REACTIVE ENVIRONMENT FOR NETWORK MUSIC PERFORMANCE USER MANUAL

Part 1: Overview

Welcome to the Reactive Environment for Network Music Performance!

Our system allows you to perform with two other remote performers, while taking advantage of our two special features, Dynamic Volume Mixing (DVM) and Enhanced Stereo Panning (ESP).

What is Dynamic Volume Mixing (DVM)?

Imagine a distributed performance setting where you can hear the other musicians via headphones, and see each of them on a separate monitor. As you approach the monitor on which you can see one of the remote musicians, you will be able to hear their volume gradually getting louder. They will also hear your volume as getting louder. Similarly, as you move away from that monitor, both of you will experience each other's volumes as getting quieter. This feature not only allows you to interact with the remote musicians and affect their sound, but also to create your individual mix based on your position in the room.
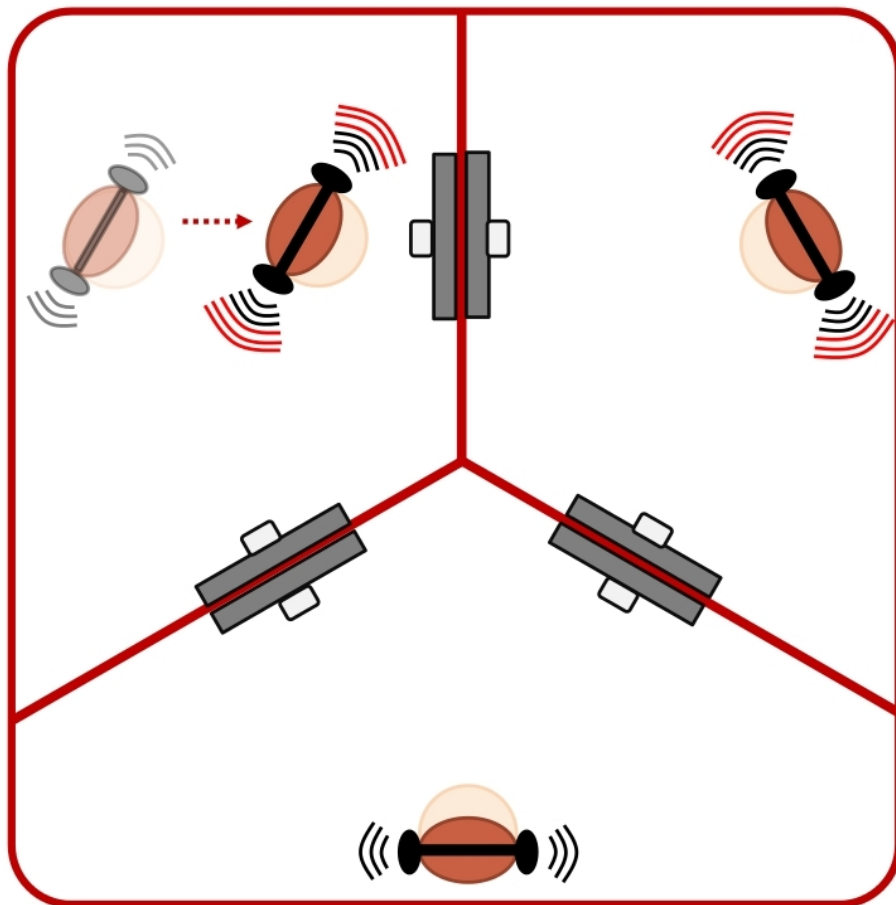
What is Enhanced Stereo Panning (ESP)?

