Team project report

Transformation of voice

Team name: A Midsummer Night's Voice
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Project summary

Nowadays, Voice changers are commonly used in our daily life by changing a voice into another one according to related methods such as changing its tonality. But actually, it’s not that easy because on one hand our computers have to deal with those voice by transforming it into the language which our computer can read. And on the other hand it has to change the voice by changing the stored data and find a definite way to play it out. In a word, the transforming process has to deal with the problems about different information and that’s challenging and interesting.

In order to find out how this process work and develop our python skills, our group decides to make our own Voice changer. Through this project, we have collected related information from books and Internet, imported many kinds of useful packages and finish the code on our own. In the end, we finished our demo and it basically reaches our requirement.

More information will be shown below.

Summary of our method

To transform a voice to another, we have 3 main problems to face which are collecting voice, dealing with the sound (make a change) and playing it back. When collecting voices, We have to **import microphone and record the voice** before the digital processing and passing it to program, which need the **read and save of WAV document and deal with byte datatype**. When dealing with the sound, we have to deal with those digital data in order to change the tone and timbre. In this section, we need to **learn some relating acoustic knowledge** and **how to shift the pitch of voice**. In the third section, we **transformed the data back to voice** and play it out by loudspeaker. Obviously, we have to **construct a visual platform** to let people see in windows.

Distribution of our work

黄章学：find information, deal with the code and integrate different parts together, deal with technical problems, write project and make ppt.

孔祥睿: write proposal, deal with the recording process, evaluate and manage the project, write project and make ppt.

贾帆：deal with the visualizing and playing process, write project and make ppt.

JIA WEI LEE: deal with the changing process, write project and

make ppt.

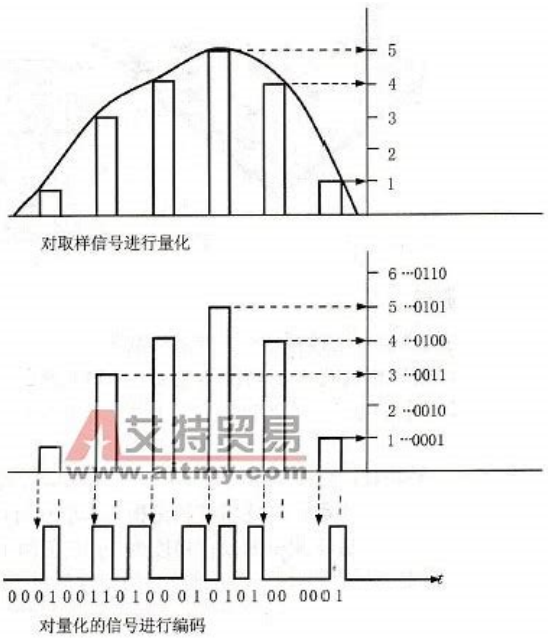
Details and principles of our project

collecting
transforming
playing
visualizing

Collecting(Recording):

Recording is the process of recording sound signals on the medium. In our project, we digitized the analog signal of sound and recorded it in the wav file of the computer. The recording process includes microphone pickup and recording. In order to save storage space and avoid invalid recording, we also judge the volume before recording data. The recording ends when the volume is too low and does not increase for some time.

To enable microphone pickup, we imported the pyaudio package, in which the PyAudio.open() function calls the microphone to record the sound as binary data.



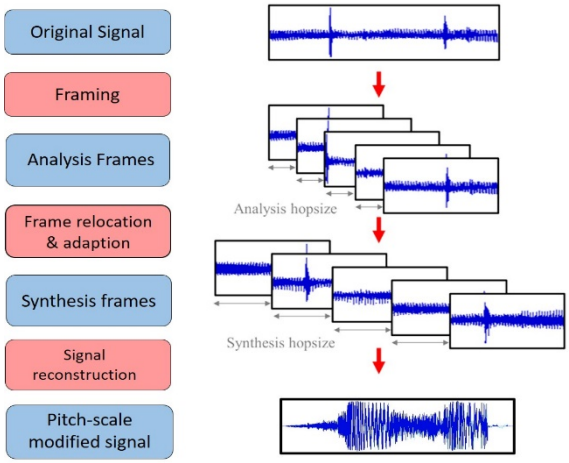
We then used the PyAudio.open.read() function to read a portion

of the audio data, which has been recoded, and convert it into an array of data processing convenience by using numpy package. Comparing with the threshold of sound recording determines whether the current volume is large or small and whether to continue recording.

When recording data, we save the sound in wav format because of the convenience of the code implementation. Importing the wave package, then use wave.open(filename, “wb”) function creates an empty wave file, which is similar to how text documents are opened in class. Sets the parameters of the audio, writes the data with writeframes() function, and the recording is complete.

