

Musical Playground

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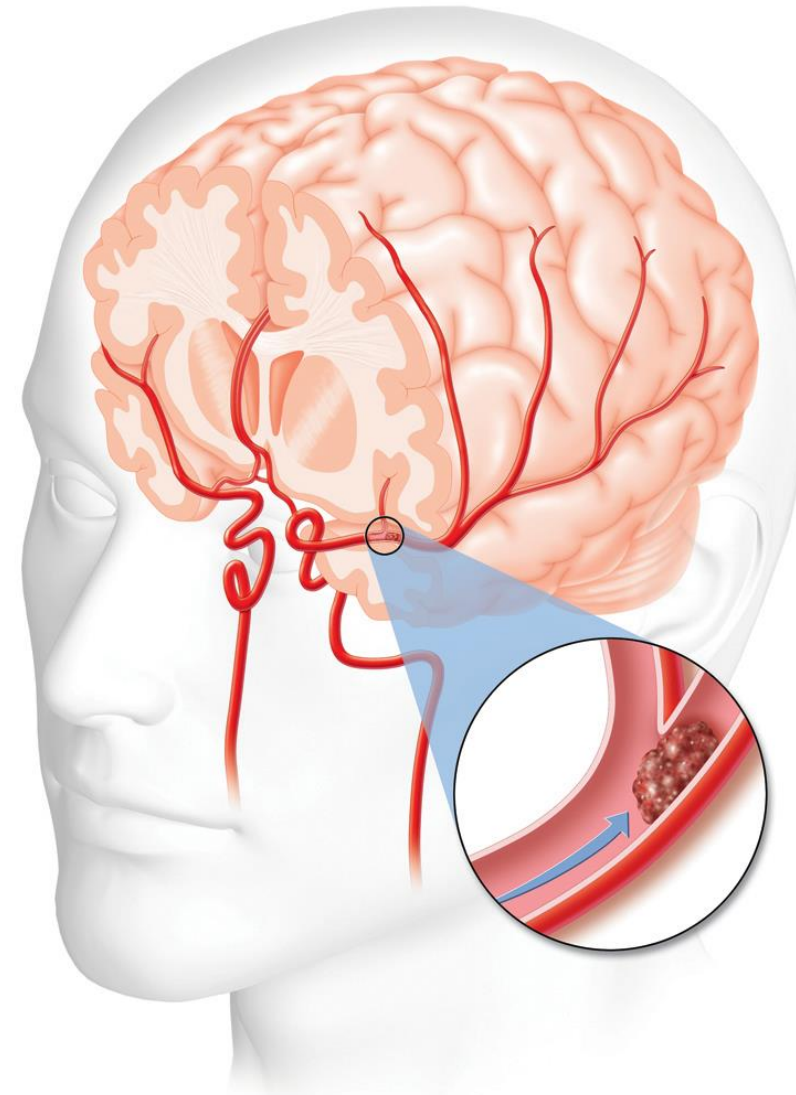
Background

A stroke occurs when blood flow is cut off to the brain. Common effects can include permanent or partial loss of speech, movement, or memory.

Strokes have remained one of the top five causes of death for past decade. Roughly 80% of stroke survivors have difficulty with moving one side of their body.

In order to regain mobility, repetitive motions are emphasized in rehabilitation.

Regaining motor control in the arm and legs are vital in order to facilitate everyday activities.



Project Goals and Objective

The goal of this project is to encourage patients to improve their limited arm motions through music.

Music is used as both a motivational tool to keep patients interested and a quantitative tool to measure progress.

In order to accomplish these goals, our team is developing an Android application. By the end of Winter Quarter, we aim to have the task-oriented mode completed.

Project Description

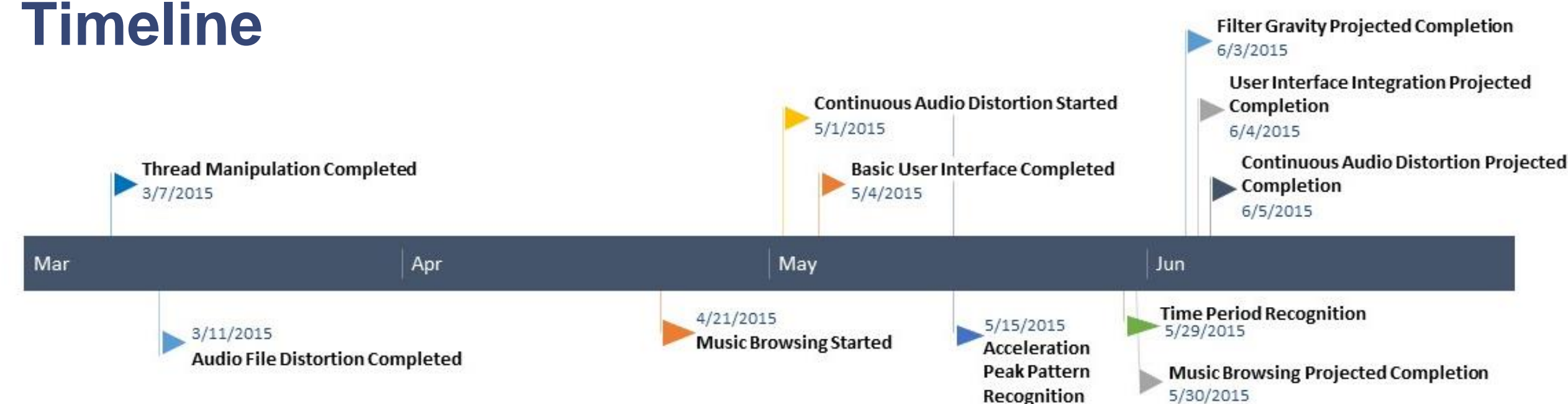
Musical Playground is an Android application that distorts music according to how well a patient moves his or her arm to a predefined path.

