Williams [re]Mix[er]: An Interactive I Ching Composing Program

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Abstract

Demonstrated here is the operational phase of the composer/presenter's project to design the protocols and implement, with the co-presenter/programmer, an interactive, octophonic, I Ching composing program, the Williams [re]Mix[er] (WRM). Its functionality is modeled on the compositional processes invoked by American composer John Cage (1912-92) to create his Williams Mix (1951-53) (WM), the first octophonic, surround-sound, tape composition. These processes were extrapolated and applied from years-long analyses by the composer/presenter of Cage's 192-page score, his sketches, and the eight monaural tapes for WM. What took Cage and his collaborators nine months of recordings, coin-tosses, score notation, and thousands of small pieces of tape measured, cut, and spliced together to complete the first realization of the WM score and tapes is accomplished--after collecting the requisite library of recorded soundfiles--in only a few minutes of computation time. Indeed, the default settings used in operating the WRM are Cage's own parameters, derived from the analyses. With the program's graphic user interface, the default values for the parameters may be changed by the user to experiment and substitute alternative, weighted distribution values to achieve a variety of compositional results.

1. Background

The process of creating John Cage's first realization of his octophonic tape piece, Williams Mix, involved the precise cutting/splicing of tape recorded sounds to create eight separate, reel-to-reel, monaural, 15-ips magnetic tape masters for the 4-minute, 15-second piece. The work's score is, as Cage referred to it, a kind of "dressmaker's pattern--it literally shows where the tape shall be cut, and you lay the tape on the score itself." Cage explained further in a published transcript of a 1985 recorded conversation with author Richard Kostelanetz that "...someone else could follow that recipe, so to speak, with other sources than I had to make another mix." Later in the conversation Kostelanetz observed, "But, as you pointed out, even though you made for posterity a score of Williams Mix for others to realize, no one's ever done it," to which Cage replied, "But it's because the manuscript is so big and so little known." (Kostelanetz 1996)

Intrigued by Cage's implicit invitation to "follow that recipe" the composer/presenter embarked on a project in summer, 1997, to create just such a new realization of and variations on the score of WM. Presignifying the development of algorithmic composition, granular synthesis, and sound diffusion, WM was the third of five pieces completed in the Project for Music for Magnetic Tape (1951-54), established in New York City by Cage and funded by architect Paul Williams. (Chadabe 1997) (Note: The other tape pieces were, in order of completion, Imaginary Landscape No. 5 (Jan., 1952) by John Cage; For Magnetic Tape (1952) by Christian Wolff; Octet (1953) by Earle Brown; and Intersection (1953, withdrawn) by Morton Feldman.) Involved as ongoing collaborators were, first, pianist David Tudor, then electronic music pioneers Louis and Bebe Barron, and finally composer Earle Brown, among several others. The score for WM was completed in October, 1952, as well as much of the realization itself for the eight magnetic tapes, those finally completed by Cage and Brown on January 16, 1953.

1.1. Analysis, restoration, and sound collection

In early 1998 the John Cage Trust provided the composer/presenter with a color-xerographic copy of the score of WM, as well as associated sketches and commentary by Cage on the compositional process involved in the original realization for eight magnetic tapes. The original manuscripts are housed in the American Music Section of the Lincoln Center Library branch of the New York City Public Library. The Trust subsequently provided digital audio tape copies of the eight earliest, extant-generation, reel-to-reel masters of the piece from the Trust's archive of Cage's works. With the score and tapes the analysis could begin of the precise relation of the recorded sound events with their I Ching-determined parameters in the score. Out
of this first, two-year phase came the restoration of the original eight tracks of tape, transferred to the digital, octophonic medium for either digital soundfile output from a computer or playback on an eight-track digital audio tape recorder. This newly restored WM, in fact, becomes the first movement, The Theme Restored, of the composer/presenter's Williams [re|Mixer|ed] octophonic tape piece. (Austin 2000) Since first starting the project the composer/presenter has continued to collect new sounds for the new, recorded library of nearly 600 sounds, according to Cage's six sound categories of city (A), country (B), electronic (C), manually produced (D), wind produced (E) and small sounds (F). Cage stated in various interviews and writings that he had collected and drawn from a library of 500 to 600 sounds; the actual number of different recorded sounds used in the Cage score for WM is 350, their iterations totaling 2,128.

