

Report on second project of the course Introduction to Music Generation.

Introduction

For this project I chose Particle Swarm Optimization algorithm to generate music. In total I generated five midi files and chose three best out of them. Throughout project I used Java programming language and library jfugue. I generated two melodies and one accompaniment.

Algorithm

To implement PSO I decided to split melody and accompaniment as two separate particles. Each iteration I calculated fitness for each particle and found global best particle.

Melody

Melody is just an array of notes, which I generated using accompaniment. Melody is one octave higher than accompaniment. For it I used multiple instruments, such as piano, guitar and synth strings from jfugue library. Initial number of particles is 5. Stopping criteria is if best fitness value is equal to 2 or number of iterations exceeds 1000.

Fitness function

Fitness function for melody is following: if each note is in the key of the melody, if note is higher than chord by one octave, and if difference between two notes is less than 4, which means that they are not far from each other in context of their keys.

Accompaniment

Accompaniment is represented as array of chords. For chords I randomly generated key and found tonic. I chose to represent each chord as a point in space: x coordinate is bottom note, y coordinate is middle note and z coordinate is a top note in a chord. I calculated position and velocity for every note in chord. Initial number of particles is 50. Stopping criteria is if best fitness value is equal 3 or number of iterations exceeds 500.

Fitness function

Fitness functions for the accompaniment is the following: if bottom note is in tonic, if bottom note is dominant or subdominant, if each note in chord forms minor or major scale. If two chords repeat more than twice I set fitness to zero, and if bottom and top notes are not in tonic I set fitness to zero too.

Conclusion

During this project I learned a lot about Particle Swarm Optimization and how to generate music using it. In the future I would like to learn evolutionary algorithms and generate music using them.