The Enhanced Stereo Panning feature is an exaggeration of the stereo panning we experience every day: as you tilt your head to the left, you will be able to focus in on the audio stream of the musician whose monitor is situated on your left: the stream will appear to be louder and clearer through your left headphone. Similarly, if you tilt your head to the right, you will be able to focus in on the audio stream of the musician whose monitor is situated on your right: the stream will appear to be louder and clearer through your right headphone. This feature allows you to focus in on either of the other two musicians at a time, without disturbing them or affecting their audio mix.
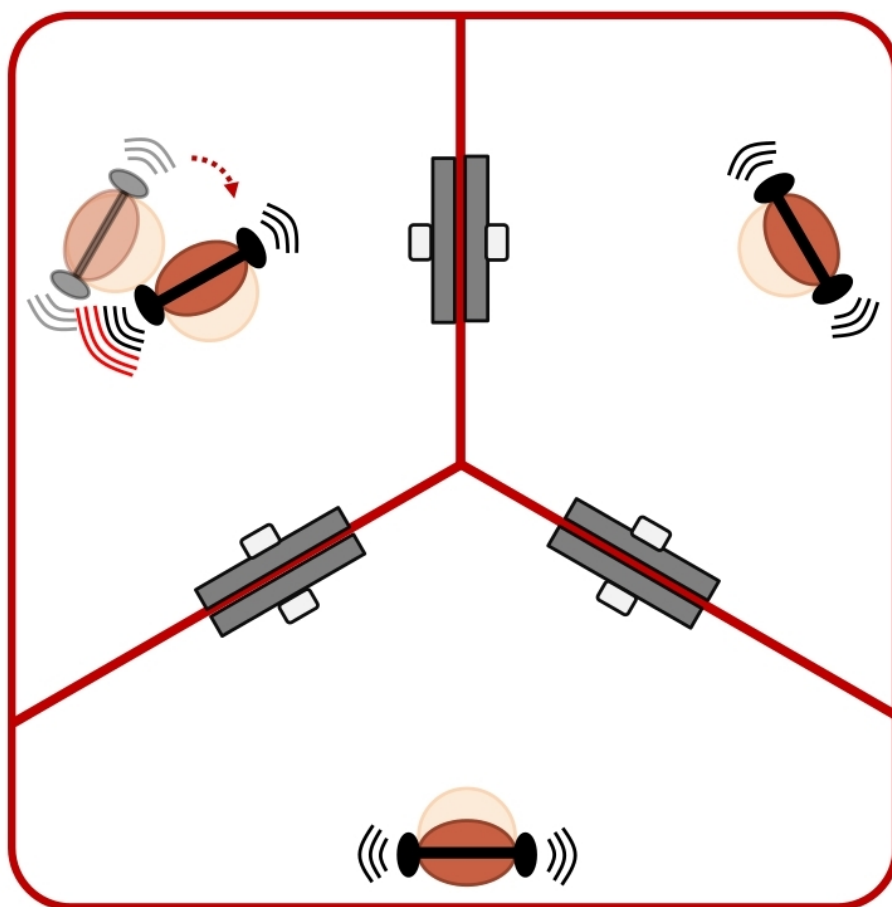
PART 2: Requirements