1.2. Cage and the I Ching (The Book of Changes)

In WM Cage invoked I Ching chance operations for compositional decisions: 1) the duration of successive time-segments, which are the "structural division of the whole into parts" of the piece; 2) the density and relation of sounds-to-silences, which is the form and "morphology of continuity" of the piece; 3) the choice of which sounds in which of six categories of sounds; 4) the determination of the duration of sounds and silences; 5) the single or double combination of these sounds; 6) the attack/sustain/decay ramps of each sound; 7) the timbral variation of the frequency, overtone structure, and amplitude or the unchanged constancy of each sound; 8) the striation (pulsation) or not of each sound; and 9) the panning among tracks and/or the overlapping of sounds on the same track. (Cage 1960)

Cage's method of mapping numbers to parameters of the piece derived from consulting the I Ching three-coins oracle, where heads = "1" and tails = "0": three coins are tossed six times to create, from bottom to top, two trigrams combining to form a hexagram or gua. Where the compositional choice to be made was simply yes or no, Cage tossed one coin, heads or tails to obtain the answer; in other situations he drew a number from a deck of cards like the Tarot deck to replenish the numbers in the 8X8 charts with numbers 1 to 64. (Cage 1959)

2. The Williams [re|Mixer|er]

It was during this intensive period of restoration and analysis of the relationship between the score and Cage's realization that the composer/presenter's concepts about the nature of the projected new realization of WM focused more clearly. They had evolved toward what Cage would have done himself in creating new realizations of WM. A clue about how he might, himself, have made a new realization was given by Cage in an unpublished portion of a 1966 interview with Kostelanetz about the nature of the process of creating the first WM realization. Explaining the process of deriving numbers from the I Ching by tossing three coins six times, he suddenly exclaimed, "Now, this is all remarkably like a computer!" Indeed!

Cage, by 1966, already understood that a computer program could be written which would invoke the I Ching and could, for example, yield ever-new WM scores. Such new realizations could be based on the same protocols of music composed by process and chance operations that Cage had created in his pre-compositional sketches, a program that creates ever-new "dress patterns" and "recipes" modeled on the compositional process--itself derived from the I Ching--of creating that first "pattern" or "recipe". In fact, in 1968 Cage and Lejaren Hiller engaged programmer Ed Koblin of the University of Illinois to write such an I Ching program as one of the key subroutines in the main program, "HPSCHD", to use in their collaborative computer music composition, HPSCHD. (Koblin 1970) Cage did, indeed, go on to use that "ICHING" program and subsequently other I Ching programs written for him as a compositional tool for many other pieces years after.

The composer/presenter analyzed Cage's score and sketches over and over, noting the characteristics and statistical distribution of each parameter of the piece. From these analyses, programming protocols were designed which could be implemented as effective I Ching algorithms in the way Cage used his own chance processes.

2.1. The Williams [re|Mixer|er] computer program execution protocols

Through the tossing of coins, Cage asked the oracle of the I Ching to answer the questions he had about the morphology--form--of WM, what events were to occur and when and how they were to relate. Form--the sound, the silence, and the space of the piece--subsumed all: form was the wholeness of the piece, the shaping of musical time and space through change. From the number and duration of the WM "structural units"--time-segments--to the duration of each of the recurrent pattern of six time-segments in each group--hexads--to the density of sound/silence events in each hexad to the selection of sounds, their category, combination, and transformation through the course of the piece, chance operations and how they would be invoked--asking the oracle--determined the piece's form and effect. It was found through intensive analysis of the morphology of the WM score that Cage formulated the right questions: the answers are the genius of the piece.

Through analysis--mainly listening, comparing, counting, and measuring--the composer/presenter discovered trends in the piece's morphology that established distributive weightings of its parameters statistically, shaping the form of the piece. These perceived, counted, measured trends became models for the protocols he designed that, when extrapolated and implemented in the WRM computer program, could replicate the original piece with new choices, freshly
made: ever-new realizations and variations. What follow are summaries of the protocols designed for the computer program algorithms implemented for the WRM.

2.2. Score to sound output

The WRM interactive computer program functions in two overall phases: 1) the first phase, where the *I Ching* subprograms calculate and write parameter data to the software sound synthesis csound score textfile; and 2), the second and final phase, where the csound orchestra "plays" or "perfs" the csound score to an 8-channel digital soundfile, ready to be performed to eight speakers surrounding the listener in a 360 degree circle. (Note: The platforms the WRM GUI application presently runs on include Linux, LinuxPPC, MacOS X (with X11R6), and IRIX with possible future ports to Windows 98/NT/2000/XP and MacOS (classic environment)).

2.3. Program execution

a: At execution time the program orders and labels all soundfiles in the soundfile library folders, A, B, C, D, E, and F, then generates 16, 8X8, 1-64, non-repeating gua charts (arrays).
b: The program now asks the user for the number of time-segments to be generated from the gua charts, in multiples of 6—called hexads. The time-segment (TS) default parameters WM come from Cage's 66 successive "structural units", time-segments marked by Cage at intervals by a vertical line through the score system. Hexads are successive patterned groups of six time segments. The default is Cage's number of 11 multiples of 6 hexads or 66 time-segments.
c: The program now generates the parameters of each successive time-segment, including the density of sound-events in each successive time-segment following the determination of the number and parameters of the time-segment hexads.
d: The program now determines the category (A, B, C, D, E, or F), combination (single or double sound), variation type (constant (c) or varied (v) in its frequency (f), overtone structure (os), and amplitude (a)), and length of sound sources in each successive time-segment, tracks 1-8, with each sound followed and preceded by a silence of N duration, including zero silence.
e: After the category, combination, variation and length of sound events in each successive time-segment, tracks 1-8, have been determined, the program now determines the type and duration of the attack and decay ramps of each sound event, track by track.
f: The program now determines which sound events in which of the tracks will be panned to which other tracks through its duration.
g: After the program has determined the durations, category, ASD of each sound event in all the tracks, the program now determines whether a sound event in a time-segment in a track will be striated (pulsated) completely or partially and at what rate.
h: The program now compiles the parameter data and writes the final csound score, ready to be "perfed" by the WRM csound "orchestra", with its numerous "instruments" for playing the selected soundfile extractions, processed (v) or not (c) by various filter instruments (comb, bandpass, hi/lo pass, alpass, etc.). At output the 8-channel soundfile is generated, ready to be played and heard.

