Assignment 4: Audio Synthesis

CS 4347: Sound and Music Computing

due February 25 (Monday), 11:59 pm

Before you start, please download `scale.wav` from IVLE. You will need it for this assignment.

1. **Pitch tracking and wav file synthesis**

   Listen to `scale.wav` and write a program to synthesize a sinusoidal wav file which contains the same notes. You may consider the following steps:

   - Use open source pitch detection tools to detect the f0 of the notes in `scale.wav`.
     Hint: you can use Sonic Visualiser with pYIN plugin.
   - Check the output of pitch detection and find out the start and end time of each note.
   - Generate a sine wave for each note and concatenate them together with the same time arrangement as the original `scale.wav`.
   - Use a sampling rate of 44100Hz to save your synthesized wav file to `sin_scale.wav`.
     Hint: use `scipy.io.wavfile.write()`.
   - Listen to `sin_scale.wav` and compare it with `scale.wav`. Why do the same notes sound differently in these two wav files? Save your answer to `comparison.txt`.
     Hint: you can plot the time-aligned spectrograms of two wav files to find the difference.

2. **Note length modification**

   Choose one of the eight notes in `scale.wav` and increase the length of it by 2 seconds. You may consider the following steps:

   - Read the data from `scale.wav` and plot it.
   - In the plot, find a single complete period of the note.
   - Increase the length of the note by looping this period for several times.
     Hint: you can use `numpy.concatenate()`.
   - Save your modified data to `long_scale.wav`.

3. Submit a zip file to IVLE containing your source code, two wav files and your answer to the question (`comparison.txt`). Name the zip file using your student number (e.g. `A0123456H.zip`). Late submissions will receive no marks.

4. Grading scheme:

   - **2/8 marks**: correct wav file for task 1.
   - **2/8 marks**: correct answer to the question in task 1.
   - **2/8 marks**: correct wav file for task 2.
   - **2/8 marks**: readable source code.