A baseline motion defined by the therapist is recorded in terms of acceleration.

Patients try to mimic this motion. The application records and compares the two sets of accelerations.

Depending on how well the patient is performing, a song is distorted and played back in real time.

Timeline



Project Design Process

The original design was an Arduino-integrated device that operated in a similar method as the current android application design. The current design eliminates the listed limitations and hardware management.

Its limitations include:

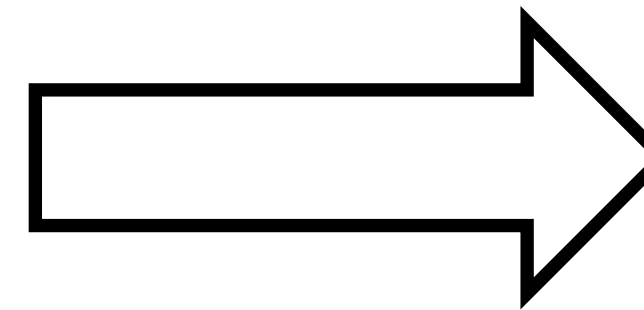
- Limited RAM
- Bulky size
- Playback not in real-time
- Lack of resolution

Hardware consisted of:

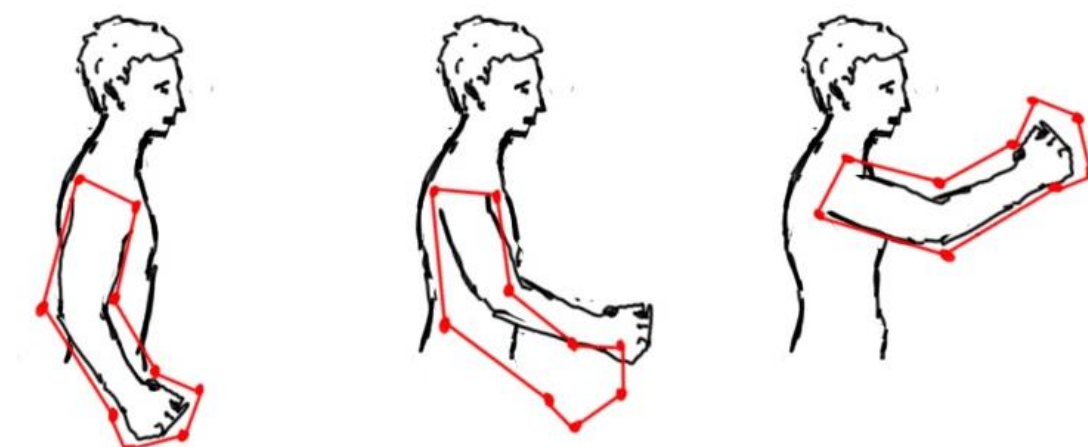
- 2 Arduino Boards
- 1 Adafruit Wav Shield
- Speaker
- Accelerometer



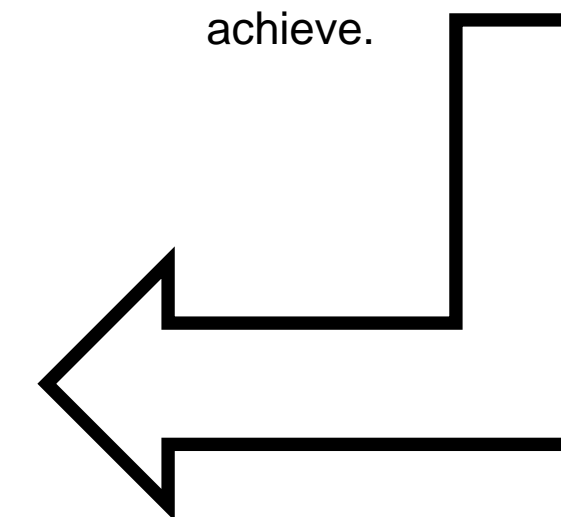
Initial Start-Up



Therapist records movements and sets the baseline for the patient to achieve.