2.4. Monaural and stereo imaging

The sounds originally recorded for Cage's WM were monaural. Each sound was heard from a single speaker on a single track. The sounds recorded for the WRM library are stereo and are heard in adjacent speaker pairs, projecting a rich stereo image all around the circle of eight speakers, depending on the track for the sound event.

2.5. The Williams [re]Mix[er] soundfile library

Cage mused: "I think that the principle of collage is very important in all aspects of the century, hmm?...in our hearts." (Retallack 1996) The heart of the WRM is the soundfile library of sounds the composer/presenter has collected and continues to find for its ever-new, *I Ching*-determined spatial collages of sounds. Cage, too, intended his own library of sounds to be a dynamic, not static, collection. (Note: WM was only Cage's first "mix" of a "library of sounds". Others followed with other collections--mixes--using other sources and other means of collection: *Fontana Mix* (1958), *Rozart Mix* (1965), *Newport Mix* (1967), *Bird Cage* (1972), *Instances of Silence* (1982), and on.)

At this time, there are 548 total stereo soundfiles in the WRM library, specifically by category: A, 127; B, 92; C, 81; D, 60; E, 146; F, 42. As time goes on, one can choose or not to remove or add soundfiles to each category. Or, as is the case of the composer/presenter's new composition, Williams [re]Mix[ed], in its six middle movements, the composer/presenter has chosen to place just one category of sounds in all six categories to create the Six Short Variations for A-city sounds, B-country sounds, C-electronic sounds, D-manually produced sounds, E-wind produced sounds, and F-small sounds.

In the present WRM library, the duration of each different soundfile ranges from as short as 20 seconds to as long as 90 and averages about 60 seconds. These nominal durations have been found to allow a variety of different sound events. In each run of the program, of course, the *I Ching* chooses a different number and combination of soundfiles and durations of sound-events to be selected from the soundfile library. When a particular soundfile with a particular duration is chosen from a particular category, the program extracts that duration from the current beginning of the soundfile. If the soundfile has been previously selected and a sound-event
duration extracted, the new sound event duration is extracted from the end of the previous selection's sound event duration, so marked or "flagged". If subsequent selections of that soundfile reach the end of the soundfile, the program "wraps around" or "loops back" to the beginning of the soundfile selection. This process is modeled on the tape-segment cutting/extraction system that Cage and Brown described. That is, such extractions would always be measured and cut from the head of the particular tape segment pulled out of the appropriately labeled envelope, which apparently contained a sizable number of such tape segments. (Note: It is interesting to note here that no "backwards" sounds were found in WM, meaning both that Cage and Brown always cut from the proper end of the tape, that is the head, and that the Barrons never prepared any "backwards" sounds for the library, nor were any notated in the score.) Of course, there was no way to "loop back", once a tape-segment length was exhausted or the duration of the sound event called for was longer than the remaining tape segment.

The sounds found, categorized, and collected for either Cage's "library of sounds" or its modeled incarnation as the WRM computer soundfile library were subject both to chance and taste in gathering each collection. Cage's six broad categories were conceived and selected by him, even though he, the composer, gave great freedom to the Barrons to choose the actual sound sources of the recordings themselves. The composer/presenter embraced Cage's categories but was nevertheless selective in what sounds or sound situations were recorded and included in each category. In both, the final arbiter of choice for the material chosen was the I Ching.

3. The non-conclusion: the Nth realization

Cage wrote: "It is thus possible to make a musical composition the continuity of which is free of individual taste and memory (psychology) and also of the literature and 'traditions' of the art. The sounds enter the time-space centered within themselves, unimpeded by service to any abstraction, their 360 degrees of circumference free for an infinite play of interpenetrations. Value judgments are not in the nature of this work either as regards composition, performance or listening. The idea of relation being absent, anything may happen. A 'mistake' is beside the point, for once anything happens, it authentically is." (Cage 1952)

On the last page of the score for WM, Cage inscribed, "(4 min. 15 sec. +) End 1st Part. N.Y.C. Oct. '52 Splicing finished Jan. 16, 1953." Dare we imagine that John's spirit is slyly laughing now, asking the oracle, "Is this the 2nd Part, the 3rd or the 4th?" Once more, envision. Listen and enjoy, again and again.

References


John Cage, "Four Musicians at Work" (New York, Trans Formation: Arts, Communication, Environment: A World Review, 1952)


