

MOTION TO TIMBRE

This folder includes:

MotionSC_PD – Pd-extended application
SoundCtr – Android application

The software presented in this folder is part of the research described in the following paper (also included in this folder):

Neuman, Israel, Charles Okpala, Cesar E. Bonezzi. “Mapping Motion To Timbre: Orientation, FM Synthesis and Spectral Filtering.” (under review ICMC-SMC2014)

Paper Abstract

Motion is a time-based event situated in three-dimensional space. In the performance of most musical instruments, the musician associates physical motion with audible results. In some instruments, physical motion is used to change the timbre of the instrument. Digital techniques of analysis and re-synthesis have paved the way for the understanding of timbre as a distribution of energy among spectral frequencies in a three-dimensional space bounded by axes representing time, frequency and amplitude. In this paper, we present a musical performance system that explores the correlation between motion and sound, more specifically, timbre. A mobile device and its motion sensors function as a control element in the performance system that creates new timbres in real time.

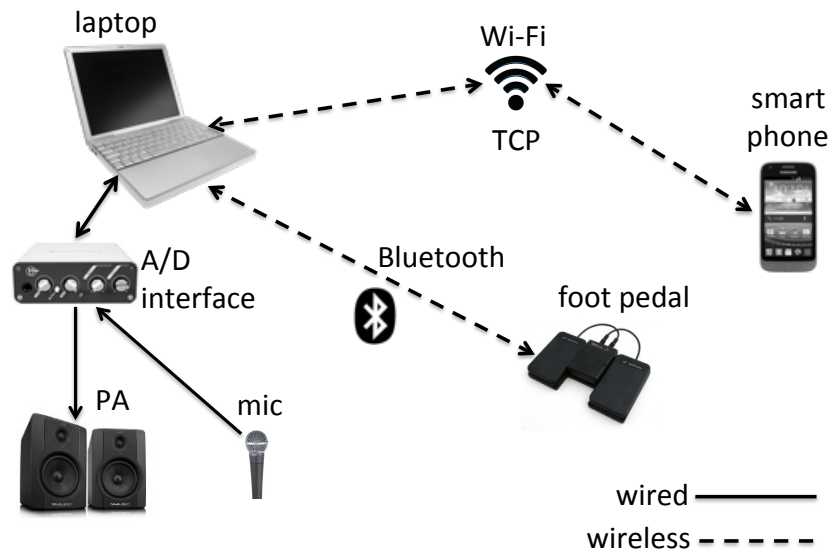
MotionSC_PD and SoundCtrl

PD-EXTENDED APPLICATION AND ANDROID APPLICATION FOR A MOTION-BASED PERFORMANCE SYSTEM

By Israel Neuman, Charles Okpala and Cesar E. Bonezzi

Motion-Based Performance System

The equipment required for this system includes a microphone, an A/D interface, a laptop with Pd-extended, a Bluetooth foot pedal, a sound amplification system and a mobile device (Android smart phone). The equipment setup is specified in the following diagram:



MotionSC_PD

A Pd-extended sound-processing application that receives data from a mobile device through Wi-Fi, applies additional mapping to the data (including FM synthesis), processes the live sound based on the mapped data and outputs the processed sound. The application has a sound processing component, mapping component and Wi-Fi and Bluetooth communication component, as well as a visualization of the FM synthesis parameters carrier frequency, modulation ratio and modulation index. System Requirement: Pd-extended version 0.42.5 or later.

SoundCtrl

An android application that maps the gyroscope and accelerometer readings to the orientation values elevation and rotation and streams the data to the laptop through Wi-Fi. The application includes a simple color-coded bar-graph visualization of the orientation values, designed using the Android GraphView library (<http://android-graphview.org>). Its interface includes start and stop buttons for starting and

stopping the data transmission and a field to specify the IP address of the receiving laptop. System Requirement: Android version 2.3 or later. For installation use Android Developer Tools such as Eclipse (ADT).

Running The Applications

Run the MotionSC_PD application before launching the SoundCtrl application. Following the equipment setup, launch Pd-extended and open the file MotionSC.pd. Launch SoundCtrl and go to the "Socket Setting" to set the IP address of the server (laptop). Check that the port number in SoundCtrl is the same as the port in MotionSC_PD (set to 4444 in MotionSC_PD; to specify a different port change the argument of the **netserver** object which is visible by ctrl+click>open on the **graph**). To check the port number in SoundCtrl, press "Socket Setting." Check MotionSC_PD (PD window) to see if a connection has been established. To start the audio and sound processing in MotionSC_PD, click on the toggle. The Bluetooth pedal can be used to start and stop MotionSC_PD as well as to freeze it in its current state. To transmit orientation data from the phone to the laptop press "Start" in SoundCtrl. To end the transmission, press "Stop". To disconnect from the server, exit the application SoundCtrl.

This system may require calibration based on the performing instrument and the positioning of the phone. The purpose of this calibration is to accommodate for shifts in the orientation's center point. The calibration is done by entering floating points numbers between -2 and 2 in the number boxes at the upper-right corner of the MotionSC_PD interface. For more details see the paper:

Neuman, Israel, Charles Okpala, Cesar E. Bonezzi. "Mapping Motion To Timbre: Orientation, FM Synthesis and Spectral Filtering."