Permutable

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ABSTRACT

In this paper, I describe the interactive musical artwork *Permutable*. This artwork was created with the algorithmic software system *Tweakable* by the same author and can be found on the web at https://tweakable.org/jwvsys/permutable.

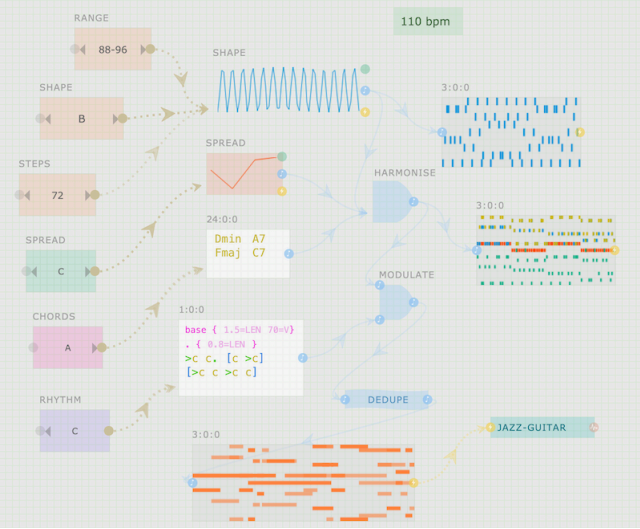

Figure 1. The components used in *Permutable*, as seen in the edit user interface of *Tweakable*

1. INTRODUCTION

As Leigh Landy discussed in *What's the Matter with Today's Experimental Music? Organized Sound Too Rarely Heard* [1], parametric approaches to making music stretch back to Cage, Stockhausen, Babbitt, Messiaen, and Xenakis, in their attempts to take serialism further, exploring how parameters such as dynamics, pitch, and rhythm could be split out and recombined.

Since then many artists (Robert Rowe, Clarence Barlow and David Cope et al) have further explored the possibilities of parametric music creation, details of which are beyond the scope of this paper. Software systems such as the astounding *Opusmodus*[2] specialize in providing parametric composition environments, but they are designed for the specialist user and are not accessible to the non-musician/programmer.

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2. INCLUSIVITY

Permutable aims to bring this approach to composition to the public in the form of an interactive musical artwork, enabling users to create sections of a composition by changing the parameters of a pre-defined structure.

Users of the artwork can make their own parameter selections to form a customized section of the composition. Once submitted, the system will examine the user's choices and musical relationships between existing sections, and append or insert the new section into the continually evolving composition while it plays in real time.

While the permutations are virtually limitless due to the number of parameters and values that can be set, the possible outputs are all constrained by the same underlying rules of the system. Because of this, each section will have some harmonic, melodic or rhythmic relationship with one or more of the other sections.

Permutable aims to bring a sense of exploration and improvisation to people who are not necessarily skilled musicians, generating curiosity amongst users of the artwork, to encourage an enquiring spirit to think and wonder about music and its ingredients.

3. PARAMETERS

The following parameters can be changed to customize a section of the composition.

3.1 Shape

The music generated by Permutable originates from a simple mathematical function. The shape parameter controls the selected function, options for which are variations of sin(x), and the start and end (x) values from which the output (y) value will be read to define the 'shape' of the initial melody.

3.1.1 Steps

The output melody is further defined by the number of (x) points sampled from the function, which is called the shape steps parameter.

3.1.2 Range

The shape range parameter governs the upper and lower limit of the output pitch of the melody

3.2 Harmonize

The Harmonize component has three inputs: shape, spread and chords. It outputs multiple parts that express a harmonized version of the input shape.

3.2.1 Spread

The spread parameter controls the density (the number of voices/parts) of the resulting harmony, and the upper and lower

pitch range of the parts. The starting note of each part of the harmony is spread across this range with slightly greater density in the upper register.

3.2.2 Chords

The chords input provides information about the harmonic progression, expressed in standard chord notation. The Harmonize component uses this information to constrain the parts generated by spreading the input shape over the spread pitch range to fit into the notes of the specified chord progression.

3.3 Modulate

The next step is to take the output from the Harmonize component and modulate it with a rhythm, as selected by the rhythm parameter.

The rhythm is supplied to *Tweakable* in script form, a custom notation which allows for some expression by defining accents (>) and note lengths (. and _). Square brackets delineate successive subdivisions of the overall defined phrase length (borrowed from *Tidal Cycles* [3] notation).

3.4 Dedupe

Finally, the output from Modulate passes through a process to remove repeated notes create sustains instead.

The dedupe process actively effects the rhythmical output of the music.

4. USER INTERACTION

As a web application, the piece can be experienced in a web browser, with either headphones or speakers connected to provide the audio output.

When installed in an exhibition, the visuals should be projected onto a screen and the audio output via speakers so that observers can experience the piece while someone is interacting with it and creating content.

To create content, users tweak the available settings to create a bank of presets, while the system plays the current section in a loop. When satisfied, the user can save their settings to the database, providing a name to identify them.

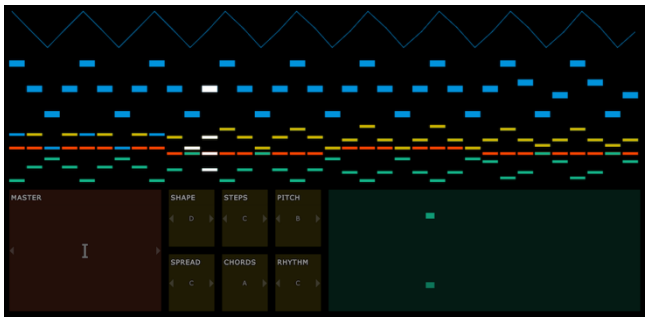

Figure 2. Part of the viewers' user interface to Permutable

The user's settings are then added to the continuously evolving musical composition which the system returns to playing, displaying the name of the section currently being played.

The artwork can be found on the web at https://tweakable.org/jwvsys/permutable.

5. REFERENCES

[1] Landy, Leigh. *What's the Matter with Today's Experimental Music? Organized Sound Too Rarely Heard.* Taylor & Francis; 1991

[2] Opusmodus *Opusmodus* [Software] Opusmodus Ltd. Available from: https://opusmodus.com; 2019

[3] McLean, Alex and others. *Tidal Cycles*. [Software] Available from: https://tidalcycles.org; 2009