

AN OVERVIEW OF ALGORITHMIC MUSIC COMPOSITION IN THE NOTENETWORKS SOFTWARE PLATFORM

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ABSTRACT

Noteworks is music composition software that re-imagines the way music is created, played, and shared. Users create musical compositions by building networks and interacting with them in real time. Noteworks reduces the learning curve for algorithmic-music composition, such that most individuals with a basic knowledge of computer interaction can create original compositions with limited instruction. Dynamic networks have the potential to play back for hours without repeating. This document will provide a brief summary overview of the GUI.

1. INTRODUCTION

Noteworks allows the user to write pieces of music that evolve over time, and features such as stochastic nodes enable the user to think in terms of probabilities and tendencies. Rather than creating one composition at a time, a single network can potentially generate thousands of unique compositions. There may be several ways in which a chord structure could evolve, and theoretically a listener could set a network in motion and allow it to unfold for days without hearing every possible combination. At any point while the composition is playing back, the user can begin writing the MIDI data to a file. They could then import this data into Finale or Sibelius and print out a piece of sheet music, or into a production platform such as Logic Studio.

2. JAVA IMPLEMENTATION

Noteworks is written in Java, and as such can be used on a variety of platforms - including Windows, Mac, and Linux. Noteworks relies heavily on the Java Swing component library for the graphical display, and on the Java MIDI library to render its sound.

The technology behind the sequencing portion of Noteworks is inspired by time-dynamical recursive neural network models, in which individual network nodes can be assigned some sort of musical expression (e.g. a MIDI message, tempo, or some sort of modification), and the arrows represent temporal relationships between nodes.

3. NOTENETWORKS GUI OVERVIEW

This section will step through the various elements of the Noteworks interface, explaining each in detail. All musical composition within Noteworks takes place in a centralized canvas, and is facilitated through a set of tools. A video tutorial covering similar material is available at the following URL:

http://robertalexandermusic.com/Noteworks_Demonstration.mov

3.1. Interface Overview

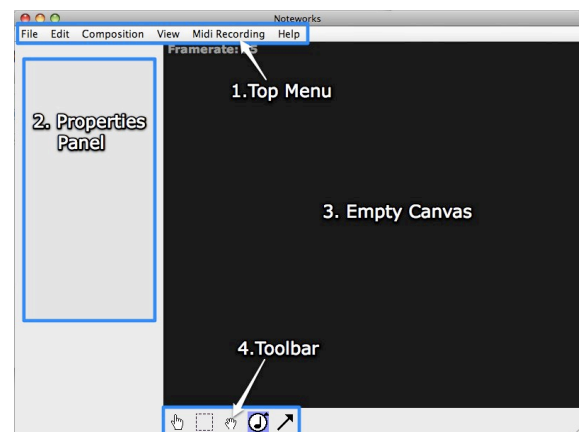


Figure 1: The Noteworks GUI as presented upon initially loading the software.

- 1) Top Menu: Here the user can save their composition, open a saved composition, edit the instruments used for playback, stop playback completely, export a song as a MIDI file, and select from a number of additional advanced options
- 2) Properties Panel: Allows the user to edit the settings of a selected node.
- 3) Empty Canvas: This space is where compositions are created.
- 4) Toolbar: These tools are used for playback, node selection, moving nodes, creating nodes, and drawing arrows.

3.2. Toolbar Elements



Figure 2: Closer inspection of the Noteworks tool set.

- 1) Node Firing tool: With this tool selected the cursor turns into a pointing hand. Clicking on a MIDI or Rest node starts the network in motion.
- 2) Selection Tool: This tool allows for selecting either a single node or multiple nodes. When a single node is selected its attributes will appear in the properties panel. Click and drag around multiple nodes, then use the hand grabber tool to move groups of nodes.
- 3) Grabber Tool: While in this mode, click and drag on the canvas to adjust your view of the composition. You can also click and drag on nodes to adjust their placement. At any time you can zoom in and out by using the scroll wheel on a two-button mouse or two fingers on a track pad.
- 4) Node Creation Tool: Click and hold briefly to reveal a sub-menu. You can select from 4 different node types: MIDI (standard instrument), Rest, Chance, and Echo. Click on a node type to select it, and then click anywhere on the canvas to add. See the section on node types for more information.
- 5) Arrow Drawing Tool – With this tool selected, the user can click and drag from one node to another to create a connection.

3.3. Node Types

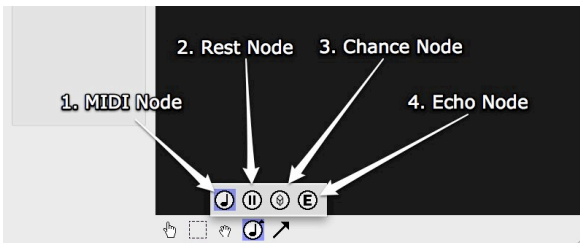


Figure 3: Example of placing a figure with experimental results.

- 1) MIDI stands for Musical Instrument Digital Interface. These nodes are at the core of every Noteworks composition. Within the MIDI properties panel the user can adjust the note pitch, duration and volume. The instrument can be changed by switching the node to a different channel, or by loading up a new instrument in the edit menu. MIDI nodes will pass an impulse to all outgoing connections.
- 2) Rest nodes can be used to delay the transfer of an impulse from one node to another. Rest nodes will pass on an impulse to all outgoing connections.

- 3) A chance node will fire to one of its outlets, which is picked at random.
- 4) Echo nodes will repeat whatever note is received, with the option of transposing this note to a new pitch and/or adjusting the delay. Echo nodes can be strung together in sequence to create complete melodic phrases. Data can be passed between echo nodes and chance nodes to create stochastic behavior.

4. FUTURE DIRECTION

The addition of sub-networks would enable users to consolidate large sections of a composition into a single, more-manageable object. Future node types would also enable compositions to unfold in a more dynamic manner. Sequential nodes would switch between all outgoing connections in an ordered fashion; this would enable the user to create recurring poly-rhythmic patterns. Interactive nodes would allow input from various external interfaces, such as a keyboard or MIDI controller. Audio file playback could be facilitated through an additional node type, or by sending data to an external sampler or VST instrument.

The object-oriented interface would readily lend itself to touch-screen interaction, future versions of the software could be implemented on the iPhone and iPad platforms. Several interaction modes could include: free composition, level based game play, and social compositions constructed by multiple users in tandem. Early research also indicates strong potential for Noteworks in the K-12 educational market.