Variations: An Interactive Musical Sculpture

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ABSTRACT
Variations is an ongoing exploration of multi-channel and interactive music experienced through a sculptural interface. The interface functions as a means by which participants can create their own mix of the music by interacting with elements of a sculpture that consists of individual modules composed of a cube that contains a speaker, a tube and a removable ball that controls which channel of music they hear. Since one or more individuals may interact with the sculpture at any given time, there is an infinite variety of music that can be heard. This paper will discuss the evolution of the sculptural interface and the creative approach used in composing multi-channel and interactive music.

Author Keywords
Digital Art, Electronic Music, Installation, Interactive Music, Interactive sculpture, Interface, MIDI, Multi-channel music, Music, Sculpture, Sound Art

ACM Classification Keywords
J. Computer Applications; J.5 ARTS AND HUMANITIES; Arts, fine and performing; Music; Fine arts

INTRODUCTION
Variations is a modular sculptural system by which multi-channel music can be experienced. It provides the participant the opportunity to mix several channels of music by interacting with the sculpture, and in doing so, create their own version of the composition. This is accomplished through a passive interface consisting of a cube containing a speaker which is playing a single channel of the music, a tube through which the sound is directed, and a removable ball, which controls the amount of sound reaching the listener. The intent of the sculpture is to increase the involvement of the participant in the music they hear. Other than the sculpture, the only cue the participant has regarding their interaction is a small card that reads "Move the balls, Mix the music". This encourages the participants to interact with the sculpture and gives them a cue to what the result will be. In addition to the sculpture, CD players are generally installed in the vicinity of the sculpture to provide viewers with the opportunity to listen to a stereo version of the music through headphones, as well.

The music is composed in multi-channel format using either DVD (five channels) or DVD-Audio (6 channels), depending on the particular configuration of the sculpture. Since the sculpture is modular, various configurations can be made, depending on the musical compositions and/or the gallery/museum installation. The content of the music generally takes two directions: soundscapes and/or electro-acoustic music, although they are not mutually exclusive. Soundscapes begin with location sound recorded in either a sequential or multi-dimensional manner, which is then enhanced with melodic and rhythmic components. The electro-acoustic music is composed using MIDI guitar and percussion synthesizers, as well as traditional acoustic instruments. The end result is an infinitely variable musical experience for the participant.

BACKGROUND
Variations was conceived to provide a means by which museum visitors could experience music in a participatory and tactile manner. It first began in 2001 as a commission to interpret the compositions of the Beligian artist and composer Jan Mensaert at the Museum het Toreke in Tienen, Belgium. I was also invited to compose original music to include in the installation, as well.

The initial idea for the installation started as a table with variously shaped holes that could be covered and uncovered using different metallic shapes. While this idea may some day be realized, it was discarded in favor of a sculptural approach using the cube, cylinder, and sphere approach. This idea had a geometric simplicity and a more direct interface. It was also modular, which gave it the flexibility to be expanded and reconfigured easily. As we will see below, the three versions of the work that have been exhibited to date all use different configurations of the installation.

Before the final modules were built, a 3D computer graphic visualization and proof of concept model were created. The proof of concept model was a small cardboard cube lined with foam, using a plexiglass tube and styrofoam ball. Figure 1 shows the 3D computer graphic visualization.

C&C'05, April 12–15, 2005, London, United Kingdom.
ACM 1-59593-025-6/05/0004.

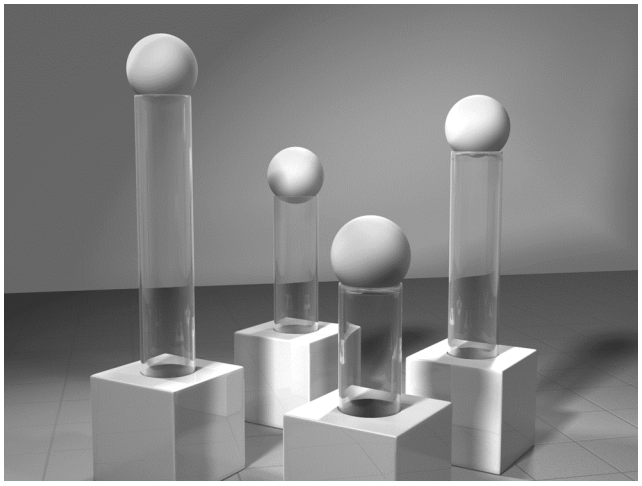

Figure 1. A 3D computer graphic visualization of Variations created by Yaron Canetti and Sheng-Fang Chen.

