

Sinkapater – An Untethered Beat Sequencer

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ABSTRACT

This paper provides an overview of a new method for approaching beat sequencing. As we have come to know them drum machines provide means to loop rhythmic patterns over a certain interval. Usually with the option to specify different beat divisions. What I developed and propose for consideration is a rethinking of the traditional drum machine confines. The Sinkapater is an untethered beat sequencer in that the beat division, and the loop length can be arbitrarily modified for each track. The result is the capability to create complex syncopated patterns which evolve over time as different tracks follow their own loop rate. To keep cohesion all channels can be locked to a master channel forcing a loop to be an integer number of "Master Beats". Further a visualization mode enables exploring the patterns in another new way. Using synchronized OpenGL a 3-Dimensional environment visualizes the beats as droplets falling from faucets of varying heights determined by the loop length. Waves form in the bottom as beats splash into the virtual "sink". By combining compelling visuals and a new approach to sequencing a new way of exploring beats and experiencing music has been created.

Keywords

NIME, proceedings, drum machine, sequencer, visualization

INTRODUCTION

The concept of creating loops has been explored extensively in computer music. Today there are a multitude of different software drum machine-like interfaces. [what is the canonical drum machine?] Nearly all have the same basic interface, a row of buttons, usually sixteen, across the bottom with lights to indicate if the particular beat is active. Additionally there is often an interface to specify the number of beats to loop over. This interface allows for mostly straightforward beats to be created on it which loop reliably and serve certain styles of music well. What the typical drum machine interface doesn't allow for is the creation of complex patterns with highly syncopated rhythms and variability. The reliability of a computer for time keeping makes it possible to program highly complex polyrhythmic beats which are very difficult for even the most skilled musicians to play [1]. This was the initial motivation for developing the Sinkapater.

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Features

As with typical drum machines, with the Sinkapater a given beat can be enabled or disabled. The global tempo can be altered and the beat division can be changed. What makes it unique is that each track can be changed independent of others. Tick marks on the screen show a visual representation of where the Master Channel's beats fall so that for any arbitrary beat division one can easily visualize where a given beat falls relative to the Master Channel. The channels are laid out in a vertical fashion with height relative to the loop length and each beat's on/off indicator "button" similarly appears in the space relative to where they fall in time compared to the rest.

Master and Slave Channel Relationship

The Master Channel determines several parameters for the remaining channels. Within this channel a number of beats is specified as well as a loop length. A beat of the Master Channel is used to determine tempo in Beats Per Minute. The Master Channel's beats (which become important for the remained of channels) are divided equally over the specified loop length. Thus, the tempo is set for the given loop length and number of beats. The loop length of the Master Channel can be chosen arbitrarily as can the number of beats. The Slave Channels on the other hand must loop over some integer number of Master Beats. When the loop length of a Slave Channel is altered it is automatically quantized to a time frame

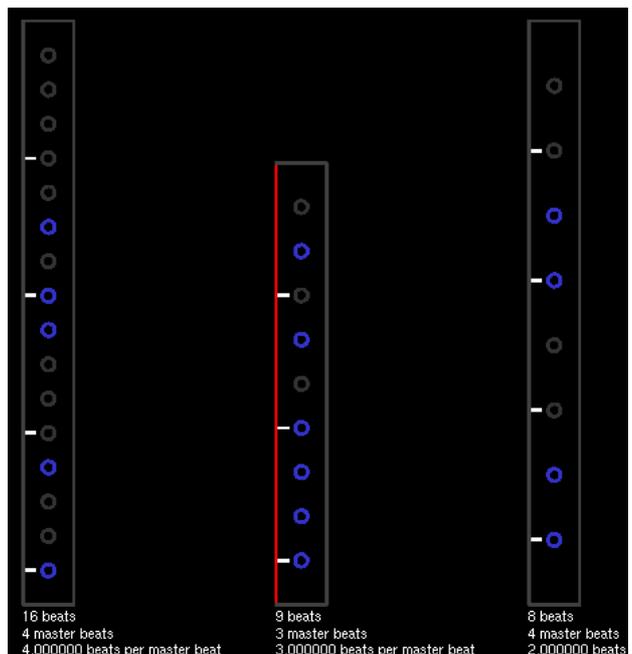


Figure 1 – GUI with Slave Channels shown

which is integer number of Master Beats. Similarly, when the number of beats in the Master Channel changes the Slave

Channels will change their loop length, retaining the same integer number of Master Beats over which they loop. Finally, when the Master Channel changes loop length, the remaining Slave Channels all change in unison, taking on the new length for their given loop rate, always determined by the number of Master Beats they are specified to loop over.

