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SoundPulse: Music from the Heart

Introduction

This study provides an experimental model for defining the potential relationships of active and passive human performance stimuli as inputs to the creation of computationally generated music. The model is implemented as a computer program that maps data from keyboard and mouse input and data from a heart-rate sensor, taken in the condition of low cardiovascular stress, as the active and passive elements, respectively. Data from these sources are mapped to contrasting musically constructive parameters for the live computational generation of melody. As the computer program generates the music together with visual representations of both the melodic variation and the data input, it is expected that the active and passive inputs will affectively interact, and so integrate these contrasting kinds of input in the overall process of creating music. Ultimately, the study aims to explore how our understanding of the role of physical human performance in musical improvisation can be expanded when considering the human body as a physical system flowing with data that can be rendered as music.

Objectives

1. Create a fully interactive virtual application that integrates live heart rate input and keypresses as controls for changing musical parameters
2. Provide the technical design capacity to stimulate further experimentation and reflection

Method

- Collecting heart rate input (BPM) in real time
- Establish a baseline heart rate for the individual subject
- Constrain BPM within a range of this baseline
- Scale BPM within the target range to a melodic range
- Map keypresses to control changes in melodic characteristics
- Provide feedback to the subject by displaying heart rate metrics

Interactive Interface

The application as built within a Max patch allows the human performer to launch the application and begin monitoring their heart rate, influencing sound from input.
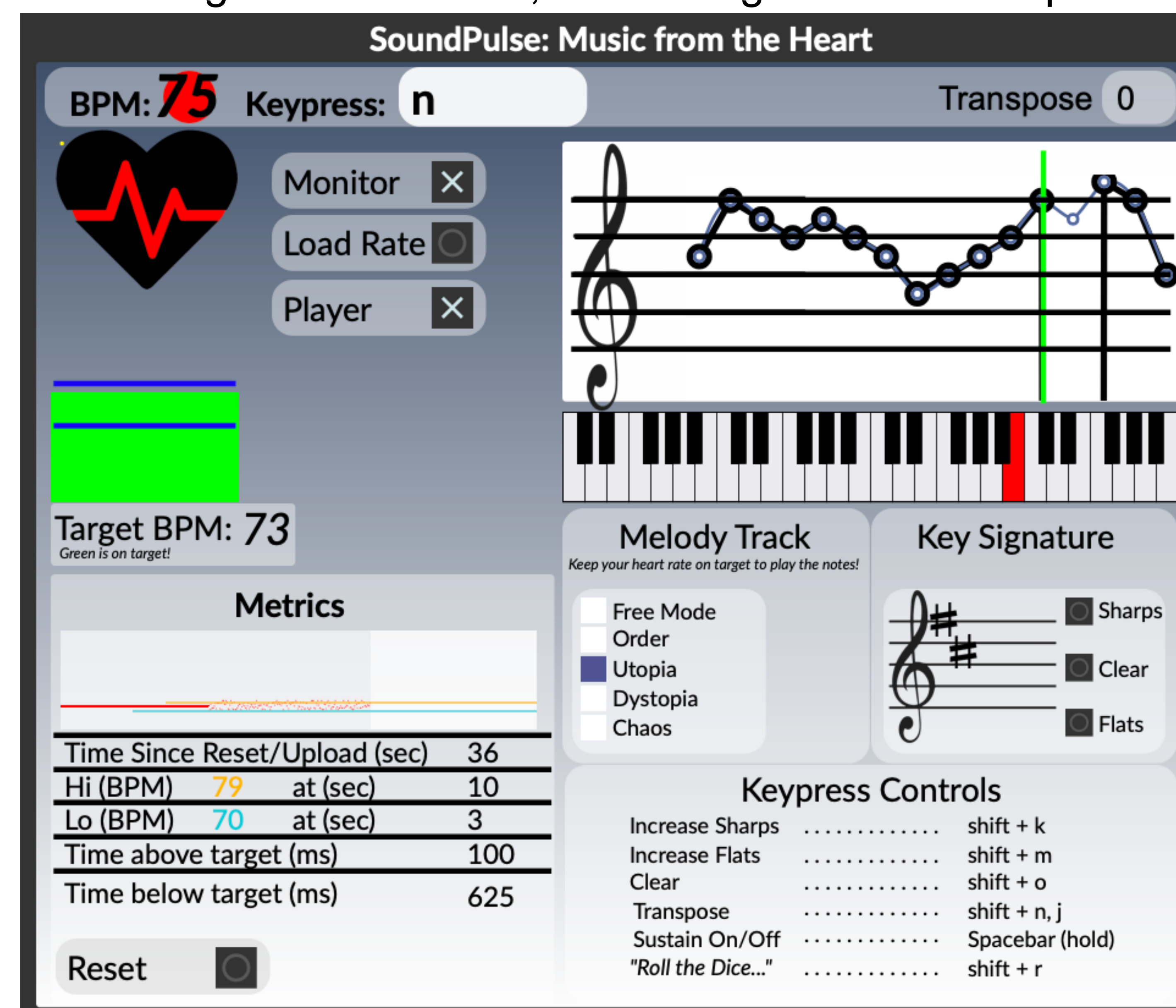
Technical Implementation