Software Requirements

Here is a list of packages required to run our Reactive Environment for Network Music Performance:
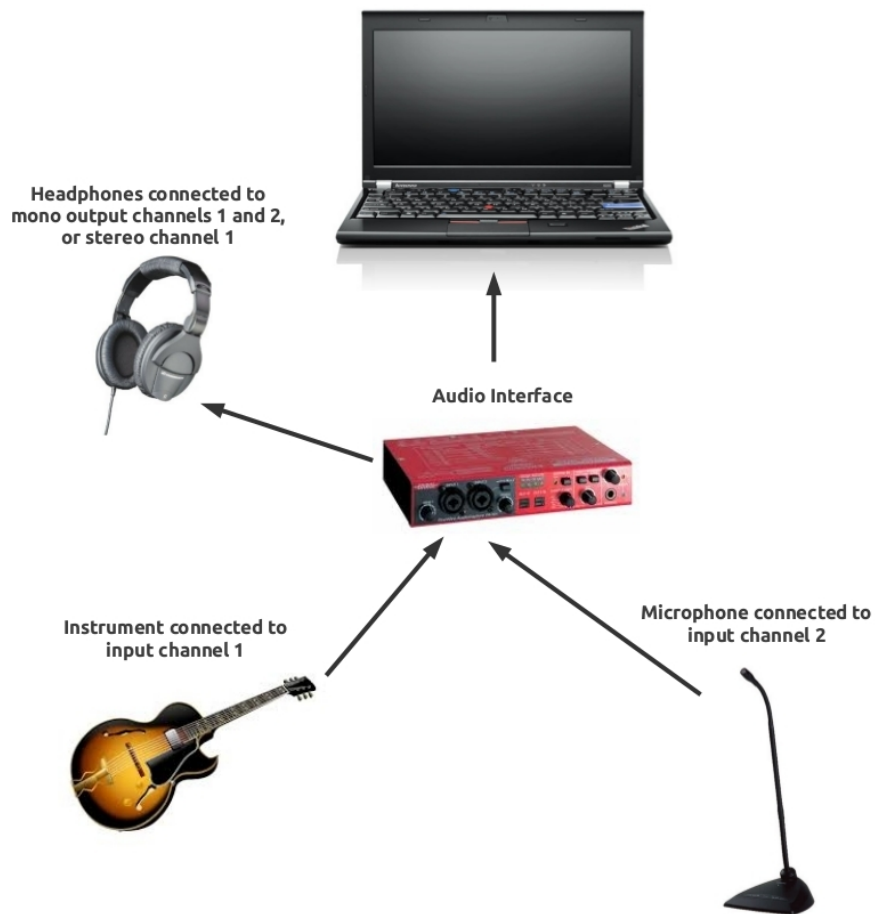
- linux-lowlatency
- jackd, qjackctl, libjack-dev
- jacktrip
- jmess (requires: libasound2-dev, g++, qt4-dev-tools)
- supercollider, supercollider-gedit, supercollider-dev, libsclang1
- java-8-oracle (or equivalent Java Runtime Environment, such as openjdk-6-jre or openjdk-7-jre)
- SwingOSC
- OpenNI (requires: git, freeglut3-dev, libusb-1.0-0-dev, doxygen, graphviz)

To install any of these packages, please refer to the instructions in 'Step by Step Installation Instructions.pdf'. Alternatively, to install all of them at once, please refer to the instructions in 'Automatic Installation Instructions'.

Hardware Requirements

Here is a list of hardware required by **each musician** to set up and use our Reactive Environment for Network Music Performance

- **Instruments:** At the moment, our system only supports electric or electronic instruments. This is because the sound of an acoustic instrument can easily drown the mix coming through the headphones, which can in turn prevent you from optimally experiencing the Dynamic Volume Mixing or Enhanced Stereo Panning features.

- **Closed headphones:** Allow each musician to hear their own audio mix.

- **Microphone:** Allows the musicians to verbally communicate with one another.

- **Audio Interface:** Although you technically can try to plug an instrument directly into your computer's input channel, we strongly recommend using an external audio interface, as they significantly improve overall quality and reduce lantency. Your interface should have at least 2 inputs, and 1 stereo or 2 mono outputs. If you only have mono outputs, you will need to combine them to experience a stereo effect. This can be done using a stereo female to two male male Y-cable. Please follow the audio hardware configuration seen in the figure below.

Headphones connected to mono output channels 1 and 2, or stereo channel 1

Audio Interface

Instrument connected to input channel 1

Microphone connected to input channel 2

- **Microsoft Kinect:** If you want to use either of the Dynamic Volume Mixing or Enhanced Stereo Panning features, you will need a Microsoft Kinect for position and orientation tracking. Without a Kinect, you can still use our system without the features, for a more traditional distributed performance.

- **Cameras and Monitors:** Our Reactive Environment for Network Music Performance package does not provide the means for video streaming. You can choose your own method for doing so (e.g. Skype, iChat, Google Hangout). Ideally, each musician will need two monitors and two webcams, each mounted on top of a monitor. Each of the monitors will display one of the remote musicians, and the webcam mounted on it will send a video stream of the local musician back to that remote musician.

  In order to correctly experience the Dynamic Volume Mixing and Enhanced Stereo Panning features, we strongly recommend you follow the hardware configuration illustrated in the image below.

