

# An Exploration of *Cosmic Code*: an Interactive/Multimedia Work for Live Performance

Joseph Koykkar, University of Wisconsin-Madison ([jkoykkar@wisc.edu](mailto:jkoykkar@wisc.edu))

**Abstract:** This paper/presentation will describe the process and technical features of *Cosmic Code*, an interactive, multimedia performance created by composer, Joseph Koykkar, and videographer, Denis Dale. The paper will demonstrate the collaborative concept behind the 20-minute production that integrates projected computer animations and graphics with a live 10-player ensemble. A brief technical demonstration will summarize how Max/MSP is used to trigger still images and animations via MIDI using a Yamaha Disklavier Grand in conjunction with the Director authoring environment software.

## 1 *Cosmic Code*: An Overview

*Cosmic Code* is a twenty-minute collaborative, music-based multimedia work for live performance featuring the combination of acoustic and digital electronic instruments in conjunction with the projection of visual imagery. This work aims to show how the integration of both still graphic images and animations within a digital video context can now be incorporated into the musical experience in a seamless, interactive fashion in a highly synchronized manner without using such traditional timing devices for live performance such as click tracks. It was the goal of the technical aspect of the work to create a technique which would allow the imagery to appear on the screen as it was synched to a musical event--pitches or rhythms. This was of course the exact opposite of what normally occurs in live performance with video/film since, in these cases, the music is always "slaved" to picture via clicks often by incorporating the reading of SMPTE timecode embedded in the video/film.

The imagery in *Cosmic Code* ranging from digital video to photography to animation is projected in front of the ensemble to form a visual environment for the stage. A number of these projected images are synchronized electronically with the music via Max/MSP while three computers projecting video and digital

images are superimposed on the screen in real time. This melding of artistic disciplines is possible because of the interactive aspects of the Max/MSP software and its ability to link to other software tools including Macromedia Director, which is at the core of this project in its attempt to break ground for live artistic collaborations among video artists and composers.

The performance ensemble utilized in the production of *Cosmic Code* consisted of 10 musicians and conductor (oboe, clarinet, 2 violins, viola, cello, bass, Yamaha Disklavier Grand piano, digital sampling keyboard, and percussion). Uniquely, the video artist also "plays" in the ensemble by producing spontaneously generated fractal-like images acting as segues between the larger sections of the work in real-time. These animations are overlaid on the studio-created digital video, which is the visual foundation of *Cosmic Code*.

The work does not pretend to be any sort of documentary illustrating scientific concepts related to astrophysics and the like, but rather a poetic and artistically abstract reaction to the writings of some of the most profound thinkers on science and its impact on civilization of recent times (i.e. Stephen Hawking, Carl Sagan, and Paul Davies). *Cosmic Code* was premiered in March 2003 at the University of Wisconsin-Madison and was most recently performed as part of the

Wisconsin Film Festival in April 2005 in Madison.

## 2 Technical Setup-Overview

Since *Cosmic Code* was conceived to be a live performance music/video event, it needed to have a technical component, which was portable, inexpensive and somewhat easy to setup. The solution was to incorporate three Macintosh computers, three projectors and a single screen. An unique aspect of the production was that the Disklavier triggered visual material via MIDI linked to Director. In fact the vast majority of the digital material triggered was visual in nature (still images and Quicktime movies) rather than musical.

The diagram below shows the overall flow of data, which allowed the triggering of all images/animations with split second timing between the MIDI triggers and the appearance of an image on the video screen. The Yamaha Disklavier acted in performance as both a grand piano and a MIDI controller whose function was to control the images stored in Director. \*

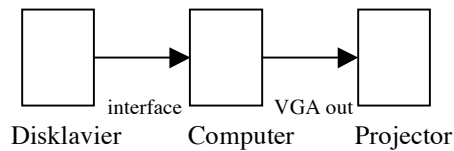


Figure 1. The technical components of the live performance. Note the soft pedal of the Disklavier is used to advance the Max patches.

\* In addition to the above setup using a single projector, two other video projectors were used; 1- to output the studio produced video material for the nine sections (start and stop controlled by the videographer in performance), and 2- to output the improvised digital imagery controlled by the videographer using the G-Force visualizer as needed. All three video projectors were focused on a single large screen for audience viewing.

For the Max to Director link, the IAC (interapplication communication) bus was

utilized. Note that in OS X there is a default IAC port icon which must be initialized in the audio/midi setup for applications to use this port.

### 2.1 Max/MSP, General Navigation

The interactive aspect of the production was based on the pianist performing on the Disklavier using Max patches, which were connected to seven of the total nine sections. These Max patches incorporated the triggering process for the visual imagery that needed to be synched to a musical note or rhythm as decided by either the composer or video artist beforehand. To organize these seven sections in such a way that the pianist could advance as well as return to the work's beginning, the Max patch below was created.