Voice Transforming:

These technique (Voice Transforming) can also be used to transpose an audio sample while holding speed or duration constant. This may be accomplished by time stretching and then resampling back to the original length. Alternatively, the frequency of the sinusoids in a

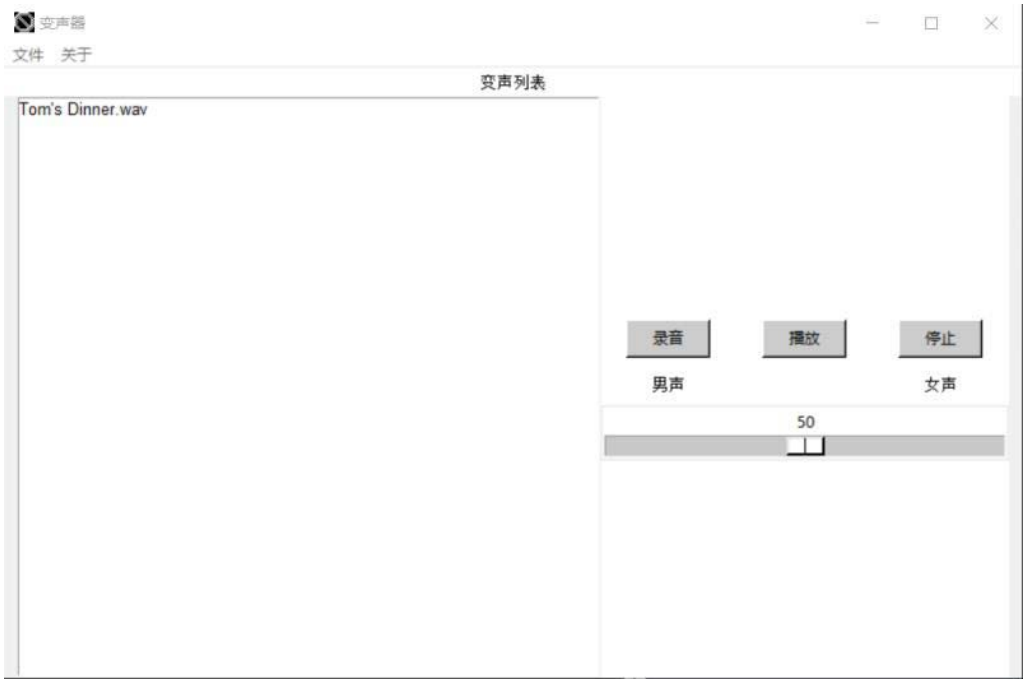


sinusoidal model may be altered directly, and the signal reconstructed at the appropriate time scale. Transposing can be called **frequency scaling** or **pitch shifting**, depending on perspective.

In voice transforming, we load sound into the sampler by using **aupyom** package to import **Sampler, Sound**. We use Sound.from_file() function to open the audio file and Sound.pitch_shift() function to shift the pitch.

Playing and Visualizing

After we finished the process above, we found that it was difficult to execute the code in Pycharm. Especially, it was hard to control the change of voice. To make it easy and beautiful, we came out the idea to build a visual interface. The interface's outlook is as follows:



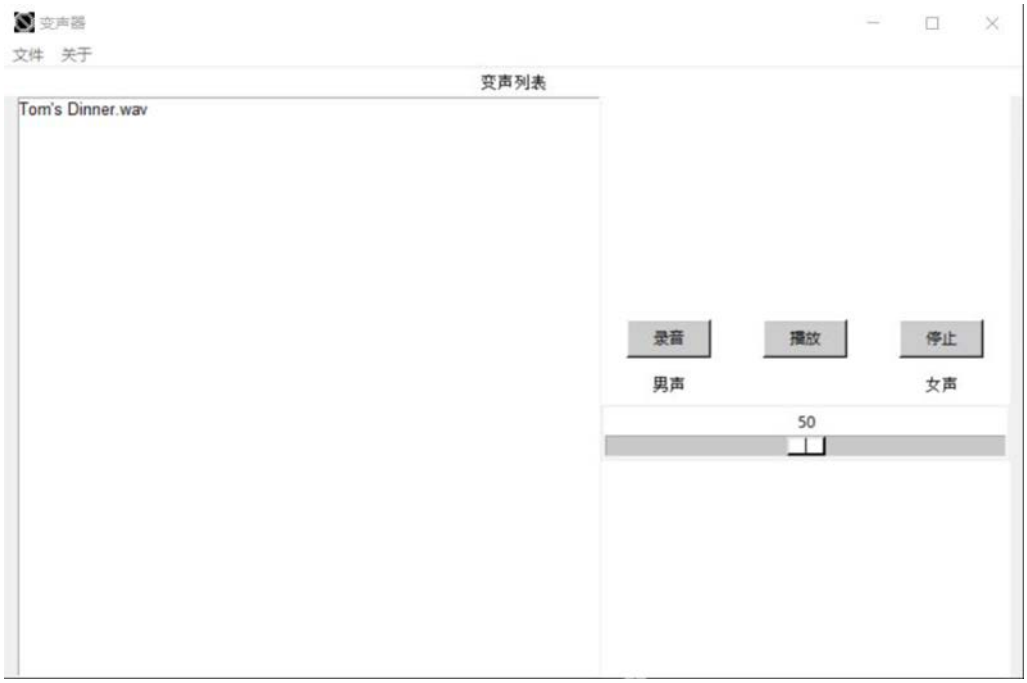
In this visual interface, we can choose to execute the functions. Now let me make a detailed introduce:

We can click the “文件” to open an audio file which is already in our computers. Click the “录音”、“播放”or“停止” can help us to execute the functions that they mean.

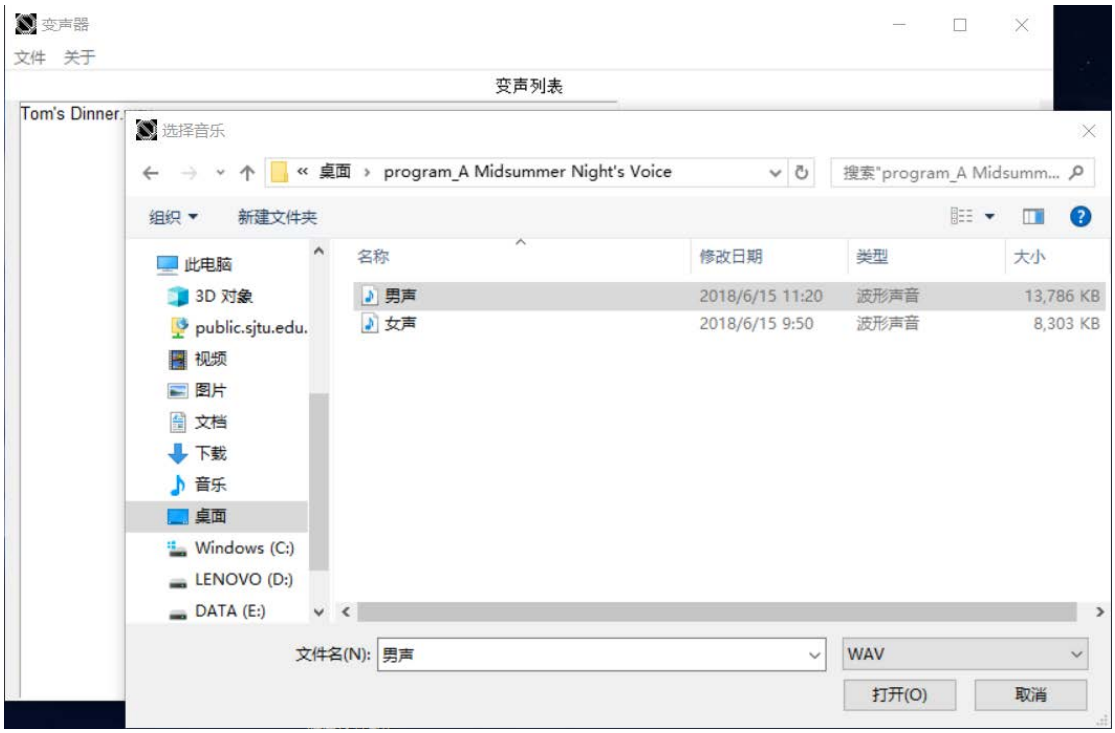
There is a change bar, whose aim is to control the extend of the voice change.

Actually, when the computer execute the “播放”and“停止” function, the computer create a channel first, and then make the voice into the channel. So we can open more than one files at the same time, and what we hair will be the mix of them. Similarly, you can quit the voice you want. The “停止”function will remove the voice from the channel.

Running interface of our application



Click on the “文件”/“打开音乐文件” button. You will see:



Choose the audio file you want to transform and it will be added into the transform list.

Problems we find and our solution

It’s obvious that designing a voice changer is not that easy. We have to read many related materials because we didn’t know too much about it before.

At the beginning, we intended to make a voice changer which is able to change one voice into voice of old people, lady and child. But when we began our project, we gradually found out that the number of variables we could control is limited because of our technic. We could only change the pitch of voice so we decided to focus on a continue change which is able to change the pitch. In the end, we finished the demo which could switch between man and woman.

we also found that it's convenient for users if our application is visual. So we decided to make a window for our users.

Conclusion

Through the project, we not only learn more detailed knowledge about how the computer dealing with those voice, but also finish our own demo which improve our ability of communicating, facing challenges and teamwork. It’s fruitful and meaningful.

Hit: There is an egg in our demo. You can find it by clicking “关于” in the menu.