Upon review of a videotape of the proof of concept model being used and the 3D computer visualization, the commission was approved and the construction of the modules was undertaken. The modules were built by the museum staff and ranged in size from 100 –140 cm. Figure 2 shows the final installation.

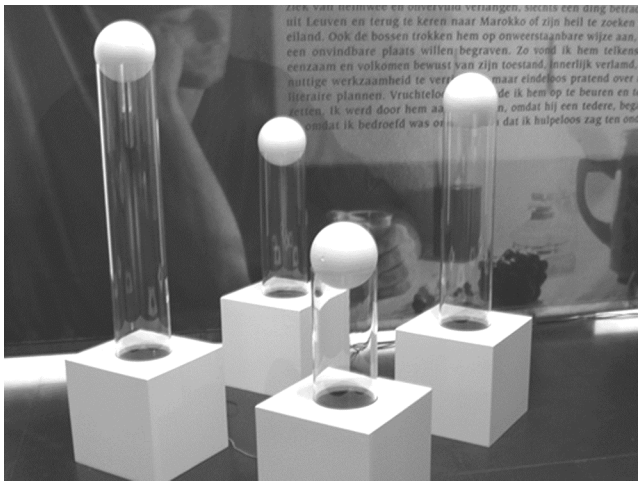

Figure 2. Photograph of the final installation.

In this version, the music was played back from two stereo minidisk players with one speaker in each module, rather than multi-channel DVD audio. The music for this installation was composed using four channels.

Variations 703 was exhibited at the SIGGRAPH 2003 Art Gallery in Los Angeles, and was the second installation of the Variations. While the same modular concept of the cube, tube and ball was incorporated as the interface, the final physical form of the installation was quite different. Rather than use large modules as the only sound source, a dual array of sound sources including four PA speakers and six sound modules was used. Small modules approximately 28 cm in height were used. Copper tubing replaced the plexiglass tubing for aesthetic reasons.

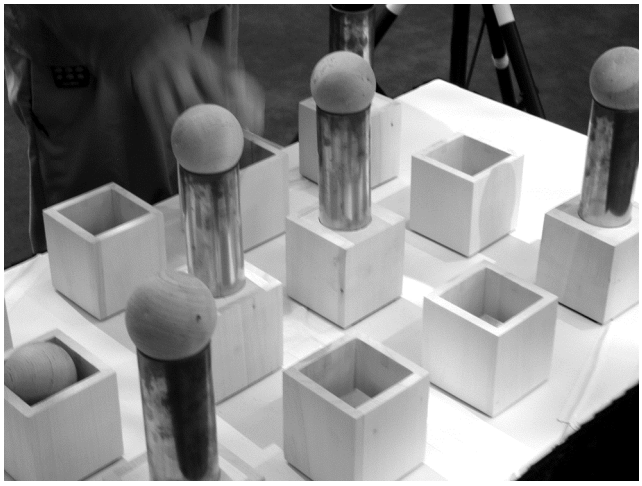

Figure 3. The smaller modules used copper tubing and cubes were used to hold the balls when they were not on the tubes.

The addition of cubes to hold the balls added a game-like component to the installation. A total of twelve elements were used in the installation, six sound modules and six empty cubes. These were placed on a pedestal, under which the DVD player and amplifiers were stored. Surrounding the pedestal were four large speakers on stands at the height of a normal person, as shown in Figure 4.

Figure 4. The smaller modules were surrounded by four large speakers on stands (three visible here).

This resulted in a larger area for the sound to be heard that was, to some extent, self-contained. Four of the six channels were fed through the speakers and all six channels were fed through the six small modules. The result being that when all the balls were on, the sound was louder on the outside of the installation. When all the balls were off, the sound was louder inside the installation. This gave viewers the ability to create a truly three-dimensional sound space when they played with the balls.