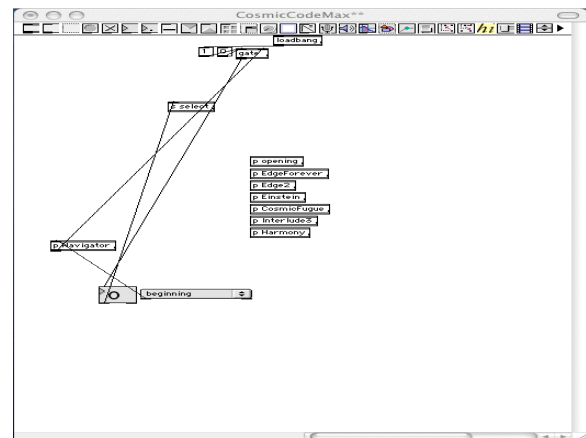


Figure 2. The Max patch delineating the sections and showing the overall navigation. The seven stacked rectangular boxes represent the sections containing imagery. The menu box in the lower left center allows the pianist to select a particular section without having to always start at the work's beginning.

### 2.2 Max/MSP, Detailed Control of Image Synchronization

For Max/MSP to always be at the correct timing to trigger an image or animation during live performance, a



the section *Edge of Forever*. The vertical redline –playback head—indicates playback position on the score timeline.

The linkage from Max to Director was accomplished by the use of software application, Xmidi. This connection needed coding in Lingo script to make the process run smoothly. Essentially Xmidi is searching for certain MIDI note numbers since each note number corresponds to a new frame marker in Director and, due to the IAC port having no connections to a sound module, only launches the image files.

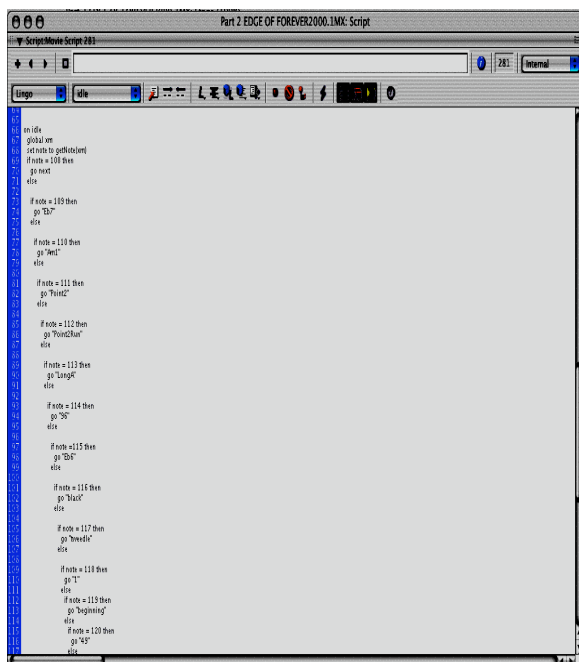


Figure 5. An example of the Lingo scripting in Director used with the Xmidi application.

There was a variety of visual material contained in the “cast member” files in Director with the majority being single digital images. Often a series of such images would be triggered creating the illusion of animation. Also there were instances where animations were incorporated as brief Quicktime movies, mostly in the section of *Cosmic Code* entitled *Einstein’s Dream*.

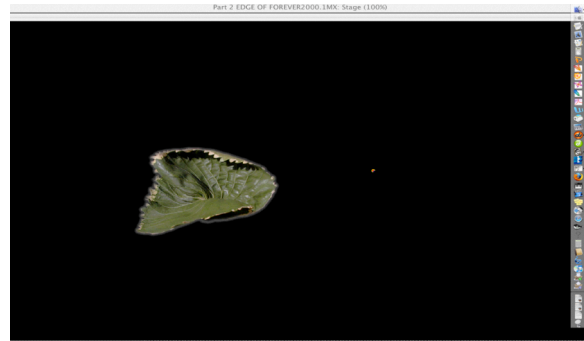


Figure 6.

An example of a single graphic image triggered at a specific point in the Max-to-Director process from the *Edge of Forever* section.

### 3 Summary

*Cosmic Code* is both an aesthetic reaction to aspects of modern scientific thought, and a methodology allowing the video artist to collaborate with the composer in an innovative manner. Through the usage of Max/MSP and Macromedia Director using the Xmidi application, a new approach to the synchronization of visuals to sound and music has been presented.

### 4 Acknowledgements

I would like to thank my colleague, Todd Welbourne, for his invaluable assistance for his programming related to Max/MSP and Director and for his support of the project from inception to fruition. Also I would like to thank my collaborator, Denis Dale, for his brilliant video imagery and his wonderful skills as artistic director of the live performances.

### References

Todd Winkler, *Composing Interactive Music*, (Cambridge, MA: The MIT Press, 1998).

### Notes

A brief demonstration of the above technologies occurred after the paper.

Xmidi is a shareware product that functions as an XTRA for Director allowing the input and output of MIDI. For more information refer to—  
<http://orders.kagi.com/?DSN>