Revisiting Cagean Composition Methodology with a Modern Computational Implementation

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ABSTRACT

The American experimental tradition in music emphasizes a process-oriented – rather than goal-oriented – composition style. According to this tradition, the composition process is considered an experiment beginning with a problem resolved by the composer. The noted experimental composer John Cage believed that the artist's role in composition should be one of coexistence, as opposed to the traditional view of directly controlling the process. Consequently, Cage developed methods of composing that upheld this philosophy by utilizing musical charts and the *I Ching*, also known as the Chinese *Book of Changes*. This project investigates these methods and models them via an interactive computer system to explore the use of modern interfaces in experimental composition.

Keywords

Multi-touch Interfaces, Computer-Assisted Composition

1. INTRODUCTION

American experimental composers characteristically reject conventional approaches to musical compositionthe consistent and controlled arrangement of harmonies and timbresand instead advocate process-oriented methods. For this reason, the focus of artistic creativity in experimental music naturally shifts from the final composition to the processes employed to arrive at it. The act of composing in itself becomes an "experiment," a concept from which the genre/style takes its name, where a problem proceeds to a resolution [1].

John Cage is regarded in the world of experimental music as one of the most well-known and prominent composers whose composition style was heavily influenced by Eastern philosophy, with a specific emphasis on Zen Buddhism. Cage would come to believe that an artist should coexist with the experimental composition process rather than attempt to control it, a direct influence of his philosophical interests [2]. As a result, Cage began incorporating chance into his methods of composition, most notably in the form of the Book of Changes, otherwise known as the *I Ching*.

The *I Ching* is an ancient Chinese text embodying Taoist philosophy as the balance of opposites and is often used as a divination system [3]. A set of sixty-four oracular statements are represented by unique symbols called hexagrams, composed of six stacked solid lines (yang) and broken lines (yin). Hexagrams are formed as the pairing of two trigrams, the primary unit in the text, of which there are eight: heaven, earth, thunder, wind, water, fire, mountain, and lake. An individual traditionally consults the *I Ching* by tossing coins or drawing colored beads to construct a hexagram, thereby leading to a statement in the text. Cage transformed the functionality of the *I Ching* into an experimental composition process by linking hexagrams to a corresponding set of unique musical phrases. This allowed for hexagrams to be constructed in the conventional manner of tossing coins, the order of which would determine the series of events in a composition.

Our work revisits Cage's composition methodology by emulating this practice through the use of modern computing technology. A software application is developed for a multi-touch surface, allowing an individual to construct a series of hexagrams corresponding to a library of pre-recorded samples, ultimately producing a composition. This project explores the concepts of process-oriented composition and coexistence in the context of advances in human-computer interfaces and computing power to identify new directions and unrealized potential in American experimental music.

2. PROJECT OVERVIEW

A modern implementation of John Cage's compositional methodology using the *I Ching* is realized with the goal of further exploring the role of technology in experimental composition. The system consists of a laser light-plane multi-touch table interface and a software application developed in the Super-Collider environment. Algorithms are designed to construct compositions based upon a user's chance interactions with the system from a library of pre-recorded samples.

2.1 Multi-touch Surface

Incorporating state-of-the-art human-computer interaction, a prototype laser light-plane multi-touch table is selected as the interface modality for our system [4]. The table consists of a glass surface mounted on a wooden frame, four infrared lasers positioned at each corner, and a camera/projector assembly disposed underneath. When active, the lasers create