Minimum distance away from Kinect

approx. 0.7m

Performance area seen by Kinect
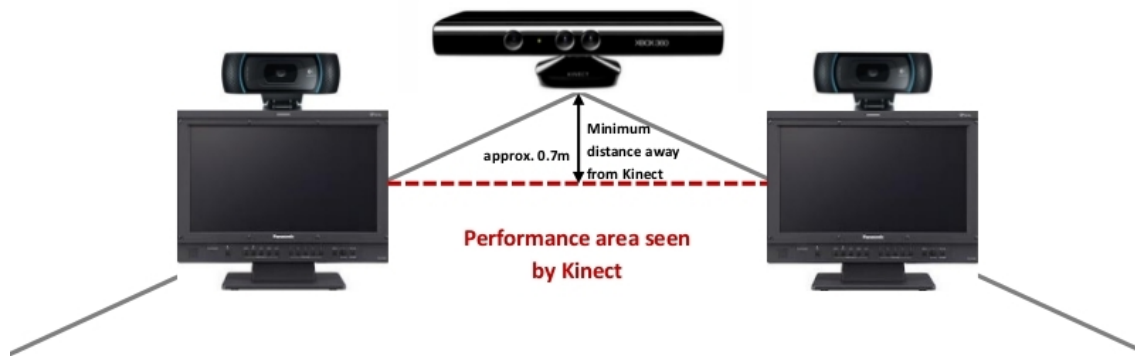
PART 3: Getting started

1. Boot your computer and choose the linux-lowlatency kernel from the GRUB menu.

2. Launch JACK by typing the following command in a terminal:

```
# qjackctl
```

3. Click on 'Setup' and set the following options:

- Select 'Realtime'
- Select 'No Memory Lock'
- Frames/Period: 256
- Sample Rate: 44100
- Periods/Buffer: 2

Note: It is very important for ALL musicians to choose the same settings in order for jacktrip to work correctly. If you prefer to change the settings listed here, please make sure all the other musicians do so as well.
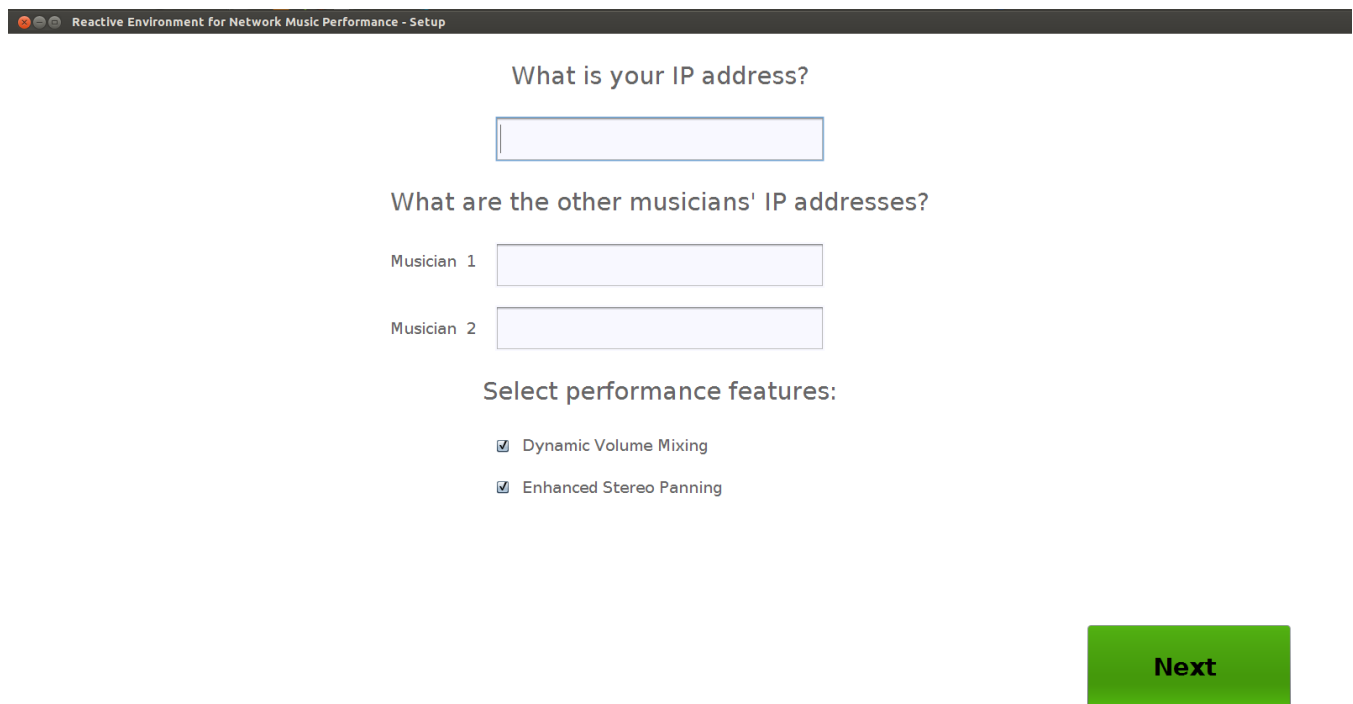
4. In a terminal, go to your `reactive_environment_for_NMP` folder and type the following command:

```
# ./reactive_environment_for_NMP.scd
```

