Engravings for Prepared Snare Drum, iPad, and Computer

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ABSTRACT

This paper describes the technologies, collaborative processes, and artistic intents of the musical composition *Engravings for Prepared Snare Drum, iPad, and Computer*, which was composed by Timothy Polashek for percussionist Brad Meyer using a jointly created electro-acoustic and interactive musical instrument. During performance, the percussionist equally manipulates and expresses through two surfaces, an iPad displaying an interactive touch screen and a snare drum augmented with various foreign objects, including a contact microphone adhered to the drumhead's surface. A computer program created for this composition runs on a laptop computer in front of the percussionist. The software captures sound from the contact microphone and transforms this sound through audio signal processing controlled by the performer's gestures on the iPad. The computer screen displays an animated graphic score, as well as the current states of iPad controls and audio signal processing, for the performer. Many compositional and technological approaches used in this project pay tribute to composer John Cage, since the premiere performance of *Engravings for Prepared Snare Drum, iPad, and Computer* took place in 2012, the centennial celebration of Cage's birth year.

Keywords

composition, interactive music, iPad, John Cage, prepared snare drum, percussion

1. INTRODUCTION

Engraving is the art of incising a design onto a hard, usually flat surface, by cutting grooves into it. *Engravings for Prepared Snare Drum, iPad, and Computer* directs the percussionist to create and sculpt in sound by performing gestures on an iPad and a prepared snare drum through tactile and interactive processes. A computer, fed by a contact microphone on the drum and wireless signals from the iPad, renders these inputs into sound and displays a score consisting of a series graphical images based on statistical data from the state of Kentucky for the performer to interpret and "engrave" through time.

2. THE PREPARED SNARE DRUM

Brad Meyer created the prepared snare drum by modifying the drumhead of a standard snare drum. Although snare drums are usually used to produce sound by being struck with drumsticks, the prepared snare drum is equipped with a contact microphone to capture and amplify softer sounds created by rubbing, tapping, and scraping. Six tightly-wound metallic springs that vertically protrude

through the drumhead are struck to create a quick, "ping-pong ball bouncing" effect. A trapezoidal piece of sandpaper is taped onto the drum, which is scratched with the hand or a knitting needle to create a granular, white noise sound. One side of a pair of Velcro strips is glued to the drumhead. When the free side is slowly pulled away from the other fixed one, a light popping sound is created, or a louder hissing sound when pulled quickly. A small chain is looped through the head and drum shell to create an "infinite growl" sound. An attached rope is pulled on with the fingernails for a dark, rubbing sound. A rectangular section of attached moleskin enables muted sounds when tapped or scraped. Also, a small rubber ball that has been cut in half and attached to a wooden skewer is used to create a nontraditional "lion's roar" effect. It can also create muted whale-like sounds.

Figure 1. Overhead view of the prepared snare drum.

3. REFLECTING JOHN CAGE

The premiere performance of *Engravings for Prepared Snare Drum, iPad, and Computer* took place in 2012, the centennial celebration of Cage's birth year, and several decisions in the technological design and composition of this piece are inspired by Cage's work. The previously described prepared snare drum is inspired by Cage's tendency to modify traditional instruments and to score for "found" objects, such as tin cans, radios, and flower pots, which are non-traditional musical instruments, to produce compositions such as Cage's *Water Walk* [2] and *Sonata and Interludes* [1] for prepared piano.

Cage is well-known for creating graphic scores and implementing aleatoric procedures to make musical decisions, therefore Timothy Polashek decided to combine both approaches in the composition of *Engravings*. Polashek searched through images providing statistical data about his home state of Kentucky on the internet. Some of the randomly returned images, for example, show the Annual Mean Temperature of Louisville, Kentucky, the Unemployment Rate in Kentucky (1975-2012), the Kentucky Coal Mining Production and Employment (1979-2008), the 2009 Kentucky Derby Positions

