

COMP3601 Design Project A

Term 3, 2019

Overview

This document describes the music file specification, indicating the range of notes that must be played and the method by which the default tempo (when not controlled by the user) is provided.

Range of notes.

There are 25 frequencies of notes that you must play going from middle C ($220 * 2^{3/12}$ Hz \approx 262 Hz) and the next two higher octaves up to and including the 2nd higher C (~1047 Hz) and all the semitones in-between. Hence, regardless of the range you choose, there are 25 notes that you must be able to produce. You should also be able to produce silence. These notes will be mapped to the letters of the alphabet as per the following table:

| Letter | Note | Frequency (Hz) | Letter | Note | Frequency (Hz) |
|--------|--------|----------------|--------|--------|----------------|
| a | C4 | 261.6 | m | C5 | 523.3 |
| b | C#/Db4 | 277.2 | n | C#/Db5 | 554.4 |
| c | D4 | 293.7 | o | D5 | 587.3 |
| d | D#/Eb4 | 311.1 | p | D#/Eb6 | 622.3 |
| e | E4 | 329.6 | q | E5 | 659.3 |
| f | F4 | 349.2 | r | F5 | 698.5 |
| g | F#/Gb4 | 370 | s | F#/Gb5 | 740 |
| h | G4 | 392 | t | G5 | 784 |
| i | G#/Ab4 | 415.3 | u | G#/Ab5 | 830.6 |
| j | A4 | 440 | v | A5 | 880 |
| k | A#/Bb4 | 466.2 | w | A#/Bb5 | 932.3 |
| l | B4 | 493.9 | x | B5 | 987.8 |
| m | C5 | 523.3 | y | C6 | 1046.5 |

Length of notes will be described as one of six values. The values represent a quarter beat (1/16 note), half beat (1/8 note), beat (1/4 note), two beats (1/2 note), three beats (dotted 1/2 note) and 4 beats(full note) and will be represented by numbers as follows:

| Number | Name | Beats | Number | Name | Beats |
|--------|------------|---------------|--------|--------------|-------|
| 1 | Semiquaver | $\frac{1}{4}$ | 4 | Minim | 2 |
| 2 | Quaver | $\frac{1}{2}$ | 5 | Dotted Minim | 3 |
| 3 | Crotchet | 1 | 6 | Semibreve | 4 |

For added challenge, you may want to try adding numbers for other note lengths, such as the triplet (1/3 of a beat), although these will not be tested.

The limits of tempo range that should be reached are 60 beats per minute and 120 beats per minute. The device should be able to operate at a significant number of frequencies within this range and does not need to support every value within the range. Granularity is up to you.

Repeated notes in the file should be audible to the listener as separate notes, meaning you should stop playing a note shortly before its allotted time (perhaps half the length of the shortest note).

You are free to extend any of these ranges if you prefer.

File Format

The file format for testing files we will be providing is shown below. This also represents the file format that your PC program must be able to allow users to easily and logically create. Extensions can be made to the file if necessary, but the default specification MUST be supported. You do not need to use this format to send info to the board.

- The first byte of the file should be a byte that has the ASCII value of the tempo being represented. For example, lower case 'x' is tempo 120 as that is the decimal value of ASCII 'x'.
- The notes of the song follow as pairs of ASCII encoded bytes. This pair of bytes will be:
 - A letter from 'a'-'z' representing the frequency of the note as per the table above. 'a'-'y' will play the frequency mentioned in the table while 'z' is a special value used to represent silence (no note should be played).
 - A number in the range '1'-'6' representing the length of the note as per the above table.
- After the final note, an '@' character is used to indicate the end of the song.

Sample Input

The following text, if inserted into a text file, should play Hot Cross Buns at a tempo of 60bpm:

```
"<e3c3a3z3e3c3a3z3a2a2a2c2c2c2e3c3a3@"
```