowledgements

Constellations was made possible by NetFIVE Ltd. and a grant from the Japanese Ministry of Posts and Telecommunications (MPT), 1999. It was premiered at Coexistencias Lisbon, 1999 and shown at Festival du Web, Webbar Paris, 2000.

MP3q is published online at http://fals.ch/Dx/atau/mp3q

Bibliography

[BRA 94] BRANDENBURG K., STOLL G., "The ISO/MPEG-1 Audio Codec: A Generic Standard for Coding of High Quality Digital Audio", *J. Audio Eng. Soc.*, vol. 42, 1994, p. 780-792, AES, New York.

[BRO 00] BROUWER J., "Global String", *Machine Times*, 2000, V2_Organisatie, Rotterdam.

[KON 99] KONSTANTAS D., et al., "The Distributed Musical Rehearsal Environment", *IEEE MultiMedia*, vol. 6, n° 3, 1999.

[TAN 99] TANAKA A., "Network Audio Performance and Installation", *Proc. Intnl Computer Music Conf*, 1999, ICMA, San Francisco.

[TAN 99b] http://www.sensorband.com/atau/constellations

[TAN 00] http://fals.ch/Dx/atau/mp3q

[TAN 01] TANAKA A., « Relier l'espace matériel et l'espace immatériel: les projets de musique en réseau », *Dossiers de l'audiovisuel* , n° 96, 2001, p. 61-64, INA, Bry-sur-Marne.

[WOS 98] WOSZCZYK W., et al., "Networking Audio and Music Using Internet2 and Next-Generation Internet Capabilities", *AESW P—1001 Technology Report TC-NAS 98/1*, 1998, AES, New York.

Atau Tanaka *est compositeur et chercheur. Né à Tokyo, il grandit aux Etas-Unis. A Paris il travaille à l'Institut de Recherche et Coordination Acoustique/Musique (IRCAM) et devient Ambassadeur Artistique chez Apple Computer. Suite à une commande a NTT-ICC en 1997, il s'installe à Tokyo. Il recoit des prix et le soutien du GMD, Fraunhofer Society, et la Fondation Daniel Langlois.*