Introduction to Artificial Intelligence Assignment 2 Accompaniment Generation. Report

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1 Introduction

During this assignment, by using evolutionary algorithm I have generated accompaniment for a couple of monophonic midi files (melodies).

2 Manual

To start working with program you need to have python 3.7 or higher versions. On your machine you should install Python music21 and mido libraries. Inside python file you should consider the name of the input .mid file (twice: for input and key detection) and output file name in the end of the code.

3 Keys

The program detects key for the input melody. To detect it I have used Python music21 library. In this library key is detected by applying **Krumhansl-Schmuckler** key-finding algorithm. If you want to know more about it, explanation on this algorithm is on this site https://rnhart.net/articles/key-finding/.

Also, in assignment it was required to write in report detected keys for 3 given input files:

1. input1 – Dm – D minor
2. input2 – F – F major
3. input3 – Em – E minor

4 Evolutionary algorithm

For evolutionary algorithm I decided to choose **genetic algorithm** as in my program accompaniment will stand as chromosome. In the beginning (1st generation) chromosomes (list of chords) are generated randomly depending on:

1. root note (from 0 to 120).
2. chord type (minor, major or diminished).

To generate new solutions we use **crossover** (recombination), taking genes (chords) depending on random point from 2 parents and sum them into a child chromosome. Also every iteration we **mutate** half of population by changing some chord to another random one.

Fitness function for algorithm is based on finding best fitting combination of chords for them to be consonant. Firstly, we give fitness value for each chromosome depending on its size and then we make that value smaller for each conditions considered below:

1. The place of random chord is same as consonant chords.
2. Note is in original melody and in chord, or
3. Note is in neither of those.

The algorithm will stop under 2 circumstances:

1. Limit of iterations (I chose 10000)
2. Fitness is equal to zero, so the chord is fitting all of the conditions