

Macaroni Synthesis: A Creative Multimedia Collaboration

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Introduction

The Creativity and Cognition Research Studios (C&CRS) were established for the purposes of developing new art and technology projects and to conduct research into the creative process. In the COSTART Project 1998-2003 an innovative approach to the study of technology-based art founded on practice-led research methods has been developed. The work centers on the practice of art making. In this paper, we report on the particular innovations associated with one of the residencies; that of Yasunao Tone, an artist who was awarded the 2002 Ars Electronica Golden Nica prize for Digital Music. Tone has been changing calligraphic characters into images, then the images into sounds. The artists and technologists explored sound representation in real-time (interaction between image and sound).

The COSTART Project developed a new approach to the study of technology-based art founded on practice-led research methods. The artist-in-residency is at the heart of the process but it is a residency that differs in a number of important respects from the conventional type. First, it is a fundamental part of the approach that a residency support team with specialist knowledge about both technology and art practice is established. The team has expertise in many forms of computer systems, programming languages and devices but equally important is their personal involvement in music and visual arts practice both as researchers and practitioners. In addition, the environment into which the artist-in-residence comes is designated primarily for their use rather than on a guest access basis. Artists are invited to submit a proposal for a new project and to specify both artistic and technical needs. The research team carries out feasibility studies into each proposal as to whether the requirements can be met and whether it has sufficient challenge technically. The research exercises involve collecting data about the collaborative creative process that takes place in the core event, a five-day residency. This period is followed up with further development work in preparation for the exhibition of works that arise. The study data is analysed ready for publication in reports and papers. It is central to the approach that the research process and the creative practice take place in tandem and that the experience for the artist represents a realistic situation. See *Explorations in Art and Technology* by the authors.

A Residency Study

Yasunao Tone is often associated with the Fluxus group that began in the 1960s. Throughout the 1960s and 1970s Fluxus evolved into an international art movement, notorious for its refusal to accept traditional ideas about art, culture and authorship. Tone has pursued a totally new relationship between text and sound: *Molecular Music* is (1982-5) is an earliest experiment as such. The piece is based on the poems written in Chinese characters including three poems from the Tong Dynasty as well as the 8th Century Japanese poem. The piece employs the sound-generating system includes light sensors attached on the film screen and oscillators connected to light sensors, so that the film projected on the screen creates varying sounds in accordance with the specific arrangement of the sensors and the changing brightness of the projected images.

Yasunao Tone's process for working with the conversion of calligraphic drawings into sound is very time-consuming involving as it does changing first Chinese characters into images and then the images into sound. Such time scales restrict the use of real-time interaction with his work. The aim for the residency project was to explore the possibilities of sound representation in real-time. The intention was for the development of a program for performance that could focus on the interaction between image and sound. The instrument that was developed made it possible to do live performance in which,

instead of having to transform the text into images with pictogram-like Chinese characters, the artist draws calligraphy on the board and transform any text into sound.

The concern throughout the residency was how working with an artist of this nature influenced the process of making the work, and how a rejection of prescribed methods, tools and structures changed the way in which software systems were developed. This activity was further complicated because the apparent divide between the work and the means of making the work. So there was no point at which we were making simple tools or technical solutions that would later be used by the artist to produce the work itself. In the pre-residency discussions, it had seemed that it would be interesting to make data about his drawing gestures available computationally. The idea was that he would use the *Soft-board* in our studios. This device looks like an ordinary whiteboard but has the additional capability to detect the position of a pen on its surface. This information is output via a serial cable and can be used to keep a dynamic record of developments in a meeting, for example.

When it was suggested to Yasunao that a variation on granular synthesis to generate sounds could be used, he said that his idea was more like ‘macaroni synthesis, because it already had a form’. Tone explained what he meant by that:

Y	Oh!... I have a piece called “Molecular Music” which... the title itself is “My Dissatisfaction with Computer Music”. Computer Music is a kind of... started from atom. Yes..... so I start from molecules not from atom. And this time I told Mark “This is a macaroni”...its developed through the granular synthesis. Granular synthesis is ...he obtains certain small tiny bits of a wave form and in the building, so doing you have to make a pitch how you make yours, you have to do the same thing as I know, take academic computer music So I don’t like that. So instead of grain I use macaroni.
C	Well there’s some cooking required after that.
Y	Yes cooking
C	Is it cooked macaroni first or...the basic ingredients.
Y	Yes basic ingredients
C	the performance is the cooking?
Y	Right

When the team try to imagine a system that transforms the movement of a pen into a sound they almost inevitably started to think in a certain way – to define a complex system of conditions, choices, relationships, behaviors, where a given input is mapped to a particular parameter and a certain kind of intervention has a certain kind or result. This kind of method seems true of most explorations of correspondence between image and sound through interaction.

