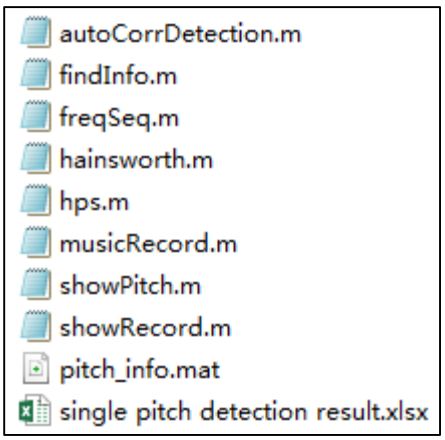
Code Descriptions:



"pitch_info.mat" contains:
pitch_name: C #C D #D … A #A B C~
pitch_freq: the standard frequencies of the notes respectively (from wikipedia)
pitch_info: a 4*2*13 matrix
(:, :, i) is the ith note's information
(:, 1, :) is the value of the peak
(:, 2, :) is the location of the peak
pitch_info was generated by running: >> **findInfo**
All the data can be obtained by running: >> **load pitch_info**

"autoCorrDetection.m":
It realizes the single pitch detection by autocorrelation.
The output: two numbers
- the first number is the result obtained by the autocorrelation in time domain
- the second number is ……. in freq domain

>> **[x fs] = audioread('piano-C4.wav');**
>> **autoCorrDetection(x, fs)**

"findInfo.m": generate the "pitch_info" in the "pitch_info.mat"
"freqSeq.m": a function used in "findInfo.m"
"hainsworth.m": the function I wrote in the last homework. It is to find out the tempo of a song (find out when a new note comes up)
"hps.m": a function using HPS algorithm to find out pitches (can detect both single and multi pitches)
"showPitch.m":
A script file to find the pitches of a single pitch or a chord.
The output: four parts
- pitch: the pitch names of the detection result
- freq_detect: the detected frequencies
- freq_correct: the corrected frequencies based on the detected frequencies
- num: the number of pitches detected by us

(the test file name can be changed in the first line)
>> **showPitch**

"musicRecord.m": a function to make a record for a song
"showRecord.m":
A script file to make a record for a song.
The output: one vector and three figures
- record: the pitch names of each note in the song
- figure 1: the tempo of the song and the wave of the song
- figure 2: x-axis: time; y-axis: frequency

- figure 3: the STFT of the song

(the test file name can be changed in the first line)

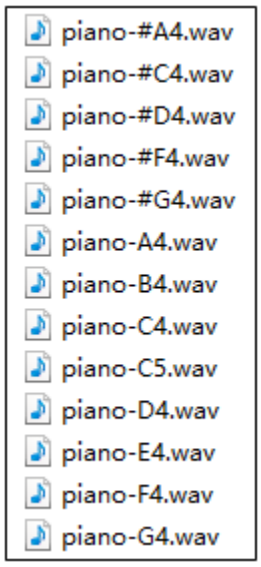
>> **showRecord**

"single pitch detection result.xlsx": the single pitch detection results obtained by autocorrelation in time domain, autocorrelation in frequency domain, and HPS, and their errors compared with the standard value from wikipedia. (I think the autocorrelation in frequency domain detection has big errors; autocorrelation cannot be used for multi-pitch detection. So HPS is the best one in these three solutions. And maybe we can find another solution?)

Problems:

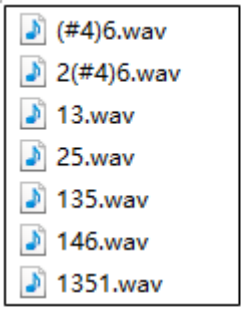
1. There may occur some detection errors. For example, when making the record for "Jingle Bell.wav", the 10th note should be "D", but the result is "E".
2. For the song record part, now the code can only make the record for songs consisting of single-pitch notes. (So the song "Ode to Joy (chord).wav" cannot be successfully recorded.) I have not figured out how to save the results when there are different pitches in different notes (because for a matrix, each row or each column must have the same length as other rows or columns).

Test Files:



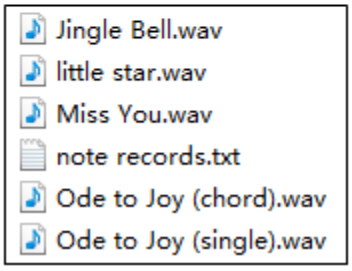
Single Pitch:

The name of the file is the pitch of it (can be used to see if our results are correct)



Chords:

The name of the file is the pitches of the chord (can be used to see if our results are correct)



Songs:

"note records.txt" contains the records of each song. "Ode to Joy (chord).wav" consists of multi-pitch notes. Others consist of single-pitch notes.