Through Race, and the Gamma Radiation Gross Count Rate in 2011 for Lexington, Kentucky. Thirty-eight of these images were selected to form the score for *Engravings*, and Polashek created a computer program, written in the MAX language [3], to sequentially display them to the performer along with a red, vertical cue line, which moves from left to right over each graph. Again paying homage to Cage, the perucssionist is given the instruction to perform on the prepared snare drum and iPad with improvised gestures that mimic the process of engraving the shapes and lines presented in the current image. Conversely, the performer is also instructed, at times of his or her choosing, to decide to improvise freely and to ignore the graphs, or to musically respond to unseen and unheard gestures and sounds of an imagined performer that is responding to the graphs. As the cue line is moving through a score image, a small copy of the next image is displayed to the upper right of the current image in order to help the performer create seamless musical transitions between the given images.
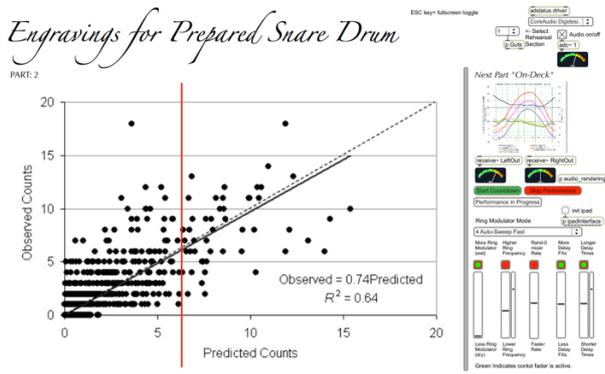

Figure 2. The computer animates for the performer a cue line moving from left to right over the graphic score for the current section (left) while providing a preview of the next section's graphic (upper right), audio level indicators and system controls (middle right), and iPad control states and override controls (lower right).

4. iPAD INTERFACE AND AUDIO SIGNAL PROCESSING

The role of the iPad in *Engravings for Prepared Snare Drum, iPad, and Computer* is to provide the performer with a tactile interface of controls for a variety of audio signal processing algorithms that extend and transform the timbres of the prepared snare drum.

The iPad wirelessly sends control signals to the program running on the performer's computer, which does the actual audio signal processing of audio captured from the contact microphone on the prepared snare drum. The signal processing features ring modulation, frequency modulation, and delay effects, which are routed to speakers for the audience.

During performance, the performer uses the iPad interface to choose different behavior modes for the audio signal processing of the prepared snare drum. Three of the modes ring modulate the signal with an oscillator whose frequency is also modulated at performer selectable slow, medium, or fast rates. There is also a randomizer mode for the oscillator feeding the ring modulator that randomly alternates its frequency in rapidly or slowly changing rhythmic pulses. Another mode allows the performer to manually control the frequency of the oscillator. For all of these modes, the performer has control over the mix level ratio of the ring-modulated level to the original signal. The performer also has control of a delay/echo effect,

including the effect level and delay time. If the performer changes the delay time, after several seconds, it will gradually sweep back to the default delay time, which eases the workload of the performer and facilitates the utilization of accelerating and decelerating rhythmic effects. Although these audio signal processing algorithms are relatively simple, but quite flexible, the performer can predictably combine multiple iPad control gestures with various percussive gestures on the prepared snare drum to synthesize a great variety of both static and transitioning timbres, ranging from acoustic to electronic, pitched to indefinitely pitched, metallic to wooden, and inharmonic to harmonic spectra.

Figure 3. Prepared snare drum and iPad positioned for performance. Visual interface on laptop computer screen (cropped out of picture) is centered below and in front.

5. CONCLUSION

Engravings for Prepared Snare Drum, iPad, and Computer is a collaborative work between composer and performer in the joint development of performance technology, a fusion of acoustic, electro-acoustic, and digitally interactive musical frameworks. The purpose of this work is to maximize the diverse and expressive rhythmic and timbral potentialities of the prepared snare drum by empowering the percussionist with simultaneous and equivalent expressive control of both acoustic and electronically processed sounds. In addition, this work commemorates and reflects upon the widely influential approaches and philosophies of composer John Cage in honor of the centennial of his birth.

6. REFERENCES
[1] John Cage. 1946-48. *Sonatas and Interludes.* Edition Peters, EP 6755.

[2] John Cage. 1959. *Water Walk.* Edition Peters, EP 6771.

[3] Cycling74. 2012. *MAX.* http://cycling74.com/products/max/

7. ADDITIONAL RESOURCES

1-Video recording from a performance of *Engravings for Prepared Snare Drum, iPad, and Computer*:
https://www.youtube.com/watch?v=mu9cQBrejjU
2-Timothy Polashek's website: http://www.tdpmusic.com
3-Brad Meyer's website: http://www.brad-meyer.com/