This will launch our application.

PART 4: Settings

1. When the application first launches, you will see the following screen:

2. Enter your IP address and those of the other participating musicians in the appropriate text boxes.

3. Select the features would like to use by clicking on their corresponding check boxes.
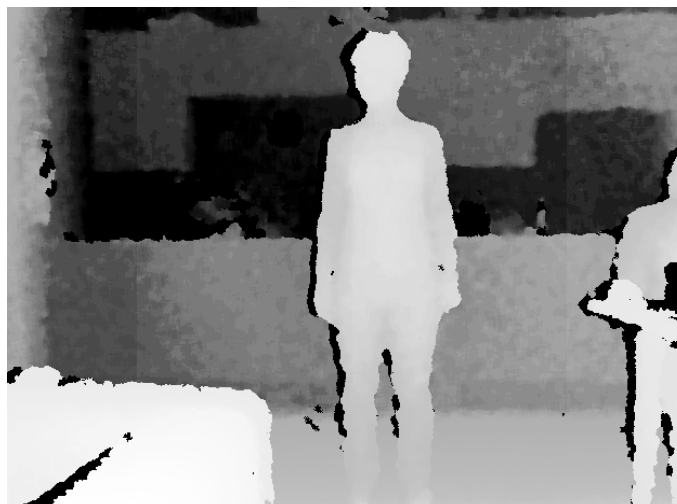
4. When you are done, click the 'Next' button to move on to the main screen.

PART 5: Calibrating the Kinect

1. To calibrate the Kinect, click the 'Start Calibration' button on the main screen.
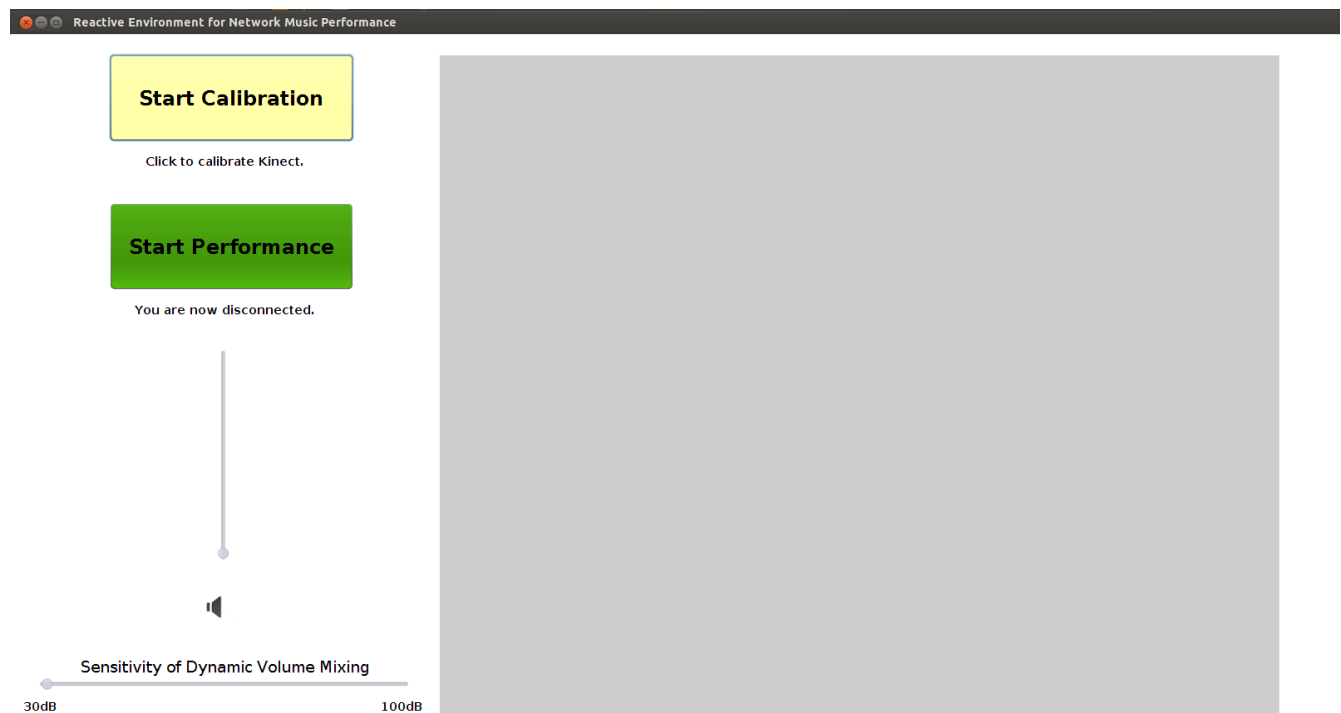
2. A depth view window will be activated. Move around your entire performance area, making sure to cover its extremities.