Data from an LED pulse sensor processed through Arduino programming provides pre-processed heart rate input into the Max 8 programming and graphical display environment.
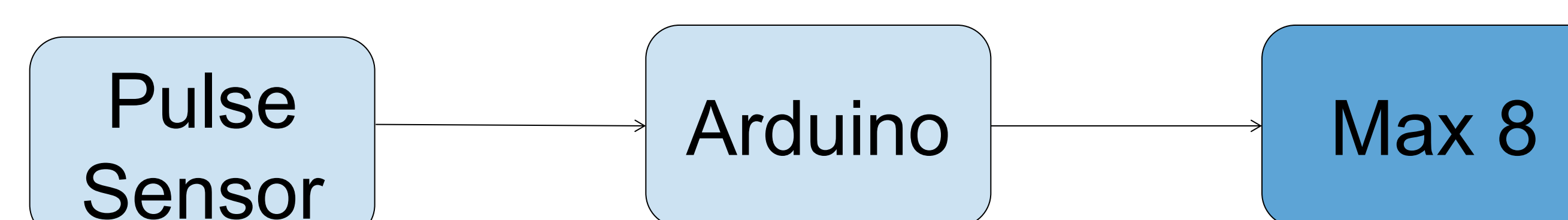

Performance

The human performer can attach the small LED sensor using Velcro to the index finger of their left hand. Keypress controls are accessible from the right hand in standard English keyboard placement.

Visual Feedback

The user is provided visual feedback on maintenance of heart rate within the indicated blue target range. Acceptable rates will be shown as green on both the musical player and the heart rate slider. If the rate is outside the range, red will appear and the note correlating to that individual BPM instance will be skipped. The user can use "Load Rate" to calculate a new baseline.

Establishing a Baseline

An automated system to collect rate from a 10 sec sample.
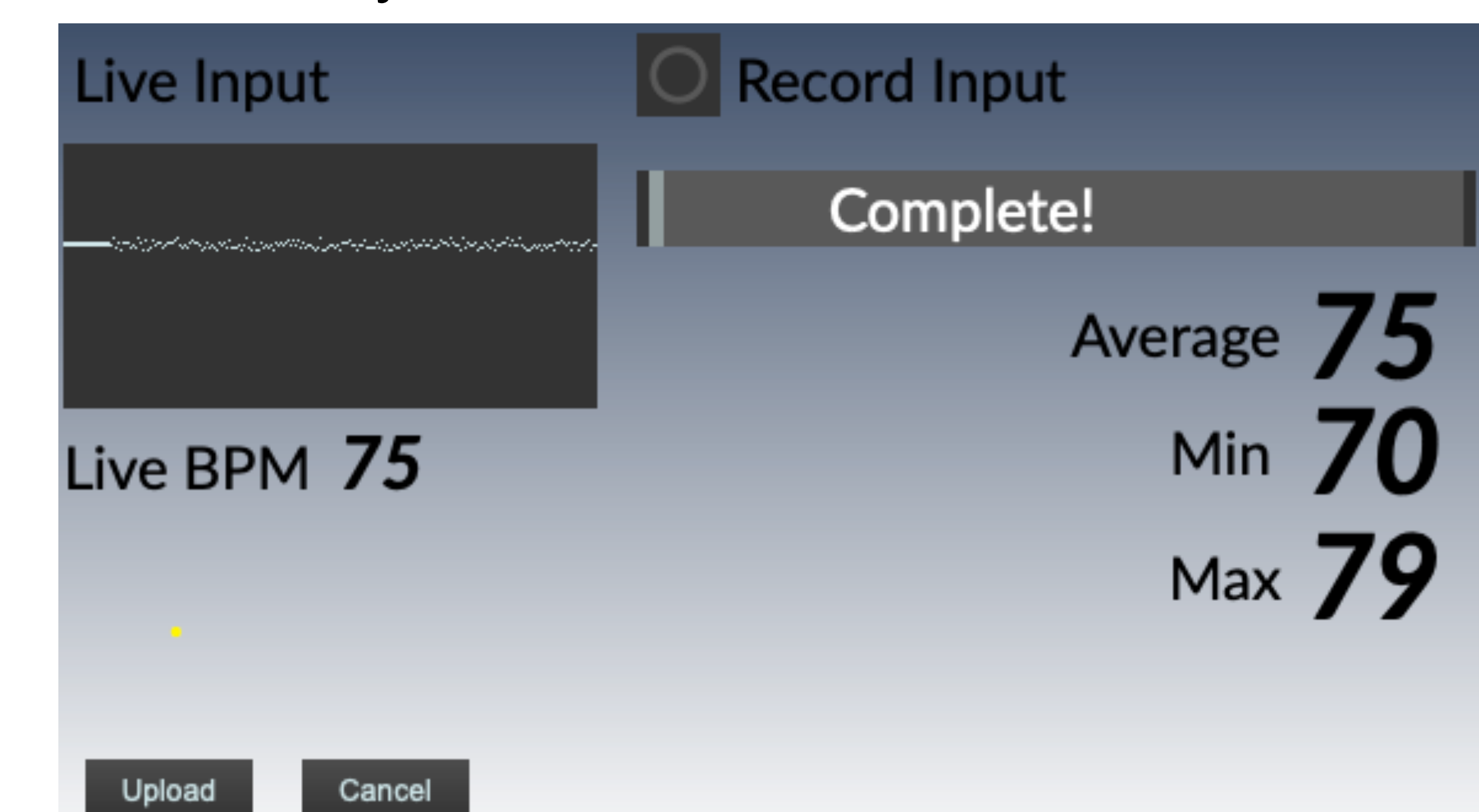
Heart Rate Analysis

Analyze changes to the user heart rate in real time. Observe trends, peaks and troughs as an influenced possibility through the Melody Track and Key Signature.