

Found Musical Objects

Johnson's paper discusses the theory and process through which his musical compositions are derived. Before explaining his process it is important to understand a little history of the evolution and understanding of Art. Traditionally only the creations solely created by the individual have been considered Art. "The Fountain", a urinal presented as Art by Marcel Duchamp, is the first recognized attempt to challenge this notion. While not originally recognized over time the idea of using "readymade" or "found objects" has become widely accepted as a viable medium of creation.

Central to Johnson's work is the notion of a "found object". Although most found objects are physical things, Johnson proposes that there is no reason an abstract entity such as mathematics cannot provide good readymades. In fact he argues that mathematics offer a variety of properties that make them particularly suitable. First, he believes, that since numbers are infinite an eternal then music derived or linked to numbers are able to transcend to the infinite and eternal as well. Additionally he is interested in enabling the music to some how "do what *it* wants" and believes the self containing structure of automata help achieve this goal.

There are essentially three types of objects that Johnson describes; Automata, Cycles and Groups. He begins with a simple example of an automata to show us what exactly he means by a mathematical object and how he uses this to create a piece of music. The example is basically a simple recursive function

$$n \rightarrow n, n+1, n$$

that creates the following infinite sequence

010121010121232121010121010

This sequence can then be translated into musical notation by creating a mapping from numbers to musical notes. He continues with two other examples based on similar automata using the same basic process.

The next mathematical object he describes is Pascal's triangle that inspired three separate pieces, the first two of which are significantly different than his previous automata work. Pascal's triangle is a way of describing all the possible chords in an octave, 2^{13} minus the empty set and single keys = 8178 chords. In this case the mathematical object did not describe an infinite sequence, but a set of musical objects to perform.

Melodic Loops & Cyclic Groups are the final type of objects he elaborates. These are types of mathematical formula that produce sequences of numbers which divide groups into interesting sub-groups, usually by producing subgroups which are replicas of the original sequence. The "Rational Melody 15" is his first self-replicating piece and a simple example to show what he means. He starts with the constraint of finding a 15 note sequence that has the property that playing only the odd notes will produce the same melody as the entire sequence (only half as long). The sequence he produced is:

AGGFGEFDGFEDFDDAGGFGEFDGFEDFDD

A G G F G E F D G F E D F D D

He concludes the paper with two more interesting problems proposed by Thomas Noll and some theoretical advancements by the mathematician Markus Reinke.

Johnson's essay is an interesting example of working within constraints to inspire creative works and focus musical ideas. This paper also delves into interesting philosophical questions such as, what is music? He suggests it is "in the notes", while his contemporary Grisey argues it is "in the sound" but concedes there is probably some middle ground. In his attempt at trying to maintain a level of purity and highlight the structure of the mathematics questions of context, point of view and objectivity are also brought to the forefront of the analysis.