

Converting Electronic Music to Sheet Music

TJHSST Senior Research Project Paper

Computer Systems Lab 2009-2010

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January 22, 2010

Abstract

Electronic music has been steadily expanding over the past years. Many file formats have come into use, including WAVE, MP3, Ogg Vorbis, and many others. This project hopes to take any one of these file formats, and, based on the pure audio wavelength data (what the computer must see to play the song), convert it to a sheet music version. **Keywords:** music, analysis, mp3, wav, sheet, music

1 Introduction

Problem Statement and Purpose This project will involve reading the audio data from an electronic audio file and converting it into a file format called ABC. The ABC format will be discussed in more detail later in the paper. This process will be difficult because converting music files to basic sound data can be very complicated, especially in the case of MP3 and other "compressed" formats.

2 Background

I need to have a good understanding of how C++ works. Also, I need to know musical composition, and how virtual music files are put together. The reason for knowing these things is so I can perform the operations stated above in the fastest time. With bigger music files, the analysis portion of this project could take a long time, so I need to be able to optimize the process. I know some previous research has been done in this area, by some TJ students and other researchers.

3 ABC Format

ABC notation is a way to represent sheet music in a text file. The format is simple, with the letters of the keyboard serving as the notes of the piano. You can add information such as the title, the arranger, the performer, and other things to the music. In addition, there are lots of programs available for converting this notation to a

PDF document, so it can be actual sheet music. ABC notation is best for rendering single-melody songs, so it will be very useful for my project. The general format of an ABC file is as the following example:

```
T:Paddy O'Rafferty
C:Trad.
M:6/8
K:D
dff_ cee|def_ qfe|dff_ cee|dfe_ dBA|\
dff_ cee|def_ qfe|faf_ qfe|1 dfe_ dBA:|2 dfe_ dcB|\
~A3 B3|qfe_ fdB|AFA_ B2c|dfe_ dcB|\
~A3 ~B3|efe_ efg|faf_ qfe|1 dfe_ dcB:|2 dfe_ dBA|\
fAA_ eAA|def_ qfe|fAA_ eAA|dfe_ dBA|\
fAA_ eAA|def_ qfe|faf_ qfe|dfe_ dBA:|
```

This creates a sheet music file like so:



ABC format is a well-used format, with many websites offering versions of their MIDI or MP3 files in ABC format as well. An example is The Session (<http://thesession.org/>). This website is a collection of Irish traditional folk music. This is useful, because, most folk music has one melody, and a single line at a time. For my project, these types of songs will be best to test my program on, as there is a low probability of getting the song wrong if the program is actually working.

4 Description

So far, I have a working program that reads in a .WAV file and prints out information gleaned from the information chunks of the file. It also saves the file, in chunk form, to a buffer, and then writes it out to a copy of the file, just to show that it can, and the structure of a .WAV file can be easily imitated. The structure of a .WAV file is pretty simple; it consists of three main sections, and each has a number of chunks contained within it. The chunks contain information such as the type of file it is, the bitrate, the sample size, the number of channels (mono, stereo, etc.). These are used by music players, mostly. It also contains information about the type of compression the file uses; if there is one, some extra chunks are added to tell more about it. This will probably be one of the hardest parts to complete, as I need to be able to convert from the compression into actual data. This program is still useful in the second quarter of my project, because I will need to convert the files to audio data. I have done some more research on this, from my main research book "Elements of Computer Music," by F. Richard Moore.

5 Elements of Computer Music

All waves are defined by two things: frequency and amplitude. Basic physics tells us the dynamics of these waves. Sound waves are exactly the same. They travel fast, albeit slower than light, and through most

non-vacuum mediums. Computer sound files work the same way, in fact. Energy is converted into data by the use of a transducer. An analog signal is then sent out, which the computer can interpret into sound.

6 Conclusion

I have a lot of work left to do in this project. The program does not do very much in the way of analysis or modification yet. I still need to figure out how the data part of the file is constructed, as I do not know the structure of this mega-chunk yet (it is most of the file, after all). Once I figure this out, I should be able to complete the rest of the project. I want to be able to read in a file, determine the soundwave data, and then analyze and interpret it to note format, and then to ABC. The hardest part by far will be the analyzing of the file to determine what notes and speed the song is.

7 Bibliography

<http://www.sonicspot.com/guide/wavefiles.html>
<https://ccrma.stanford.edu/courses/422/projects/WaveFormat/>
<http://thesession.org/> Elements of Computer Music (F. Richard Moore)