A SEQUENCER WITH DECOUPLED TRACK TIMING

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ABSTRACT

Sequencers almost exclusively share the trait of a single master clock. Each track is laid out on an isochronously spaced sequence of beat positions. Vertically aligned positions are expected to be in synchrony as all tracks refer to the same clock. In this work we present an experimental implementation of a decoupled sequencer with different underlying clocks. Each track is sequenced by the peaks of a designated oscillator. These oscillators are connected in a network and influence each other's periodicities. A familiar grid-type graphical user interface is used to place notes on beat positions of each of the interdependent but asynchronous tracks. Each track clock can be looped and node points specify the synchronisation of multiple tracks by tying together specific beat positions. This setup enables simple global control of microtiming and polyrhythmic patterns.

1. INTRODUCTION

Sequencer user interfaces usually have a grid-like structure with musical time in the x-axis and the number of tracks in the y-axis. All values in the horizontal refer to the same discretisation of musical time, often sixteenth notes. As users place notes on this grid, they expect vertically aligned points to play in synchrony. This setup is virtually universal but also notoriously unintuitive for polyrhythmic and microtiming pattern generation. Modern sequencers offer several workarounds, such as the possibility to place notes on a much finer subgrid or the possibility to have repeating sequences of different length for each track. In this demonstration we decouple the tracks by using microtiming patterns generated by coupled oscillator networks as beat positions for each track individually.

2. THE OSCILLATOR NETWORK

A simple oscillator network is modelled as two connected ordinary differential equations with reset mechanism. The oscillators peak when their respective values reach a threshold level u_{peak}. A modifying oscillator u_2 influences the time derivative of a salient oscillator u_1 at peaks:

$$\tau_1 \frac{du_1}{dt} = u_1 + c_{12}\delta(u_{peak} - u_2) \tag{1}$$

$$\tau_2 \frac{du_2}{dt} = u_2 \tag{2}$$

Each u_i is reset to u_{reset} when passing a threshold u_{peak}. We implement an expanded network of eight oscillators with modifiable interdependencies c_{ij}, initial values, and frequencies τ_i. Each oscillator's peak times are recorded as sequence of anisochronous beat times.

3. THE SEQUENCER

The sequencer consists of eight tracks, each sequenced by an assignable oscillator. Each track consists of a definable number of beat positions visually arranged in the usual grid structure. The timing of the positions is computed by the sequence of peaks of its oscillator. A segment of the oscillator output can also be looped. To reduce the chaos of completely independently repeating patterns of different length, two looped tracks can be tied together at node points in the sequence of beat positions. Two tracks that share a node point will play the respective positions simultaneously. The track higher on the y-axis defines the absolute length of the loop, the other loop gets dilated or shrunk to fit. In the same way subsequences can be distorted by setting multiple node points. The sequencer will be made available as web-based tool for experimentation.

4. SUMMARY

By multiplying, connecting, and decoupling the underlying beat oscillations from the familiar grid interface we are able to implement a simple sequencer with expanded microtiming and polyrhythm capabilities. A few changes of the parameters generate for instance quintuplets over a wonky four on the floor and a continuously evolving completely distorted timing pattern on top. High-level control of the whole sequence offers a musically intuitive approach to timing pattern generation. It is our hope that this sequencer architecture facilitates experimentation where editing single notes becomes too tedious.

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