# REACTIVE ENVIRONMENT FOR MIXING AND COMPOSITION USER MANUAL

Part 1: Overview

Welcome to the Reactive Environment for Mixing and Composition!

Our system allows you to play and record an instrument while simultaneously mixing it with pre-recorded tracks, using five special features: Dynamic Volume, Dynamic Reverb, Musician Spatialization, Mix Control and Track Panning.

Imagine you are playing in a band with two other musicians, each of whom is assigned pre-recorded track. You will have access to a graphical user interface, seen in the figure below, that offers a top down view of all the band members, including yourself, as avatars. You are represented by the red avatar, while the other "virtual" musicians are represented by the that have been assigned the labels '1' and '2'.
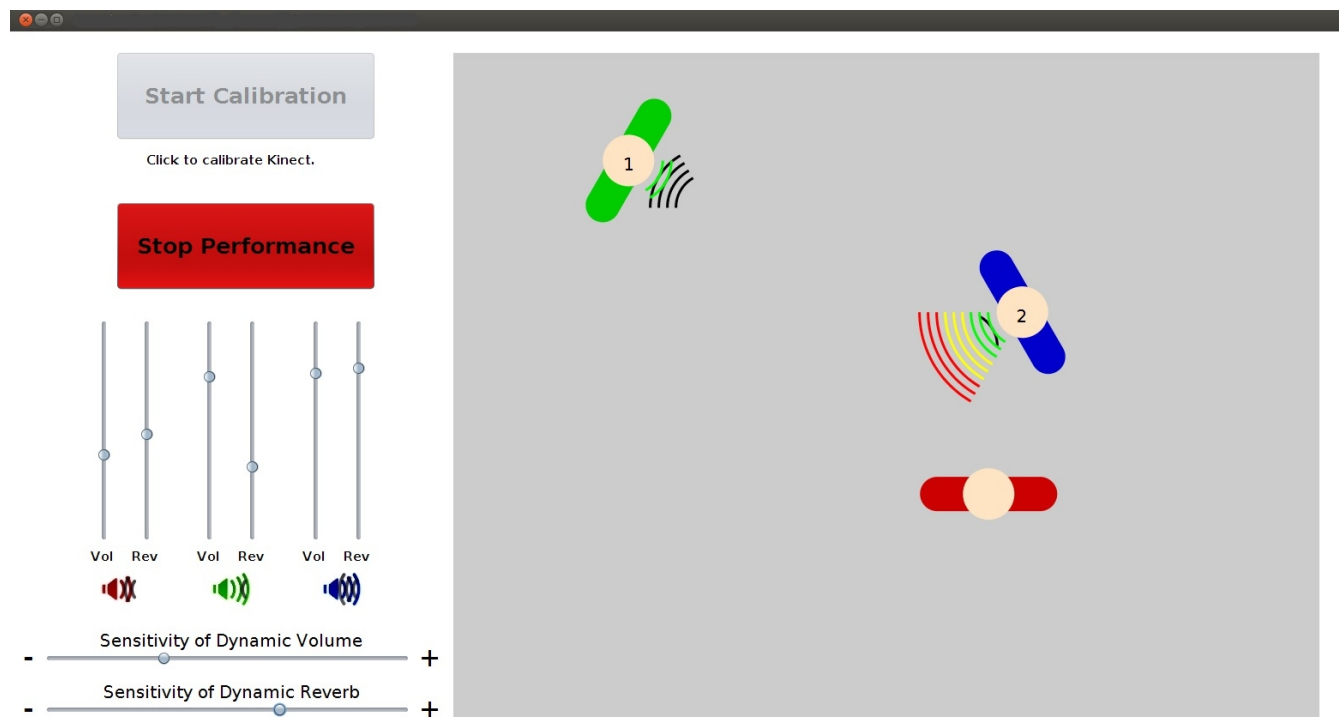
You can then play your instrument and interact with the other band members' tracks according to the following system features:

Dynamic Volume

As you move towards one of the band member's avatars, you can experience the pre-recorded track associated with that band member as gradually increasing in volume. The converse holds true as you move away from that band member's avatar.