Variations 704 was exhibited in May and June of 2004 as part of the First Beijing International New Media Arts Exhibition held at the Millennium Museum. This version had yet another configuration of the small modules. In this situation, four channels of sound were used and a matrix of

nine cubes was designed, with the four sound modules at the corners, the four empty cubes in-between and a null cube in the center. While the smallest of the three configurations, it was also the most personal and was more often used by a single person, rather than multiple players. The installation is shown below in Figure 5.

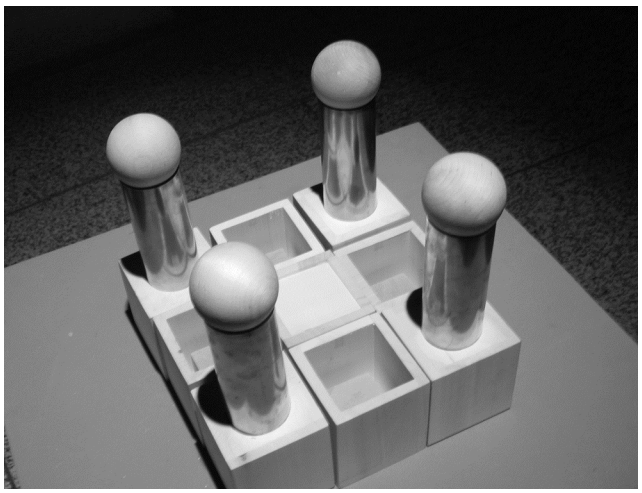

Figure 5. Variations 704 at the Millennium Museum in Beijing

In addition to the installation, the sound art and music was also presented on CDs with headphones in a stereo version, as seen in Figure 6. This gives listeners an idea of what the composer intended the final stereo music to sound like. There are times when different mixes are included on the CDs, as well.

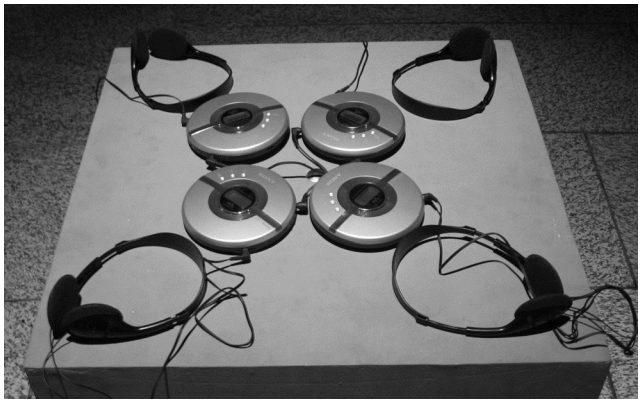

Figure 6. CD players with the music and sound art in stereo.

While the actual installation for Creativity & Cognition 2005 is still in the planning stages, the above explains some of the ideas that are behind the sculptural part of the work. In the end, it is really about the music. By creating an environment and interface which not only support the multi-channel music, but also induce the participant to concentrate on the music by giving them the opportunity to create their own version of it, all the elements work together and contribute to the overall involvement with and appreciation of the musical experience.

COMPOSITIONAL PROCESS

Composing music and sound art for multiple channels is a daunting task. Coming from the background of a blues and jazz musician performing in clubs in New York City, Variations offered me new musical and sound art territory to explore. A live performance is immediate, real-time and improvisational. The acoustics in the room are the best that one can achieve at the moment. As such, this type of performance has great appeal and presents many challenges. When translating this experience into multi-channel composition and a studio/museum environment, there is much that can be brought from this past experience. Improvisation plays a large part in my compositional process. Also, similar challenges of live sound are often met in the museum and gallery environment with ambient noise, and less than ideal acoustic environments, such as marble floors and hard walls and ceilings. As mentioned above, the multi-channel music and sound art I create generally fall into two categories: soundscapes and electro-acoustic music.

