

Steven Jin

Executive Summary

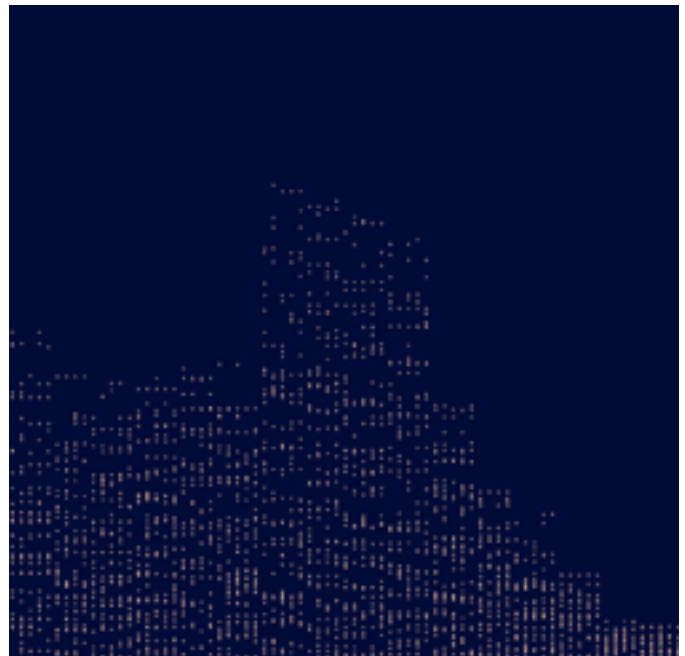
Honors Capstone: Synesthesia/Gravity2

Introduction

My name is Steven Jin and I am currently a senior dual majoring in computer science and physics. Ever since coming to Syracuse University, my goal has always been to explore and utilize both my majors to the fullest. My program Synesthesia is a venture to join what I have learned from both fields into a single substantial project. During this spring semester of 2017, I have the privilege of working under the guidance of Professor Walter Freeman to build this application.

What the is it?

Simply put Synesthesia is an interactive music visualizer. Like a standard music visualizer, Synesthesia uses a row of 16 bars(with the option to add more) that oscillate up and down to represent music frequency as well as amplitude. The unique thing that separates it from other music visualizers is that each bar is made of countless free moving balls. Forces are applied to these balls to have the bounce to the sound of music. As a user, you can interact with these balls by clicking to apply a force.



What are it's features?

Synesthesia's main functionality is the ability to play and visualize WAV music files. By putting a music.wav file in the same directory as the program, the program will read, visualize and play the file. By clicking on anywhere in the window, you create an attractive force to all of the dots on the screen. Pressing the 'r' key reverses the direction of the force making it repulsive. Normally most forces (such as gravity) get exponentially weaker the farther away you are. This is called the inverse square law. Pressing 'd' turn's off the inverse square law and makes the force ubiquitously strong. Pressing 'R' allows you to reset the screen to it's default. Pressing numbers 0-9 allow you to select through a variety of colors. Pressing 'g' allows you to turn on and off gravity in the window. Pressing 'n' allows you to select how many stars you want. There are many more options I have incorporated into the program, the aforementioned are just a select few.

How Does it Work?

The program works by first reading in the header data of the WAV file. From the header file, the program learns various key facts about the music such as the sampling rate and size. The file then is read window by window; 4096 samples at a time. A fast fourier transform is then applied onto the window. The output from the transform is then adjusted to account for noise and leakage and is ultimately represented as a force onto the balls in the program. The forces are implemented by a physical concept called separation vectors. These vectors indicate how far the ball is to the mouse, and an according force is then applied to the ball.

What do I hope to implement?

There is a large list of things I hope to add to the program to improve it. Here are my top three:

1. Make the program more user friendly: Currently the program is pretty foreign to new users
2. Optimization: Due to the large number of balls the program tends to lag from time to time
3. Increased interaction: While the program does allow users to interact with the balls, I hope to incorporate a way to interact with the music.

Thank you for your time in looking at my project. All feedback and suggestions are welcome.