According to this approach a perfect system might be one that is flexible enough to generate an almost endless series of tonal variations, yet be controllable enough so that each one makes musical sense. In making such a system we primarily concern ourselves with two types of question, firstly about how data is mapped to sound, and secondly how we might operate the system, how we know what it will do under certain conditions and how we become skilled in its use. The ultimate assumption is that the system is a tool or instrument of expression, and that this knowledge will enable the artist to control the system, so the he or she can articulate and communicate something about their feelings or beliefs. There are works that employ the opposite approach, ones that make the relationship between input and output problematic by creating systems that range from seemingly random, to ones whereby the uses grasps some sense of what they are doing, but are unable to understand fully. It was known in advance that Yasunao’s work embodied the polar opposite of these issues. Accepted knowledge gained in addressing such issues would be called into question (or even, totally ignored). Such work not only challenge ideas about art, technology and creativity but, in doing so, presents new perspectives on sound and image correspondence, generative systems and human computer interaction in a widest sense.

A New Instrument for Interaction

The interaction device made during the residency uses the *Soft-board* upon which the artist draws a series of strokes. The *Soft-board* sends information about pen color, and pen position to software that is used to synthesize sound. Projected onto the soft board is a sequence of video images selected by the artist. As the artist draws, the video image advances frame by frame. Data is taken from the x-y co-ordinates, the speed of movements and mapped to synthesis parameters. The fundamental frequency of each sound generated is determined by the brightness of the pixel. Each pixel has brightness that generates frequencies in the range 0hz to 10khz. The brightness value is also used to multiply the amplitude of the sound, which results in distortion. When the pen is placed on the surface, the volume is switched on and when the pen is lifted off the volume is silenced. Thus, sound is only heard when the pen is on the surface. When the pen is placed at the outer extremes of the board along the x axis (to the far left and far right) only the fundamental frequency is present. As the pen moves closer to the center the harmonic content is changed, the first harmonic is introduced, then the second and so forth. The speed of movement in the x axis (horizontal) is used to determine the volume of sound. Slow movements in this direction create quite sounds, and fast

movements create harsher sound. At the very center of the soft board drawing area, a small square is defined. When this area is drawn in it produces white noise.

The Artist's Viewpoint on the Collaboration

“..I was lucky enough to have been assisted by Mark Fell who had known my previous work and understanding my ideas suggested me to use Soft-board for the visual to sound conversion. The system of SoftBoard has detect movements of hand drawing with the markers on the board with the accuracy of pixel by pixel, then the drawn lines are converted to binary data and stored in a computer for processing.

The program that using Max/MSP enables to make parametric variants through scanning lines of video image from the harmonics we create beforehand. Also, it makes possible tracing positions of moving hand with a marker to coincide the sound distribution of pitches and timbers. So a stroke of calligraphy or tracing outline of an image invokes great variety of sounds. Soft-board has advantages over other device I have used, which are:

First, it makes possible to do in live performance situation, by combining with Max/MSP. Second, when I have created pieces I mentioned I had to transform the text into images, which is only possible with pictogram like Chinese characters. With Soft-board I don't need to transform Chinese characters into images but simply draw calligraphy on the board. Also, it enables any text into sound. In only five days it was quite an achievement”.

Conclusions

In the Yasunao Tone residency, a highly challenging view of human-computer interaction was taken. It led to the development of a quite novel interaction device that formed the core base of a new creative performance artwork by Tone. The nature of the study undertaken, in which the roles of artist, technologist and researcher were allocated equal place, was highly effective in stimulating innovation. As well as enabling valuable research into the creative use of technology, the approach can be used to stimulate the creative development of technology.

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