Introduction to Artificial Intelligence
Assignment 1: Compass and Pirates
Report

Vladislav Danshov, BS21-05

1. Manual for running program

1) Install mido library for python interpreter (is it's not installed).

2) Also there should be three input files (input1.mid, input2.mid, and input3.mid) at the same directory as VladislavDanshov.py file.

3) Then, run program by following command: python –u VladislavDanshov.py

4) You will get three output files

2. Technologies used

1) Mido library for working with midi files.

2) Some other standard python libraries for necessary computations.

3. Key detection algorithm

To implement key detection algorithm I used the following source (link). It suggests to compute the correlation coefficients for all possible keys. The major key will be that one which corresponding correlation coefficient will be the maximum from all others.

4. Detected keys

1) For barbiegirl_mono.mid - C#

2) For input1.mid - Dm

3) For input2.mid - F

4) For input3.mid - Em

5. Genetic Algorithm Description

1) Gene - is a Chord in my case. I've created a class Chord that represents music chord.

2) Chromosome - is a set of genes. In my case, it is a required accompaniment - set of chords.

3) Population is a set of Chromosomes, namely, set of accompaniments. It has default size of 500 elements or size can be specified by user.

4) Crossover. My crossover function with equal probability take genes from two parents (Chromosomes) for a new child.

5) Selection. Selection function performs a selection pairs from population the most fittest according to result of fitness function.

6) Mutation is a function to mutate a Chromosome. By default, probability that needed to mutate is 0.8, but it can be specified by user.

7) Fitness function. My fitness functions check whole candidate for accompaniment on fitness to melody. First I increase the fitness score of candidate if note that I check contains in given

melody. I decrease score if difference between first notes if chords was grater or equal then 4 and when two first notes in chord are equal.

8) Generation Process. In each generation, we perform selection pairs from population. Next, Foe every pair we perform crossover, get child, mutate it and append to new generation. After that, we add new generation to our population and sort them in decreasing order of fitness of every individual. Then we cut individuals with the smallest fitness score.

6. GitHub

Here you can find the link to my GitHub, where files for this assignment are located.