Dynamic Reverb

As you move away one of the band member's avatars, you can experience the pre-recorded track associated with that band member as gradually increasing in reverb. The converse holds true as you move away from that band member's avatar.

Mix Control

This feature allows you to change the mix of your instrument with the pre-recorded tracks by changing your body's orientation. Turning your body to the left will move the sound of your instrument, along with that of the band member whose avatar is to your left, entirely to the left headphone. The track of the band member whose avatar is to your right will be heard unaccompanied through the right headphone. The converse holds true when you turn your body to the right.

Track Panning

You can isolate each of the pre- recorded tracks by changing your body's orientation. Turning your body to the left will allow you to hear only the track of the band member whose avatar is to your left, entirely through the left headphone. The track of the band member whose avatar is to your right will become silent. Your own instrument will continue to sound the same, coming through both headphones. The converse holds true when you turn your body to the right.

Musician Spatialization

This features allows you to experience the pre-recorded tracks as spatialized sound sources within your own space. In other words, the track of the band member whose avatar is to your left will appear to come through the left headphone, while the track of the band member whose avatar is to your right will appear to come through the right headphones. The spatialization effect is determined by your body orientation, and changes accordingly.

Note: Since Mix Control, Track Panning and Musician Spatialization all depend on your body's orientation, they cannot be used simultaneously.

PART 2: Requirements

Software Requirements

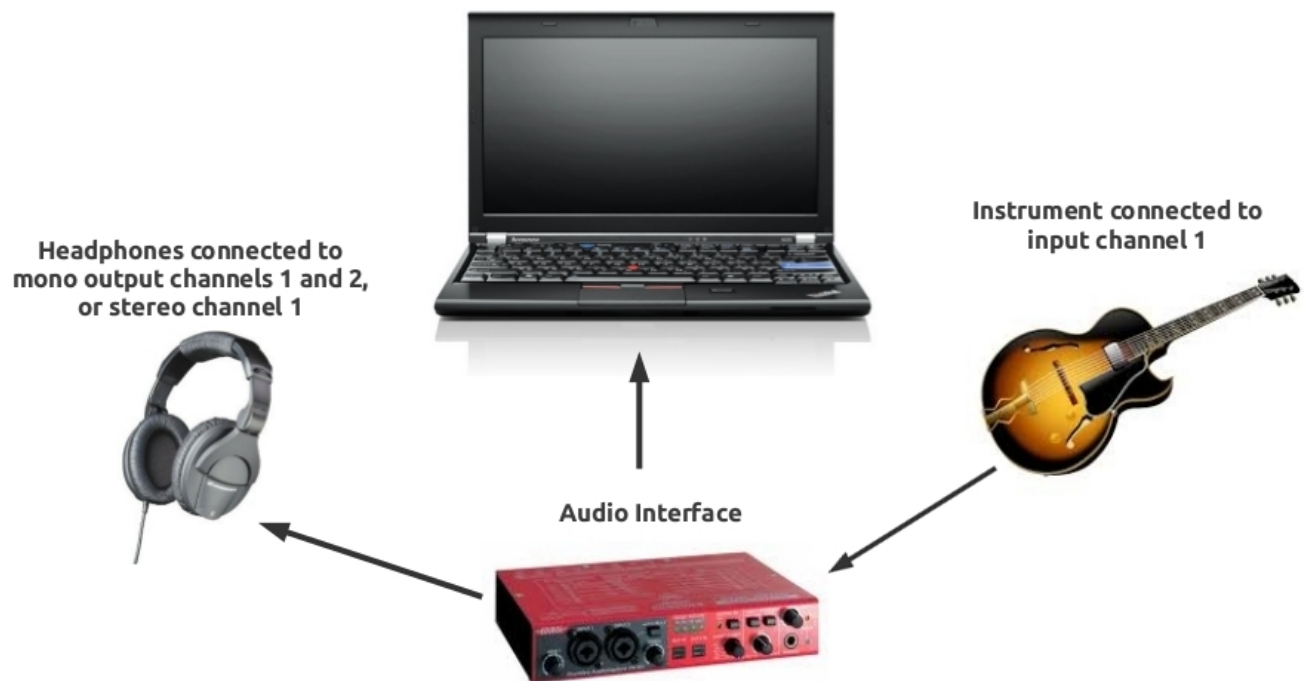Here is a list of packages required to run our Reactive Environment for Network Music Performance:

- linux-lowlatency
- jackd, qjackctl, libjack-dev
- 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)
- Ardour

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 to set up and use our Reactive Environment for Network Mixing and Composition:

- **Instrument:** 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 effects of the system's features.

