

# BASIS: A Genesis in Musical Interfaces

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## ABSTRACT

This paper is a demo proposal for a new musical interface based on a DNA-like double-helix and concepts in character generation. It contains a description of the interface, motivations behind developing such an interface, various mappings of the interface to musical applications, and the requirements to demo the interface.

## Keywords

Performance, Design, Experimentation, DNA, Big Five.

## 1. INTRODUCTION

There has been much work in the use of signals and systems such as traffic patterns, viral mutations, and images to metaphorically compose and generate music [1,2]. However, the use of metaphor in this way to design new interfaces for realtime performance has been largely untapped. An interface designed in this fashion has the potential to give the musician feelings of creating more than music as they are now part of the metaphor. It also provides the audience with another level of interest and makes for a visually engaging performance.

## 2. DESIGN MOTIVATION

The original idea behind this interface was to design a system in which the musician was creating and modifying the music as if he/she was creating and modifying a personality in a story. Essentially, the musician would mix various personality traits and learned behaviors to design a character that would be musically mapped. The character can be continually modified and expanded. As the design process continued, the idea of incorporating genetic code into the character was adopted. This gave the musician the ability to create a DNA sequence for the character and modify this sequence in realtime. It was also a requirement for the interface to provide visual and tactile feedback to the user as well as be visually exciting for the audience. The interface consists of two physical parts, the DNA editor and the Personality editor.

## 3. DESIGN AND IMPLEMENTATION

### 3.1 DNA editor physical design

The DNA editor is built based on the Watson and Crick double-helix model of DNA[3]. The DNA editor is a 7 foot 6 inch tall vertical oriented double helix made out of aluminum, steel, and plastic. (see figure 1). The rungs on the double-helix represent the base nucleotide pairs. In DNA, a base pair can be one of four combinations, A-T, T-A, G-C, C-G. The order of these pairs makes up the genetic code. In the DNA editor, the rungs are made of a square tube attached to a rotary encoder allowing the user to select one of four positions. There are 80 rungs on the DNA editor grouped in 16 groups of 5. Each group of 5 is bounded by two plastic stationary rungs that can

light one of three colors. The DNA editor can report to the mapping software the position of all the rungs and changes of these positions, as well as the speed with which the rung was rotated.

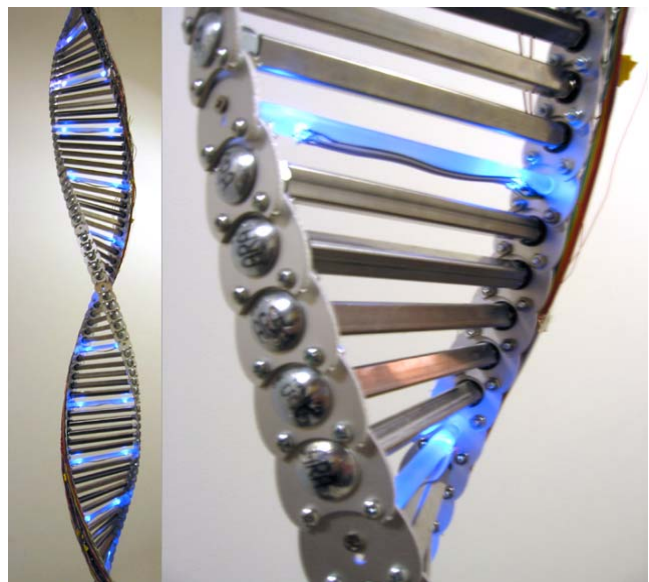


Figure 1. DNA editor physical design, aluminum scales, rotating steel rungs, and lucite light rods.

### 3.2 DNA editor mapping strategies

The DNA physical interface lends itself to many mapping strategies. Currently, 4 mapping strategies have been implemented and are available to demo. The first 3 strategies stick to the idea that DNA is a sequence of coded instructions and map this to a sequence of musical information. The 4<sup>th</sup> mapping strategy strays from the metaphor slightly and uses the harp-like nature of the DNA editor's physical implementation in its mapping.

#### 3.2.1 Mapping Strategy 1

The first mapping strategy that can be shown uses the genetic code from the DNA as a sequence of notes as if it were an analog style sequencer. This is similar to past work done using DNA code to generate music [4], except that with this interface, it is modifiable in realtime as an instrument. The 16 groups light in tempo, each signifying a step in the sequence, with the rungs of each group setting the parameters for that step, pitch, glissando, and accent.