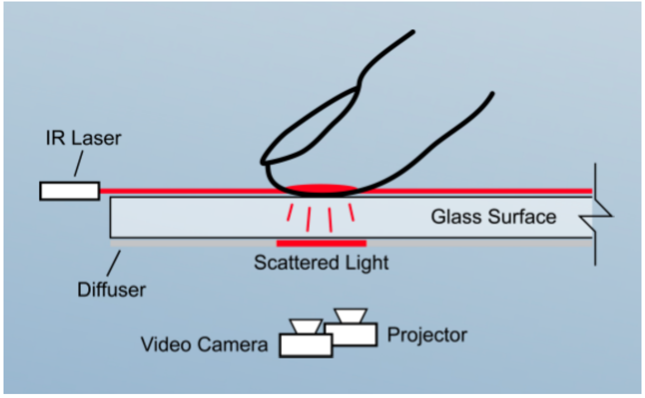

Figure 1: Diagram of laser-light plane technology.

a millimeter-thick plane of infrared light that is invisible to the human eye. Upon breaking this light plane however – as with a touch or placement of an object – the infrared light is reflected downward and captured by the camera, as diagramed in Figure 1. This video signal is processed in real-time by Community Core Vision (CCV) algorithms to perform touch detection and tracking [5], which allow the table to act as a human input device. Concurrently, the computer relays video information to the projector, casting an image onto the glass surface. A 7.1 surround sound system is positioned radially around the table to provide the capacity for immersive spatial audio.

2.2 Software Implementation

A graphical user interface is designed to emulate the process-oriented nature of Cage's original implementation consisting of five items, as shown in Figure 2: the palm reader, hexagram and symbol display, composition buffer, play and record buttons, and a color wheel. The composition process proceeds by a user first placing his or her hand on the palm reader, initiating a randomization algorithm to construct a hexagram. Once generated, the hexagram and its symbols are shown in the display area and the corresponding musical sample is played. Pressing the record button stores the sample in the composition buffer, at which point the user can repeat the process. At any point in time, the user can press the play button to hear the current status of the composition or use the color wheel to control a two-dimensional effect on the sound, where the x-axis controls harmonic distortion and the y-axis adjusts a tremolo frequency.

This software application was developed in the SuperCollider programming environment. The software architecture consists of a central processing object and three interfacing objects to communicate with the camera, surround sound system, and projector. CCV communicates with the camera interface object and reports touch information to the central processing object. Audio feedback is passed to the surround system via the audio interface object, while visual interface adjusts the information sent to the projector.

3. DISCUSSION

Through the development and use of our implementation, we have gained significant insight into using technology to expand upon methods of experimental composition. It is important to recognize that it took Cage months to compose

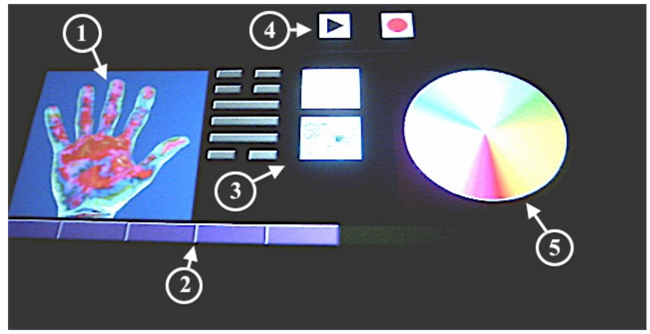

Figure 2: The Graphical User Interface of our implementation, from left to right: (1) Palm Reader, (2) Record Buffer, (3) Hexagram Display, (4) Play and Record Buttons and (5) Color Wheel.

using the *I Ching*, after having written the musical phrases himself. Our implementation allows an individual to quickly construct hexagrams, which presents the potential to extend the role of the *I Ching* and further embody the concept of coexistence. This could be achieved by using the process to first create the sixty-four phrases that are subsequently used in composition.

We have also observed that our implementation of John Cages methods can be utilized as an educational tool. A large multi-touch surface introduces the opportunity for truly collaborative experimental composition and learning. The system provides methods for allowing students to experiment with the composition process through an alternative means to traditional musical notation. This encourages creative expression in music composition for students, particularly young children, who are not fluent in staff notation. Further investigation into the system's merits as an educational tool will surely provide a more comprehensive understanding of its true potential.

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