

AI Assignment-2 Report

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Classes:

- `Chord` - class-array for notes in the chord. A chord can be **major**, **minor**, **dim**, **sus2**, **sus4**.
- `Chromosome` - stores a sequence of chords for the melody. Chromosome is an individual in GA.
- `GA` - implementation of Genetic Algorithm. I used this [article](#) a little as reference in case if **plagiarism** occurs.

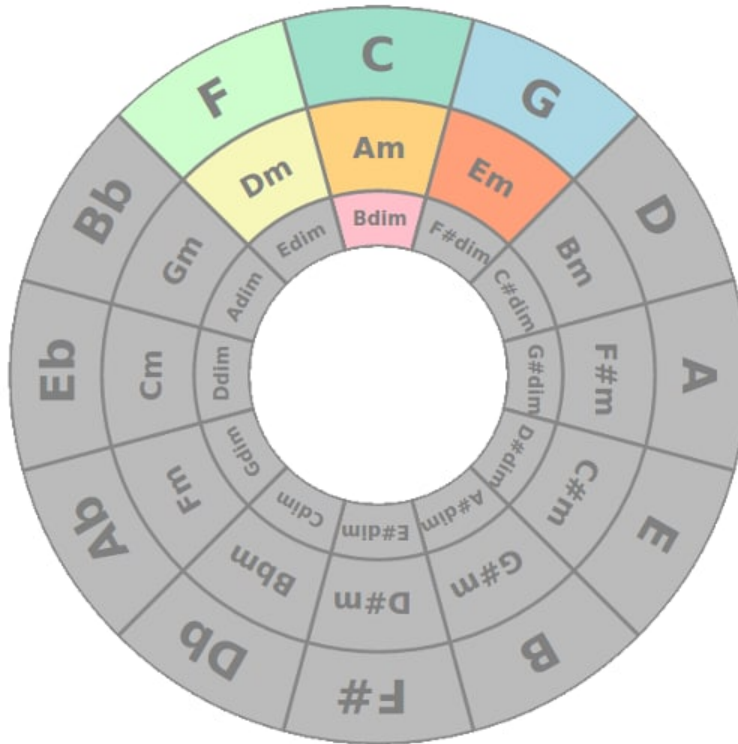
Used libraries:

- `mido` - for all the alternations with midi-file.
- `music21` - to get tonic of key note.
- `pretty_midi` - to parse the melody and convert it to time array.

You can install them with `pip install <library-name>`

Genetic Algorithm

- `Chord` - I choose chords only from the circle of fifths, they are more likely to sound good. The suitable chords depend on key of the melody and its scale (e.g. C# minor for barbie-girl). Also, the generated chords are in 2 octaves lower than the key of the melody.



- **Chromosome** is an individual (sequence of chords). Its length is such that a chord plays every 2 beats.
- **crossover** - two-point standard crossover. The selection method of parents is **Roulette Wheel Selection**. The probability of crossover is 0.9
- **mutation** - selects 2 genes (chords) in the chromosome and replaces them with random chords. The probability of mutation is 0.4
- **Population size** is 20
- **Generations** - there are 2000
- **run** - this function initializes the population (by default the first generation is of size 500 to increase the initial diversity of individuals) and iterates through 2000 generations doing variation operators mentioned above.
- **Fitness Function** :

Reward:

- If any note in chord is the same as the note of melody playing or is in harmonic difference (highlighted with green in the picture), reward.



- If a note pitch of melody is higher/lower than the previous one, it's better for the chord to be higher/lower than the previous as well, reward for that.
- If the last chord has the base of the key note, reward. Usually songs end with the key note and it makes them sound complete.

Punish

- If the adjacent chords differ too much in pitch (more than 5), punish.
- If there are more than 2 the same chords in a row, punish
- If a chord is repeated in previous to it 6 chords more than 2 times, punish. I like divergence. Don't repeat stuff.
- Punish dissonance.

Run

It took about 3-4 times for me to select the best version of a generated track.