3. While we collect samples, the completion status of calibration will be displayed as a percentage. Continue to move until it reaches 100%.
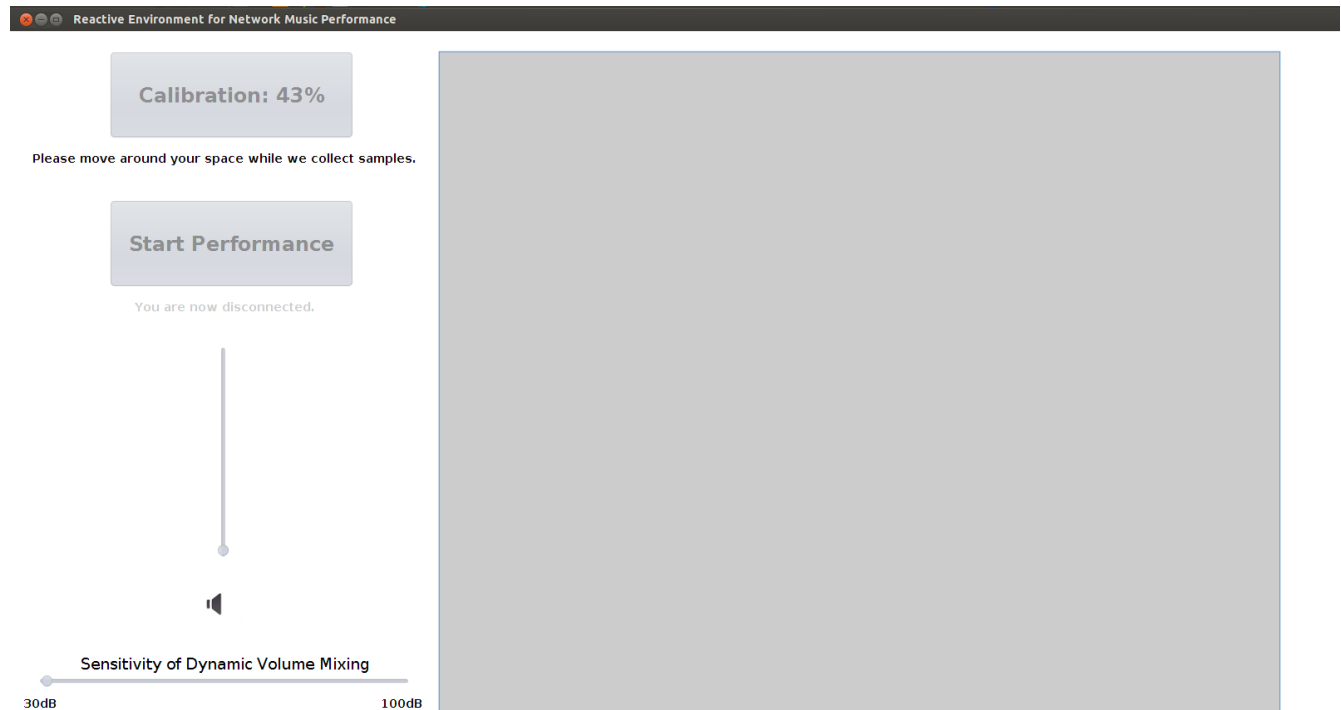

