Automated Music Composition

Final Project Readme

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1. Introduction

   JMIDIGen (Jasonmel MIDI Music Generator) is a program developed to generate MIDI musics a utomaticly. It can randomly generate musics melody channel, bass channel, bird channel, and dru m channel. With graphic user interface, it is pretty easy to use. And we can get unlimited number of automated composed musics in few clicks.

2. Using JMIDIGen

   1) System Environment

      Because JMIDIGen is written in Java, the basic system requirement is JRE (Java Runtime En vironment) running on whatever OS (Operating System) supporting Java, such as Mac OS X, Linux, Freebsd, Windows XP, ... etc. It can easily be done by referring to Java Official Site (ht tp://java.sun.com/).

      The software is developed on Mac OS X. And the program is tested on Windows XP and as w ell.

   2) Running JMIDIGen

      Under shell command line, change to the JMIDIGen directory. Then use java command to run it.

      ```
      shell> cd $JMIDIGen
      shell> java -jar JMIDIGen.jar
      ```

      Now we can see the JMIDIGen window on the screen.

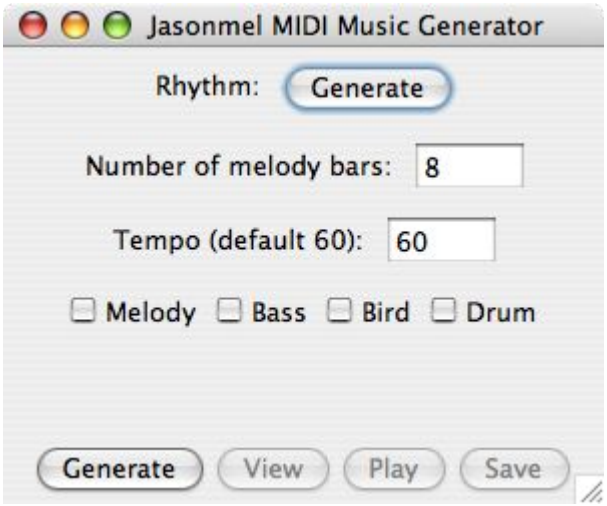


Figure 1. JMIDIGen window

Below we will show the functions one by one.

3) Rhythm Generator
Once we click on the 'Generate' button above the window, it will randomly generate one rhyth m of a bar. Here are some examples generated from the rhythm generator.

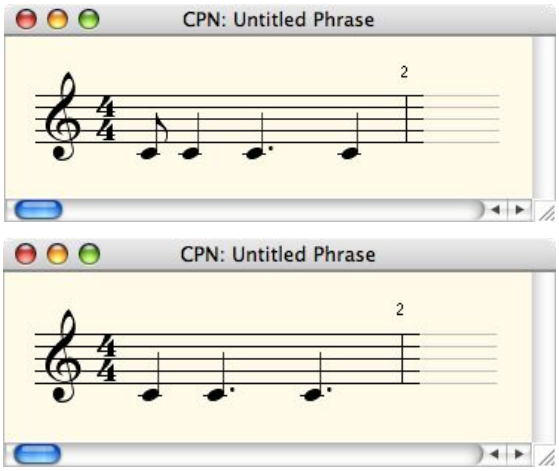


Figure 2. Some rhythms generated from rhythm generator

4) Number of Melody Bars
We can type any positive integer here to setup the number of melody bars. The default value is 8 as shown in Figure 1. Here we change it to 4 bars in Figure 3.

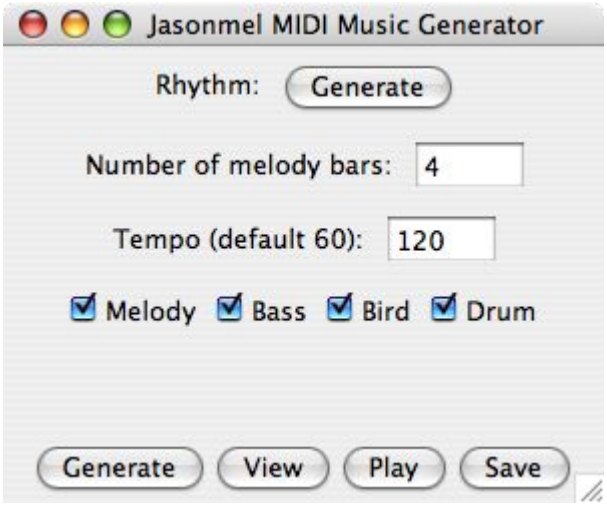


Figure 3. Different user input parameters

5) Tempo Adjustment
We can type any positive integer here to setup the tempo of the music. The default value is 60 as shown in Figure 1. In Figure 3, we change the value to 120.

6) Channels Selection
We can choose which channels we would like to generate in the music. In Figure 3, we choose all of the channels.

7) Generate the Music
Once we click the 'Generate' button below the window, JMIDIGen will compose a music gene rated randomly.