Patient tries to emulate the movements by strengthening and regaining muscle plasticity.



Song is distorted to allow the patient to understand where errors in movement are located while motivating and keeping the patient engaged.

Current Status

Completed

- Coding
 - Accelerometer access
 - Play music files
 - Distort sounds via frequency
 - Motion induced distortion
- Pattern Recognition
 - Acceleration peaks

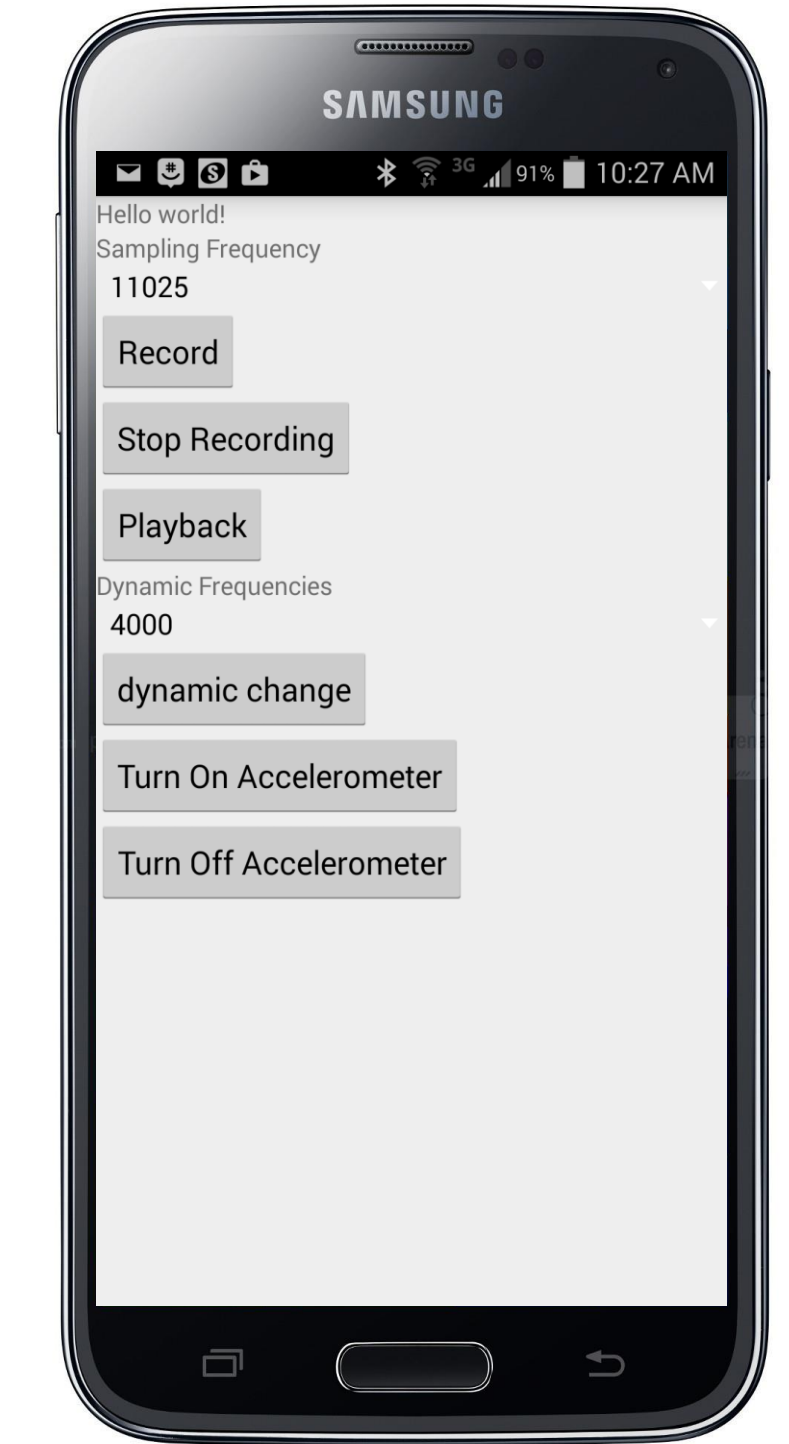
Next Steps

In Progress

- Allow smooth audio distortion
- Allow music browsing for distortion
- Filter out gravity
- Time period of wave function
- User interface design, integration

Future Tasks

- Changing pitch of audio without affecting tempo
- Exploratory functionality



Current User Interface

Project Value

Musical Playground is an enjoyable and interactive form of therapy for stroke patients. By giving direct performance feedback, it keeps users interested and aware of how well they are doing.

Smartphones have become more readily available in the US. Thus, the application will allow simple arm rehabilitation to become more accessible to the public.

There is no additional cost associated with this technology beyond the cost of the smartphone, which makes it an attractive option as well.

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Left to right: Kevin Chun, Han Tran, Mehal Garg