4. Note that your calibration results are saved. You do not need to perform a calibration before each performance, unless you have moved the Kinect.
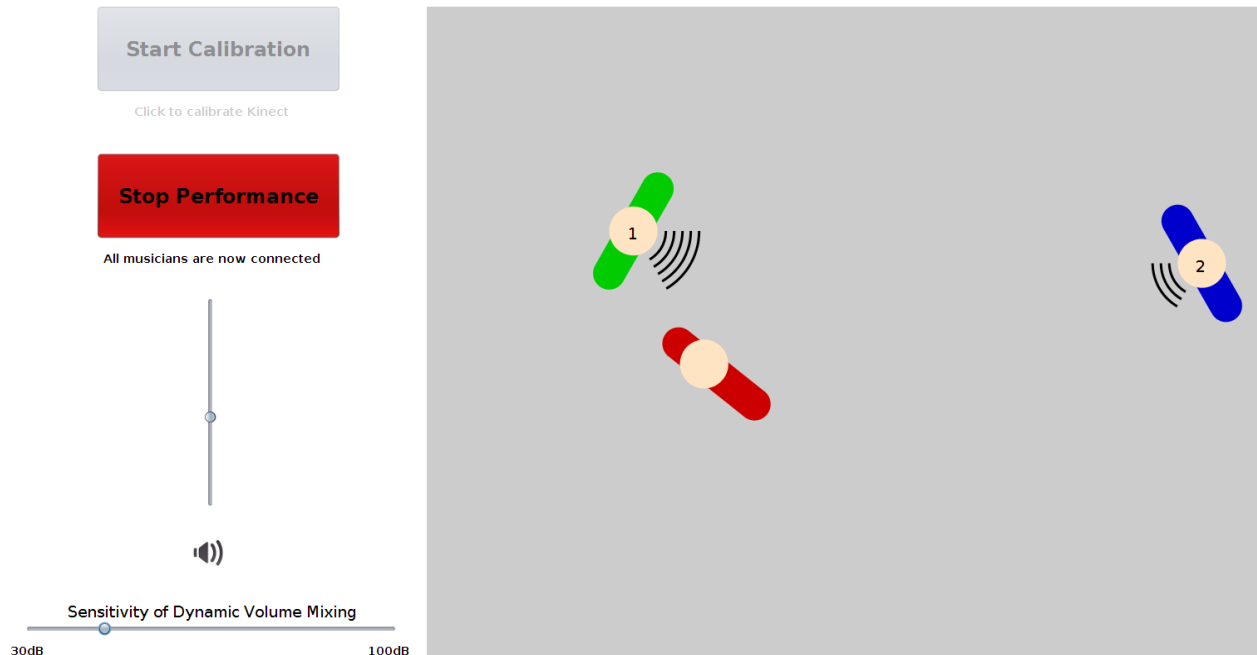
PART 6: Performing!

1. To begin, click on the 'Start Performance' button. This will also connect you to the other musicians. At this point, you should be able to hear your instrument and adjust your own volume using the volume slider.