- **Closed headphones**

- **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 it helps 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.

- **Microsoft Kinect:** For best result, mount the Kinect such that it can oversee a reasonably large, uncluttered space facing your computer's display.

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

Instrument connected to input channel 1

Audio Interface

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

4. In a terminal, go to your `'REMC'` folder (where you cloned our git repository) and type the following command:

```
# ./reactive_environment_for_mixing_composition.scd
```

This will launch our application.

5. Still in the `'REMC'` folder, type the following command in a terminal:

```
# ardour2 ardour_session_for_REMC/ardour_session_for_REMC.ardour
```

This will launch an Ardour session where you can load existing tracks, and record your instrument as you play.

6. In Ardour, right click on the region directly to the right of the track labelled as 'Musician_1'. Select 'Insert Existing Audio' from that menu, and load a pre-recorded track. This will be the track associated with the avatar labelled '1' throughout the session.

7. Repeat the same procedure for the track labelled as 'Musician_2'. This will be the track associated with the avatar labelled '2' throughout the session.

PART 4: 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 space of interaction, making sure to cover its extremities.
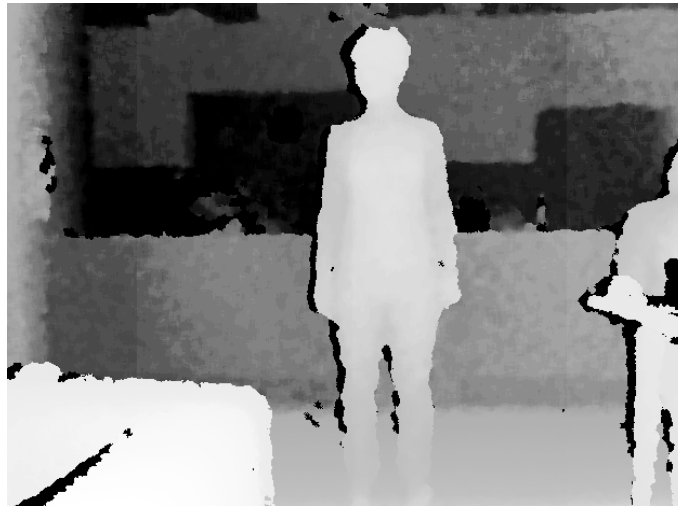

3. While we collect samples, the completion status of calibration will be displayed as a percentage. Continue to move until it reaches 100%.

Note: Your calibration results are saved. You do not need to perform a calibration before each session, unless you have moved the Kinect.

PART 5: Performing!

1. To begin, click on the 'Start Performance' button.

2. After you press the 'Start Performance' button, a secondary window, depicted in the figure, below will pop up. This window allows you to select which of the system's special features you would like to use.