8) View the Score
Once we click the 'View' button below the window, JMIDIGen will show the score of the mus ic. Figure 4. shows a score generated from Figure 3 parameters.

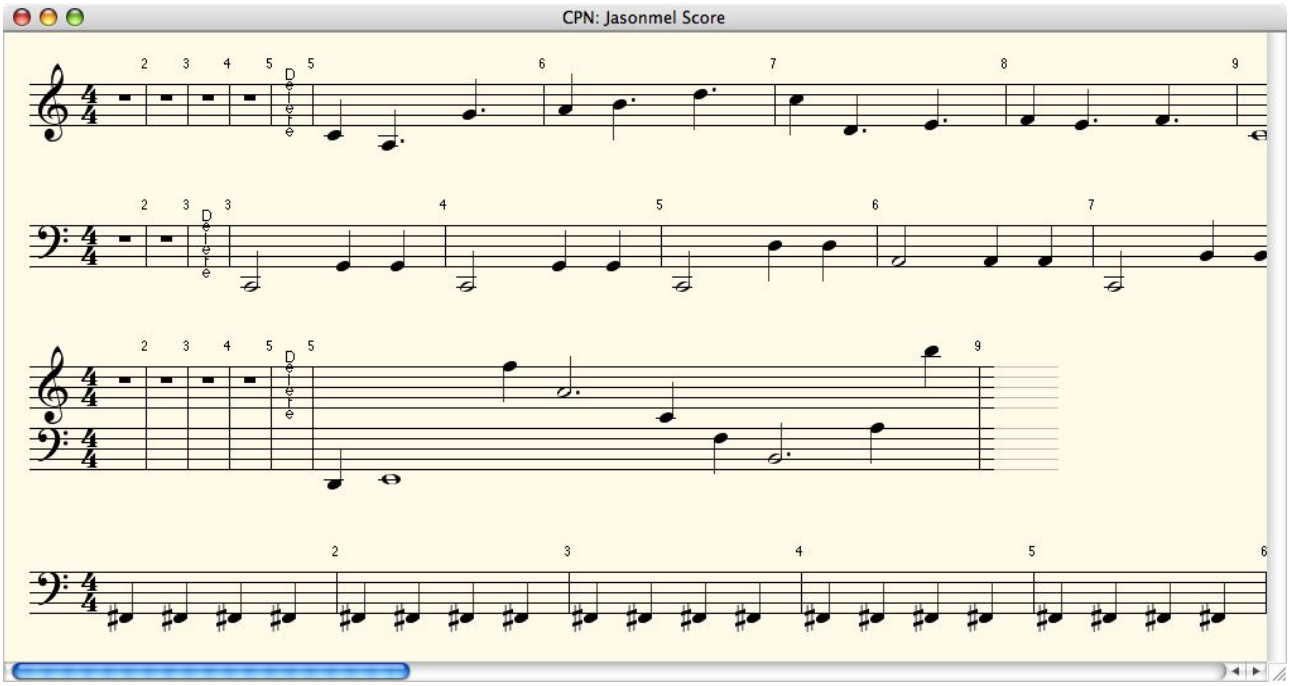


Figure 4. Score generated from Figure 3

9) Play the Music
Once we click the 'Play' button below the window, JMIDIGen will play the music. At the time, the button becomes 'Stop' as shown in Figure 5. And you are not allowed to click other button s unless you click the 'Stop' button to stop it.

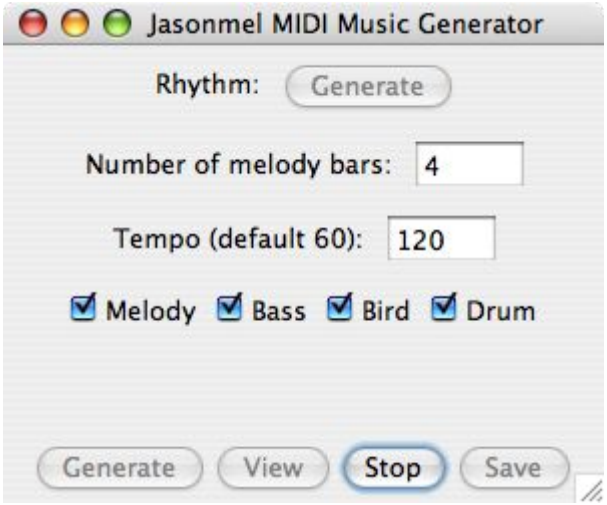


Figure 5. The 'Play' button becomes 'Stop' while playing

Caution:
There is one unknown bug. If we want to play again, we should wait until the 'Stopping' mess age appearing on the console as shown in Figure 6, or multiple musics will play at the same ti me.