2. You will be informed as each of the other two musicians are connected. As each of the other musicians connects, you will be able to hear their instruments.
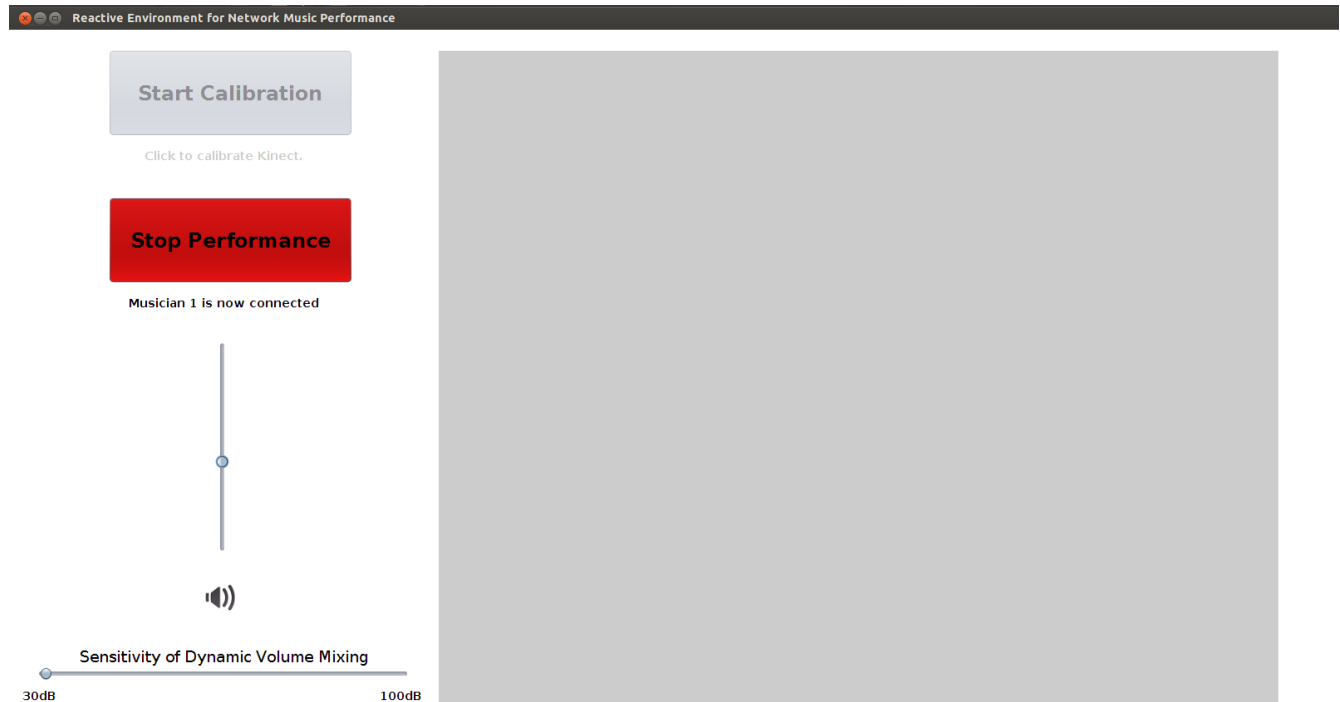
3. As you and the other musicians move around, you will be able to see 'avatars', or graphically animated representations of each other other on the screen. The avatars represent bodies as seen from the top down. The local musician has a red avatar with no label, whereas the other two avatars have the labels '1' and '2' (corresponding to Musician 1 and Musician 2, as defined when you entered the IP addresses at the start).

4. If you are using the Dynamic Volume Mixing feature, each of the other musicians' volumes will be represented as a number of 'sound waves' emanating from their avatars. The louder the volume, the larger the number of crests.

In the figure below, for example, Musician 1 is standing much closer to the local musician than Musician 2. As a result, the local musician experiences Musician 1's volume as being much louder than that of Musician 2. This is illustrated through the number of crests in each musician's sound waves, with Musician 1 having a larger number.

Start Calibration

Click to calibrate Kinect

Stop Performance

All musicians are now connected

◀))

Sensitivity of Dynamic Volume Mixing

30dB   100dB

6. You can also change the sensitivity of the Dynamic Volume Mixing feature using the corresponding slider. A larger sensitivity means that you will experience a greater change in volume when moving smaller distances. Each musician sets their own sensitivity independently, and it does not affect the other musicians' Dynamic Volume Mixing sensitivity.

7. If you are using Enhanced Stereo Panning, the head of each musician's avatar will move to the left or the right as they tilt their heads. This helps illustrate the level of stereo panning experienced by each musician, and is meant to graphically resemble a cross-fader.

In the figure above, for example, the local musician has his head tilted towards the left to focus in on Musician 1.

8. At the end of the performance, click the 'Stop Performance' button. This will disconnect you from the other musicians and stop the audio.

That is all!

If you have any questions or comments, please contact Dalia El-Shimy at delshimy@gmail.com