3. The secondary window will also allow you to move the avatars for Musicians 1 and 2, so that you can further experiment with the ranges of the Dynamic Volume and Dynamic Reverb features. For example, moving Musician 1's avatar closer to you will allow you to experience changes in volume that are closer to the upper end of the entire range of changes available for the Dynamic Volume feature, and/or changes in reverb that are closer to the lower end of the entire range of changes available for the Dynamic Reverb feature, both applied to the track associated with Musician 1.
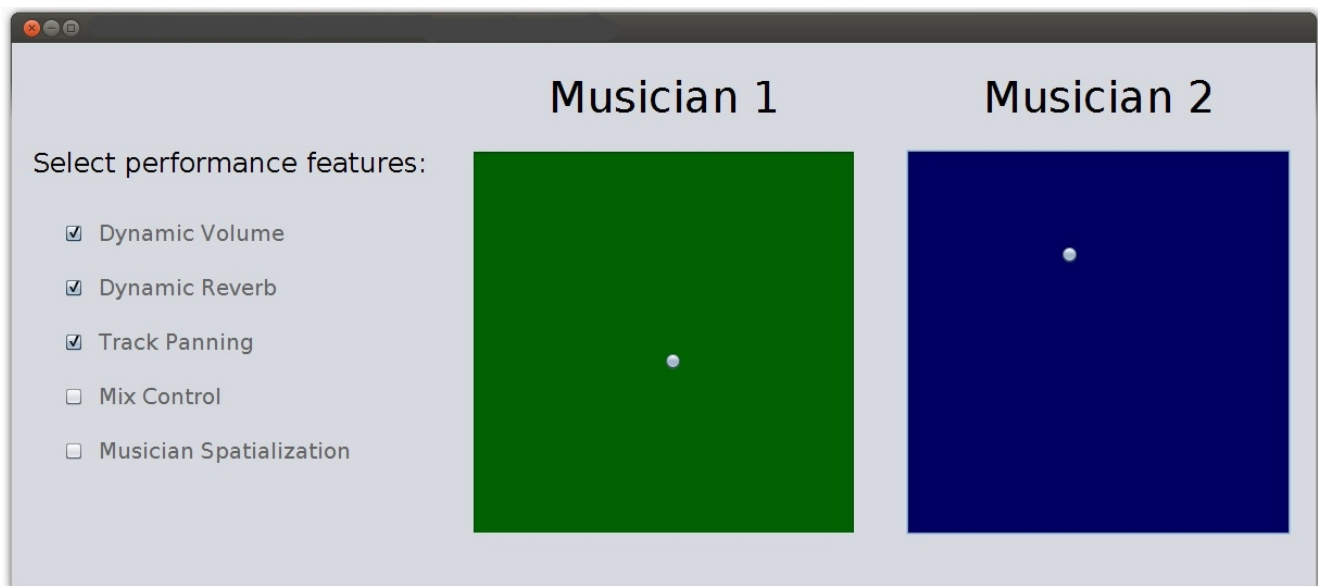
3. You can adjust the volume and reverb levels of your instrument, as well as those associated with Musician 1 and Musician 2, using the vertical sliders on the main screen. Each set of sliders is marked by an accompanying colour coded speaker icon that matches the colour of its corresponding avatar.
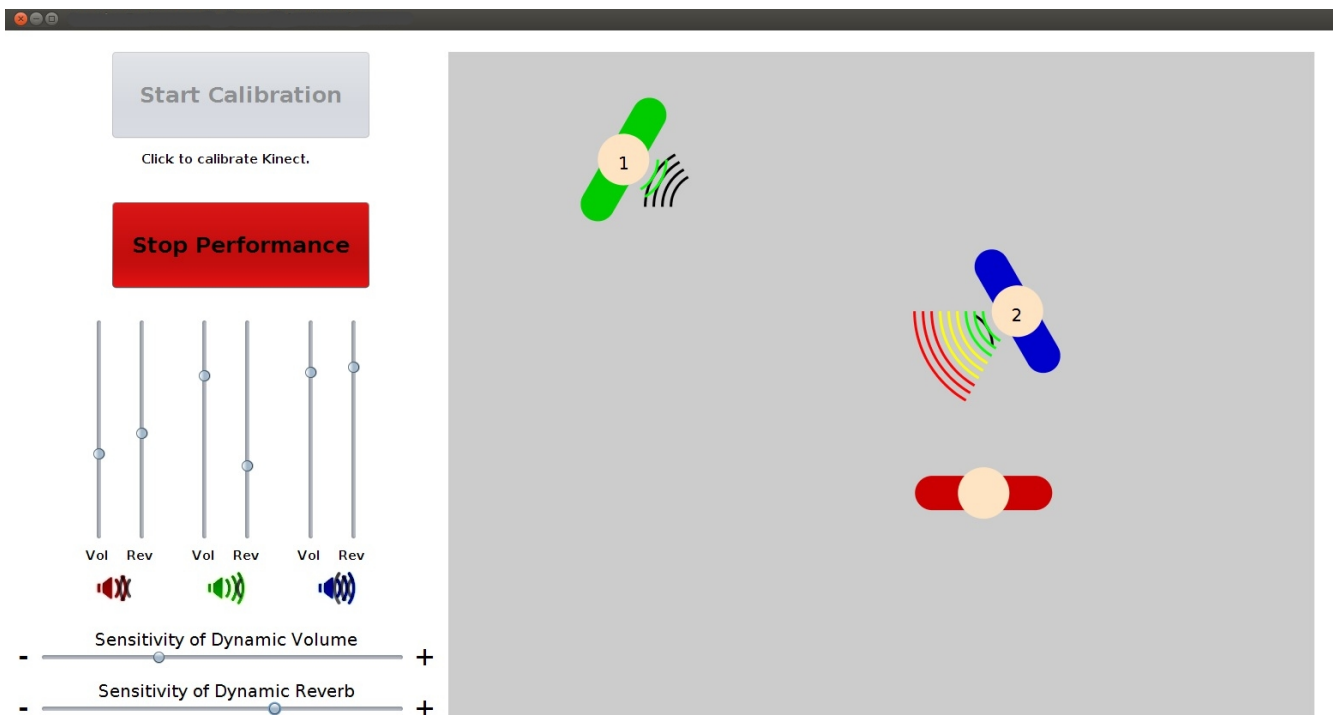
4. As you move around, the avatars will dynamically change according to the figure below.