#### 3.2.2 Mapping Strategy 2

Similar to strategy 1, but the DNA sequence becomes mapped to a 5-track drum machine. Each of the rungs in a particular step control the accent of a drum sound for that step.

### 3.2.3 Mapping Strategy 3

The DNA sequence is mapped to a waveform of a particular instrument that is being played by traditional means. The DNA editor becomes a timbre control allowing the realtime dynamic effect of the sonic waveform of an instrument.

### 3.2.4 Mapping Strategy 4

The double-helix is played like a harp, where each rung plays a note when spun. The speed at which you spin the rung controls the volume of the note.

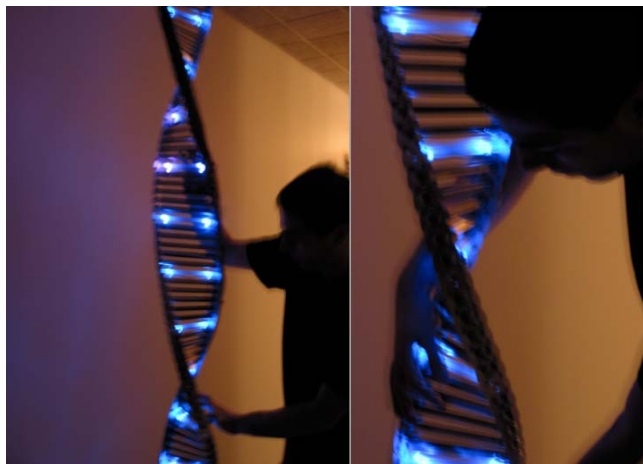


Figure 2. The DNA editor being played

### 3.3 Personality editor physical design

The personality editor is essentially a panel with five motorized faders, a single line lcd at each end of each fader, and a four line lcd with navigation buttons for control of the personalities (patches). Using this familiar interface a user is able to create and edit in real-time the personality of the character. A personality consists of seven sets of five parameters each. The sets are labeled as INBORN, GROWTH1 thru GROWTH5, and OVERALL GROWTH. Paging through the sets moves the faders to the stored values for that set and shows the names of the parameters on the lcds. On the INBORN page the parameters are based on the Big Five personality metric [5]. Each of the GROWTH# pages is used to design a modification to one of the Big Five traits. The five parameters are used to describe an event or a progression in the growth of the character that has an effect on one of the parameters in the Big Five metric. The OVERALL GROWTH page is used to design a modification on the entire character following the more specific growth elements.

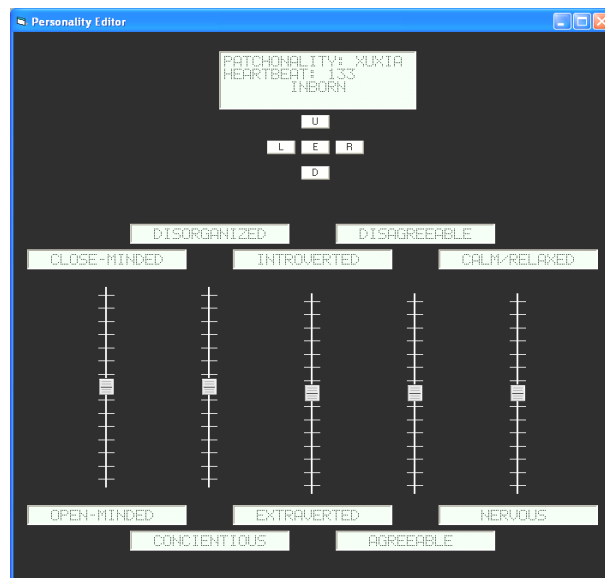


Figure 3. Software Simulation of Personality editor

### 3.4 Personality editor mapping strategy

The current mapping of the personality is to synthesis parameters. The inborn personality traits are mapped to sound generators such as oscillators, which are mixed in according to the mix of the Big Five personality traits. Growth modifiers are mapped to effects and filters on these generators. The synthesis parameters that the personality editor is mapped to give voice to the musical instructions that the DNA editor is mapped to. This completes the metaphor by combining the inborn genetic code with some personality traits leading to a complete character which is mapped to a complete musical section comprised of note information and timbre information all of which is “playable” as an instrument.

### 4. DEMO REQUIREMENTS

The main requirement for this demo is space. The DNA editor needs to be hung from the ceiling. It also requires room to walk around it. The demo also needs a table for the personality editor, computer, synth modules, mixing board, and speakers.

### 5. ACKNOWLEDGMENTS

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### 6. REFERENCES

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