

# Virtuoso Audiovisual Realtime Performance

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## Introduction

Fragments of memories produced both by human beings and by computer generate a synaesthesia of sounds and visuals. The sound of live instruments serves as an interface in an audiovisual interactive concert that merges acoustic instrumental sound and realtime computing into an improvisation. With the combination of intuitive improvisation and realtime computing, we want to create a synaesthetical artwork in which all audio and visual parts contribute equally. While visual images and processes are being generated during the concert, a multichannel granular synthesis fits together minute tonal particles that make up the instrumental sounds into a constantly changing acoustic stream made up of different pitches, durations and positions in the electro-acoustic space. The musical and visual components interact and reciprocally influence each other in order to blend into a unique, synaesthetic, improvisational work of art.

As different forms of machine musicianship are blooming nowadays, we are focusing on a very specialized form of realtime performance with a computer system: virtuoso audiovisual interaction with musical instruments. In this article we describe the development of our own audiovisual realtime computer system and document performances with different kinds of musical instruments. The goals of this project are to create an interface for visual and music computing for an associated audiovisual composition and to create a performance of equal participation of sounds and visuals.

## Computer — The Hyper Instrument

The software system created in Max/MSP/Jitter consists of a pitch and dynamic detection, realtime visual processes and a live multichannel granular synthesis with special controlling and performing methods



Figure 1: Graphics in *The Colours Of A Wooden Flute*

while the musical instruments are played in the style of contemporary composition/improvisation. All computing devices, the audio detection, the visual and the audio processing are linked via a wireless LAN to influence each other reciprocally.

The multichannel granular synthesis processes the instrumental sound in realtime, spreading its sound on an eight channel sound system, rearranging those in terms of pitch, time, order, playback direction and position within the acoustic environment. For the visual processing we developed a patch in Max/Jitter called *ModularFilter*. It either takes a live video input, for example the performer, or some prepared pictures and movies as a source for further visual processing.

There was always a desire to stimulate the brain by a combination of audio and visual effects: for example, the light of coloured glass in the strong acoustic of churches, light organs, simply hooked up by frequency response, in the disco music era up to today's high-tech audiovisual shows of popular music events, and countless more examples of contemporary artwork.<sup>1,2</sup>

Our approach reflects the same desire of making sound visible and visuals audible, but differs from the approaches described above in following issues: to make sounds and visuals of equal importance in a performance, to create a virtuoso associated audiovisual composition/improvisation in an electro-acoustic space and to play the computer as a hyper music instrument.

The interaction is multiple: Three modules of our computer system, the audio analysis, the multichannel granular sound synthesis and the interactive visuals, interact with the performers, who are an acoustic musical instrumental player and the electro-acoustic hyper instrumental player. The computing system is exchanging data between analysis, audio and video computing for a two-way digital communication. The mapping of this data, of course, is an important decision made by the artists. Last but not least, there is interaction happening between the musician and the granular synthesis performer: as usual in a musical improvisation, the musician and granular synthesis performer react to each other's sounds and both to the computer aided creation of the visuals.

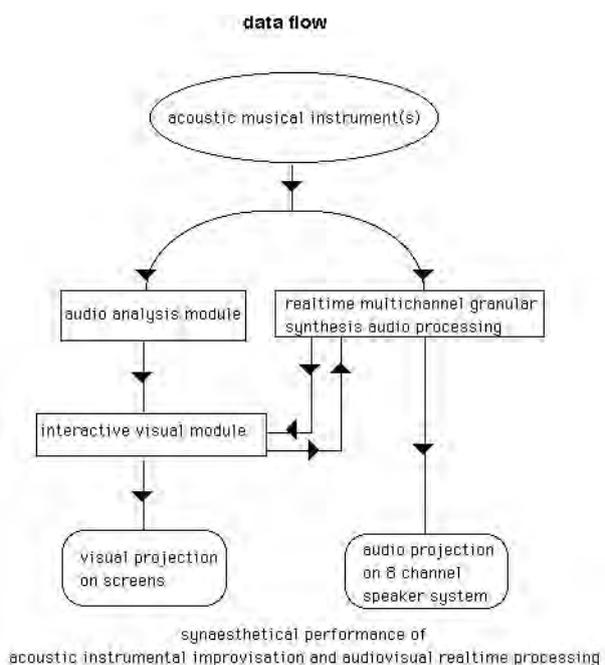


Figure 2: The overview of the data flow

## Musical instrument as interface

The acoustic musical instrument is not only acting as a musical instrument, but also as an interface for the computing system. We performed with different musicians with modern western instruments as well as Japanese, Korean and Chinese traditional instruments.

The acoustic musical instrument is controlling the creation of the visuals in realtime and the instrumental sound will feed the granular synthesis distributed on eight channels depending on the live performance. In our experience also the architecture of the concert hall or the performance space has a strong influence on the sound and interaction, as the loudspeaker tends to feed the processed sound again into system through the microphones, which we sometimes emphasize as a special effect.

We used various instruments as audio input and controlling devices in performances worldwide: The audiovisual realtime performance *The Colours Of A Wooden Flute* is performed by a bass recorder, which is

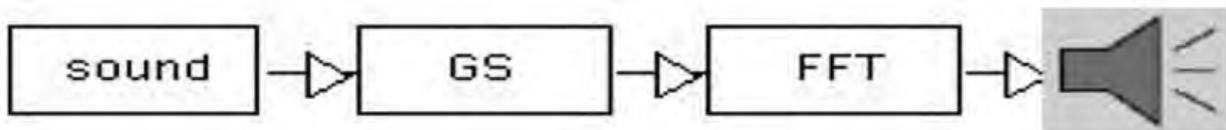


Figure 3: One channel realtime audio processing with FFT filter after granular synthesis

a wooden flute with a very low register and a smooth sound, using contemporary playing techniques like multiphonics. We use an arco-piano and our audiovisual interactive computer system in the improvisational performance *Interlude for Pi and for Io*. Arco-piano is a special contemporary technique of performing the piano with hairs of bows, which gives a very sophisticated sound of the piano. As these instrumental sounds naturally have a very long sustain we implemented a dynamic threshold system to avoid multiple triggering. In marked contrast to this we performed with a yang-qin, a traditional Chinese hammered dulcimer with a near-squared soundboard, which has strong attacks and a short sustain. Together with our computer system it represents the performance of *Erinnerung in jedem Laut*.

## Conclusions and Outlook

We have already combined the multichannel granular synthesis with other filter functions. For example with the utilization of FFT filter (Fast Fourier Transformation) after the multichannel granular synthesis we can approach very delicate accentuating effects i.e. some specific frequency will be punctuated and some will be softened, especially as these effects are moving differently in all eight channels.

Currently we are working on extending the system for a chamber ensemble or a group of instruments. We plan to separate the granular synthesis as well as the analysis functions and link the parameters of individual instruments to form a complex visual response to a live audio event.

Recently we introduced an interactive score that will conduct the ensemble.

We also hope to develop a system in which the visual events cause reasonable audio responses, to achieve equality of both the audio and the video domain.

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1 Chion, Michel. 1994. *Audio-Vision, Sound on Screen*. New York: Columbia University Press.

2 Centre Pompidou. 2004. *Sons & Lumières*, Une histoire du son dans l'art du XXe siècle, catalogue of the exhibition im Centre Pompidou.

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