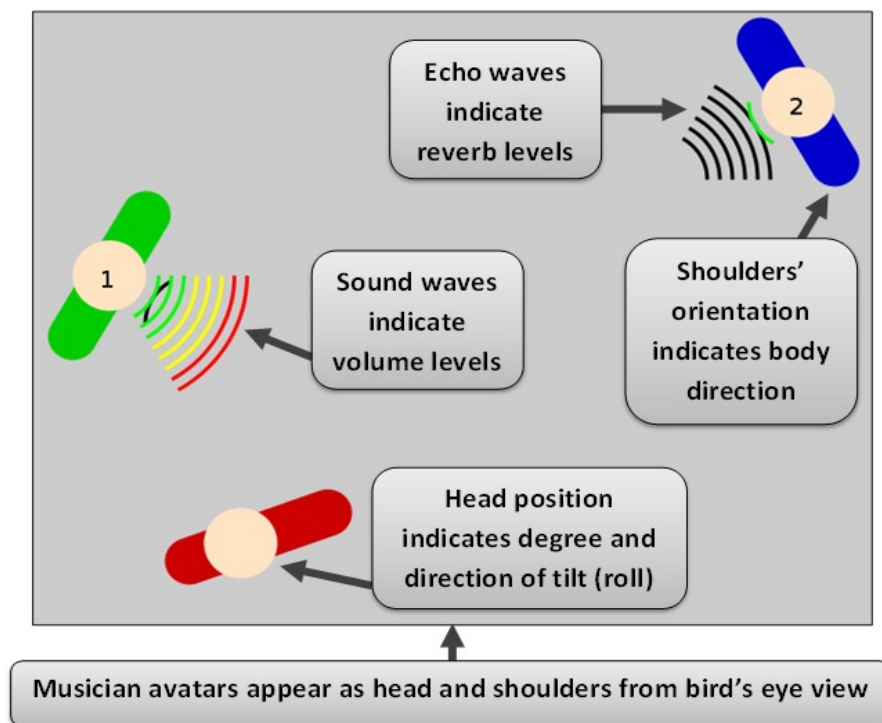
5. You can change the sensitivity of the Dynamic Volume feature using the corresponding slider. A larger sensitivity means that you will experience a greater change in volume when moving smaller distances.

6. Similarly, you can change the sensitivity of the Dynamic Reverb feature using the corresponding slider. A larger sensitivity means that you will experience a greater change in reverb when moving smaller distances.

7. When you are ready to record, go to the Ardour session. First, click on the record button (labelled by a red circle), followed by the play button (labelled by a triangle).

8. At the end of the session, click the 'Stop Performance' button. This will stop audio.

9. In Ardour, click on the stop button, (labelled by a green square), and save your session (Session --> Save).

10. When you are done, you can export your recorded session (Session --> Export --> Export session to audiofile).

That is all!

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