AuRal: A Mobile Interactive System for Geo-locative Audio Synthesis

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Introduction

AuRal is an interactive audio environment in which individual users affect the overall sound of the music associated with the locations they are in. The goal of this project is to create an audio environment that will make physical location and the choices of multiple users the driving forces behind music, rather than simply the passage of time. Users should have some degree of say in what a given region sounds like. The audio landscape should reflect the physical one. Walking through the same location at different times should result in unique listening experiences.

SuperCollider

SuperCollider is a programming language and environment that allows for real-time audio synthesis. Music is defined by code written in the SuperCollider language (example below). Operations can be performed on programmatically generated sounds, raw audio input or even existing audio files. Due to current challenges with Android SuperCollider and some legal reasons, AuRal audio is currently limited to predefined synthesizers with controllable parameters.

SuperCollider – an invisible breath, emanation, or radiation
Aural – of or relating to the ear or hearing

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<th>SynthDef</th>
<th>CDell_01</th>
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<th>arg r = 0, v = 0, m = 0;</th>
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<td>(Decay.ar(0.5, PinkNoise.ar(0.5, 0.5, 0.5, 0.5)), 0) +</td>
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<td>(if (r &gt; 0.75, Decay.ar.Impulse.ar(4, 1, 0.5, PinkNoise.ar(0)), 0)), 0));</td>
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This is a simple SuperCollider SynthDef (Synthesizer Definition) that simulates a cymbal being tapped in an infinite loop. A user parameter determines which beats are played.

Android Client App

A user’s experience with AuRal happens through an Android client app. With an embedded Google Maps view and locational services (GPS, WiFi, cellular network) the app keeps track of the phone’s location and displays that information for the user. A SuperCollider server running in the app allows it to generate music on the fly.

The app allows users to place areas anywhere on the map and associate SuperCollider audio with these areas. When the user is inside an area, its corresponding audio will play. Certain specially written SuperCollider tracks are affected by a user’s personal musical parameters, which are stored on the device. These parameters are sent to the user’s SuperCollider as OSC messages.

Users connect to a Ruby on Rails server. Once connected, they download locations from the server. The server stores a collection of user locations, user-defined areas, preferences and which areas the users are currently in.

For every user location, there is a SuperCollider synthesizer. If a user is connected to the server, the device will receive updates of aggregated user parameters for all areas the user is in.

Ruby on Rails Server

Ruby on Rails is a web application framework that uses the Ruby programming language. Inside the server is a SQLite database that houses all user locations, audio locations and other necessary information. One of the server’s core roles is to aggregate parameter data from users in a given location and then send that information via OSC messages to the users’ devices. The client app can then update its SuperCollider synthesizer for that location.

Open Sound Control (OSC)

Open Sound Control is a simple, patterned message format. The server uses OSC to update the audio parameters for individual users. The Android app also sends OSC messages to its SuperCollider server to create and modify synthesizers in run-time.

Discussion and Future Work

AuRal successfully allows users to associate music with physical locations of varied shapes and sizes and to collaboratively modify the sounds associated with those locations through physical presence and selected parameters.

- An Android app provides the platform for AuRal to run on.
- A SuperCollider server embedded into the app allows for interactive music.
- A Ruby on Rails server mediates user interaction
- Open Sound Control (OSC) is used to quickly send information from component to component

The coming months will see this project move from being limited to two dimensional maps to three dimensional visualizations. Since the basic structure of the system is now built, expanding AuRal into full Augmented Reality will be slightly less challenging. Only the client app will have to be greatly changed.

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