The resulting interface allows for complex rhythms which evolve over long periods of time. Even with only a handful of tracks with a short Master Channel loop rate a varying rhythm can be created which won't repeat until the lowest common denominator of beats is reached. For instance, a master track looping over 4 beats and a slave which repeats over 7 of those Master Beats, won't repeat for 28 beats.

Synchronization between the channels is retained by forcing each Slave channel to respond directly to a signal indicating a Master Channel Beat has occurred. Slave channels then keep track of how many Master Beats have occurred and ensure all counters start fresh after the prescribed number of beats.

Interaction

The interaction for the Sinkapater is keyboard and mouse based although an early version used included OSC support which could allow quicker access to parameters via a dedicated controller. To lengthen or shorten a channels loop rate, click on the top and drag it up or down respectively. To enable or disable a beat simply click on the circle representing the given beat. When a beat is enabled the circle will change from grey to blue providing visual feedback. A channel can be muted by clicking on the left edge of the channel's GUI, it will turn red to indicate it's muted state. Click again to un-mute.

Channels are grouped into ranks, this can be divided into instrument groups or any other categories. To access different ranks number keys are used. The space bar is used to start and stop the sequencer. The "T" key toggles to visualization mode (described below) where left and right arrow keys change the view [2].

In addition to the aforementioned tick marks on the Slave Tracks, additional and valuable feedback is given below each track indicating how many beats are currently in the loop, how many beats occur per Master Beat, the loop length (in units of Master Beats) and the loop length in seconds. While for the Master track the feedback is the number of beats in the loop, the loop rate in seconds and the number of beats per minute (BPM).

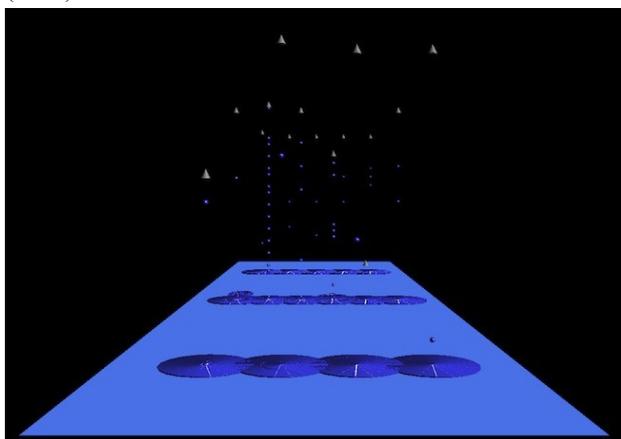


Figure 2 – Visualization Mode

Sounds

Sound samples as well as sound synthesis are used. This

allows for a wide variety of instrumentation. From experimentation I found it useful to organize a bank of sound around a particular instrument, for instance, bank 2 as a drum set, bank 3 utilizes piano samples, etc. Bank 1 is sounds from a sink, of course.

Visualization

Leveraging the power of a computer and available screen, there is a visualization mode which provides a unique view of the beats being created. When in visualization mode virtual droplets of water fall from suspended faucets, each at a height relative to the corresponding channels loop rate. When a given beat is active it produces a water droplet, when not active no such droplet appears. They land in the bottom of the virtual sink in synchrony with the sound being created. This is a 3-Dimensional environment which can be explored, taking in the scene from different angles. By visualizing the patterns in this way it gives one an intuitive sense of how the different loops interact with each other by providing a means to see the patterns as they "splash" into the basin.

Technology

The Sinkapater uses C++ and a number of open source libraries which are cross platform including STK, LibSnd, OpenGL, GLU and GLUT. A technique known as picking is used in OpenGL to determine which objects are being interacted with.

Future Work

It has been shown that timing variations among other subtle modifications including volume and timbre contribute to making a drum machine more expressive [3]. Incorporating some of these features will make the Sinkapater more well rounded. Additionally, to make this a more complete system it seems necessary to provide an interface to allow dynamic loading of samples. Further, to allow the most flexible configurations of beats a sequencer should allow arbitrary beat divisions within specified beat. That is any given beat should be allowed to be divided into 2 (eighth notes), 3 (triplets), 5 (5-tuplet), etc. And further divided within these new divisions. Only then will the full potential of polyrhythms and all manners of syncopation, as facilitated by computers be fully accessible in a beat sequencer.

Summary

While the Sinkapater is not a fully realized drum machine, it introduces new concepts to this storied interface. By allowing each channel to divide the beat in different ways and to loop over different intervals complex, syncopated and polyrhythmic patterns are easily accessible. By forcing the Slave Tracks to lock to an integer number of Master beats complex patterns remain in synchrony with a sense of cohesion.

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