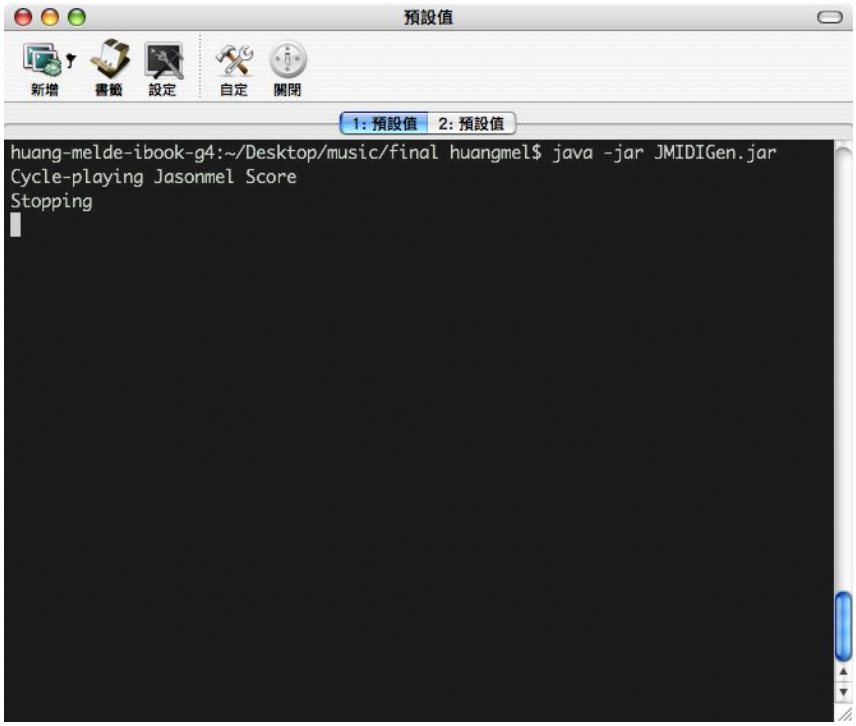


Figure 6. The 'Stopping' message on the console

10)Save the Music into MIDI files

Once we click 'Save' button below the window, JMIDIGen will save the music into a MIDI fil e called 'jasonmel.mid' in the same directory. Of course, we can open it with other programs s upporting MIDI file type.

(By the way, as we can here the result MIDI from this generator, I would like to name the son g 'Happy Timpani in the Forest.')

3. The Design of JMIDIGen

1) Software Architecture

The software architecture can be shown as Figure 11. JMIDIGen uses 4 classes as channel gen erators. And the 4 generators use JRhythm and JNote as their rhythm and note data structure.

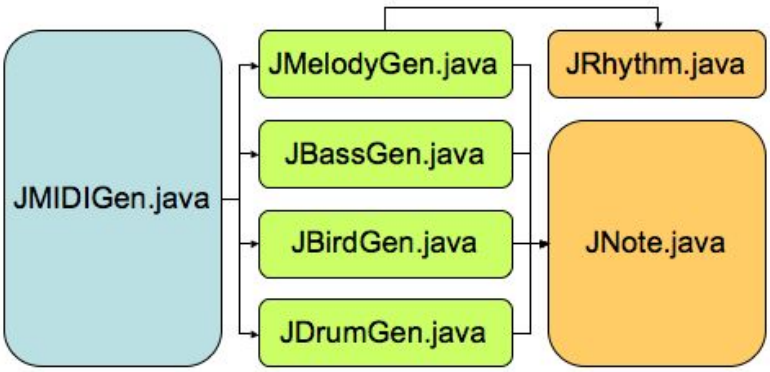


Figure 11. Software architecture

2) Algorithms

i. Melody Channel

The melody channel can have different rhythms generated automatically and different velo city variations using rhythm generator. The rhythm generator randomly combine the pitche

s from 8 eighth notes.

Using the rhythm, melody channel start to produce the pitches to fill the melody of the num ber of bars. The sudocode is shown below.

```
FOR i = 1 to BAR_NUM
    // Determine the velocity direction randomly.
    Randomly select one of {STAY_LOW, GROW_UP, STAY_HIGH, FADE_DOWN}.
    FOR j = 1 to RHYTHM_NOTE_NUM
        // Determine pitch from previous pitch.
        Randomly select one of {+1, -1, re-choose}.
        Change the pitch to C-Major.
        Apply the pitch to the velocity.
    END
END
```

Now we get a pleasant melody!

ii. Bass Channel
Using the melody pitches, the bass channel set the first pitch of a bar as the first pitch of a bar in melody channel, and the second and the third pitch of a bar is set from the last pitch of a bar plus 7 in melody channel.

iii. Bird Channel
Just random pitches with random durations!

iv. Drum Channel
Just fixed drum pattern.

4. Conclusion
Honestly speaking, this is my first time to take music related class. I'm afraid of the lack of music theory knowledge and some related concepts at the beginning. Undoubtedly, I've learned a lot in t he class. It's funny to compose a music, and it's even more exciting to compose a music generator. Finally, I would like to thank a lot to Prof. Winsor and other classmates' kindly help.