

Piano Teacher (piano WFC)

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The primary concept of our piano teacher game is to create generative music using Wave Function Collapse with some cute set dressing of being a piano teacher to a student who only sort of listens to your instruction. The aim of this project is further explore the rich tradition of generative music and computation in a lighthearted and humorous way.

This project was a marriage of Jared's previous wave function collapse project involving generative Super Mario levels through the Unity framework and Tamara and Celeste's WFC timbral generator. Here, the idea is to marry two initially seemingly disparate concepts in a pleasing way. Of course, when one really thinks about it this is not that surprising of a combination. Both computational media and music have rich traditions of aleatoric design. From John Cage's chance music to the original Rogue these two forms of media which are intended to be experienced repeatedly would naturally cross paths in such a way. However, the novel aspect that the game “follows” your examples through wave function collapse to provide this generative art adds a new dimension to this project.

The actual program functions as such. In Unity we have a series of “prefabs” (previously defined objects that are stored in memory that can be readily called) that represent notes. We have based these prefabs on the notes from ukushu's “UnityPianoGame”¹. These note prefabs are instantiated on a musical score that exists in 2d space. Much like a real musical score, the notes “x” value indicates when in time it should be sounded, and its “y” value indicates the pitch to be sounded. Naturally, when the program is set in motion the time is checked and if a note prefab exists there then it is played. However, at the beginning there are no notes and it is on the player to play a short series of notes that will be recorded at the beginning of the score. This is the “example” that the WFC “student” will learn from. The WFC implementation (courtesy of selfsame)² will look at what the user just played and try to find patterns. The AI will then proceed to compose a long and winding piano piece in real time based on what it can glean from the player's input.

Ideally, once this basic functionality is implemented there would be more steps that we could take to enhance the aesthetic of the experience. The framing device of our game is that of Player as Mentor / AI as Student, so being able to give your pupil feedback would be ideal. Being able to designate certain passages played by the student as “good” would help to increase the corpus on which the WFC algorithm could draw patterns from. The student would then have another pass at playing the piano, and afterwards you could tweak more. This cycle would last as long as the player would like. Another idea we had was to use GPT-2 trained on a corpus of song lyrics that could be “sung” along with the piano music. This is primarily for comic purpose. We basically think its really funny to imagine this little AI scamp banging away at the keyboard and doing some ad-hoc songwriting.

Ideally, these things would have come to pass.

However, at the time of this project's inception it was Spring of 2020 at UC Santa Cruz. If you are keeping up with the news, you perhaps are aware that this is a time of great upheaval, making finding time to work and collaborate on this project a scarce commodity.

What we actually have is basically just a piano WFC generator that takes human input. Its most of what we set out to do, but it lacks a lot of the personality that we were hoping for. You are able to give “feedback” to the WFC but in a very impersonal way by tweaking parameters. This is not the type of humor we intended, but its not totally devoid of humor. Watching the program listen to a small portion of music and then go off on a rambling musical phrase has a certain gleeful absurdity to it. Hopefully when things settle down a little bit we can revisit this project and make it more in line with our initial vision. Until then, it's exists as a sort of surreal proton-version of our intentions.

Referenced Works

- 1.) UnityPianoGame by ukushu (<https://github.com/ukushu/UnityPianoGame>)
- 2.) unity-wave-function-collapse by selfsame (<https://selfsame.itch.io/unitywfc>)