Soundscapes begin with a location recording. It may be a particular sonic environment that catches my ear, or it may be a recording of a journey or extended period of time. Examples of sonic environments can be as mundane as my back yard, or more exotic locations like the morning church bells in Florence, Italy or the birds and insects in a Buddhist garden in China. What inspires me to select these locations as the basis for the soundscapes is usually some sort of strong emotional reaction or spiritual feeling generated by a particular environment. In the case of journeys, I am looking to create something that might be called “audio cinema”. That is, taking the listener on an acoustic journey that can stimulate their imagination. Music, as well as books, offers something that video and photographs cannot. They act as triggers for the imagination, rather than presenting something that is literal. One of the most telling comments on this topic I ever heard was in an elevator. Two people were having a conversation and one of them asked, “Have you heard this group’s new song?” The second answered, “No I haven’t heard the song, but I saw the video.” While music videos have opened up a whole new world of creativity, one of the downsides is that the imaginative aspect of the music has been compromised by the video that now defines the visual look of the song.

Getting back to the compositional process, the recordings of the static environments form the basis of the composition. It may be looped, but is generally used as is. The original location sound is commonly recorded in stereo, but I have also used multiple microphones to get more dimension from the sound. I listen to the sound over and over and begin to pull out the rhythmic and melodic elements of the sound. These trigger musical, as well as percussive phrases. I then lay down several tracks of music and percussion, both sonically as well as with MIDI tracks. I then use the MIDI tracks to experiment with different synthesizer voices for the instruments and percussion. Along with this, I will add

acoustic instruments and percussion. As this process moves forward, multiple channels of music are now evolving.

The electro-acoustic compositional process is primarily an improvisational and intuitive one. There are times when a particular musical phrase enters my mind and I try to carry a small recording devise (digital keychain recorder, digital camera or video camera), so that when this inspiration strikes me, I can record it. I sing the phrase into the recorder and then use that as the basis for a more elaborate musical interpretation later in the studio. As mentioned above, the use of MIDI tracks to audition different voices is also a technique I employ. This happens either with instrumental voices or percussion voices. As a composer, I have found that this technique greatly expands the way that I can think about and approach the music. Ethnic instruments, in particular, can radically change one's interpretation of a musical phrase.

The nature of the interface plays a large part in the composition of the individual tracks. The goal of this type of music is to have a coherent sound when all the channels are playing together, but also allow for the raising and lowering of the volume for individual tracks. Most often, I use melody or percussion tracks as the mixable elements at the interface level. I also strive to have the melodic and percussive elements complement each other, so that should the listener decide to hear them together, they will not compete with each other. This is accomplished during the compositional and mixing stages by listening back to various combinations of the channels in the studio and playing with the volume of the channels much the same way a gallery or museum visitor would play with the sculpture. I will also make rough mixes of the music and burn a DVD and work with it using the sculpture. As mentioned above, there is some sound that leaks through the cubes when the balls are on and this plays a part in what the overall sonic experience is.

Once I am satisfied with the overall composition, the process of spatialization then begins. I work with ProTools software, which allows for precise and real-time positioning of sound from each of the channels. For example, soundscapes are given three-dimensional ambience. Additional effects, such as panning a train sound from left to right, or having a bird fly across the space, can also be produced in post-production. I often mix natural and synthesized sounds together or have them interact with each other. The same process of burning test disks is used and the particular work now evolves into its final form. Once this is finished, a stereo mix is made of the music for listening with headphones, or through a stereo system.

CONCLUSION

The ultimate concern of this artwork is to increase the involvement of participants in the music. The passive interface of Variations allows them to create an infinite variety of mixes, especially when multiple individuals are interactive with the work. The sculpture also serves as an aesthetic vehicle for the delivery of multi-channel music. By providing a game-like interface with the simple instructions of "Move the balls, Mix the music", participants easily understand the intent of the work. The evolution of the different configurations of the work was explained with images from the three exhibitions to date. Insight into the compositional process of the author was presented, both from a musical perspective, as well as how the music integrates into the sculptural interface.

ACKNOWLEDGMENTS

I would like to thank all those individuals who have contributed to the creation and evolution of this work, including Margaret Harrell, the staff at the Museum het Toreke in Tienen, Belgium, Michael Wright and the 2003 SIGGRAPH Art Gallery, and Zhang Ga, Tsinghua University and the Millenniun, Museum in Beijing. I'd also like to thank Yaron Canetti and Sheng-Fang Chen for the 3D visualization, Paul Geluso at Harvestworks for engineering and mastering, and Chuck Hancock and Joe Taino for their musical contributions. All photographs by Bruce Wands. Thanks also go to Linda Candy, Paul Brown, Janis Jefferies and the rest of the C&C 2005 staff.