Sound Effector Based on Speech Recognition



Yuhui Chen, Electrical and Computer Engineering, University of Rochester Shengwen Yang, Electrical and Computer Engineering, University of Rochester

Abstract

- Objectives
- Introduction
- -Speech recognition
- -Sound effect
- Algorithm
- -Feature extraction
- -Codebook generation
- -Speaker recognition
- **Functions**
- Implementation
- Speech recognition
- Sound effector by voice control

Speech Recognition

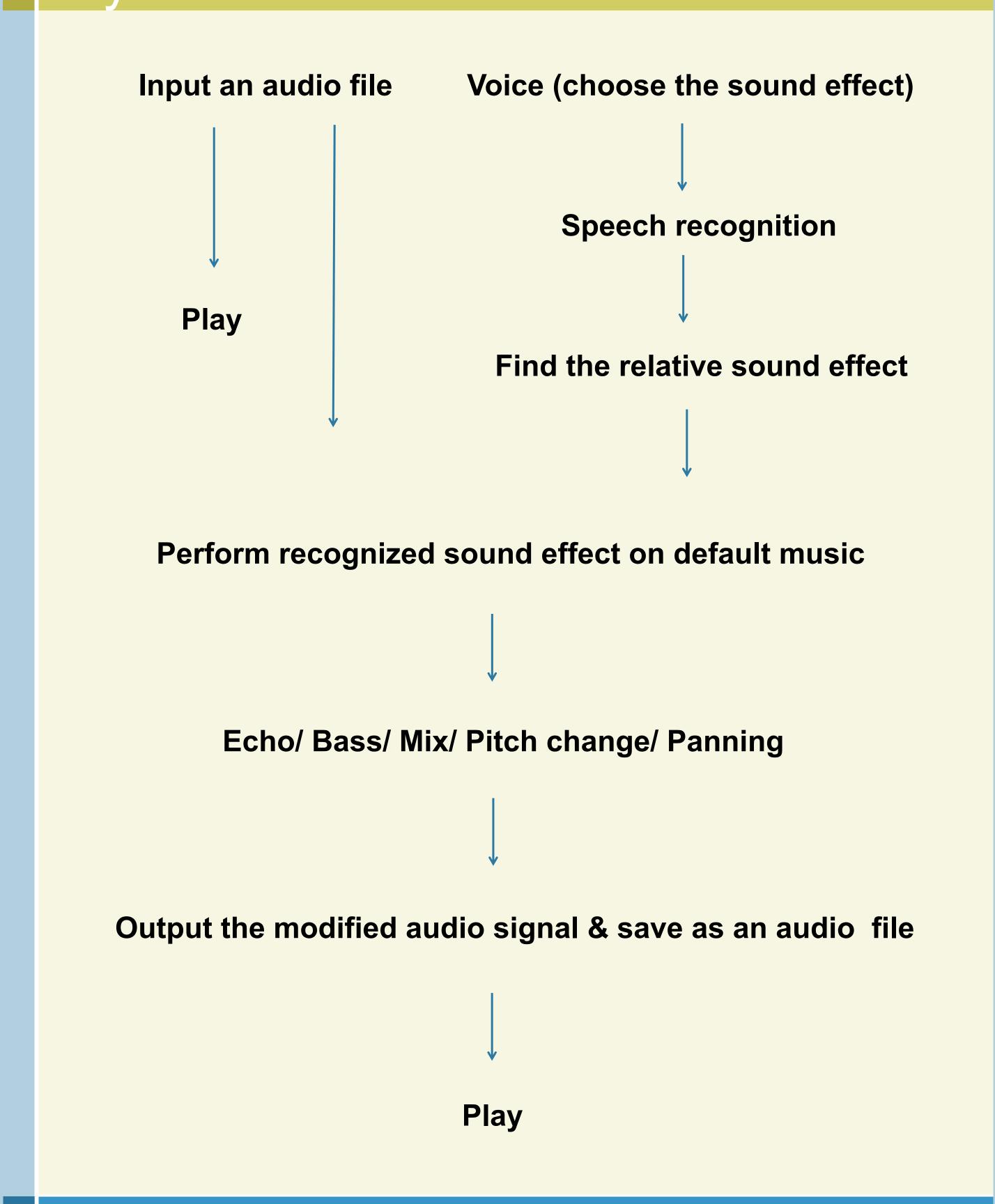
- Speech recognition (SR) is the translation of spoken words into text. It is also known as "automatic speech recognition" (ASR), "computer speech recognition", or just "speech to text" (STT). Nowadays, speech recognition is widely used in vehicle-mounted system, electronic products, such as Siri of Apple, and medical
- The speech signal contains both the message being spoken and the information of the speaker. Therefore we can use the speech signal for both speech and speaker recognition. The goal of these two tasks can be summarized as follows:
- 1. Speech recognition: Extract the underlying linguistic message in an utterance.
- 2. Speaker recognition: Extract the identity of the person speaking the utterance.
- Speaker recognition can be further divided into two different tasks:
- 1. Speaker identification: To determine which one of a group of known voices best matches the input voice sample.
- 2. Speaker verification: To determine from a voice sample if a person is whom claims to be.

Sound Effects

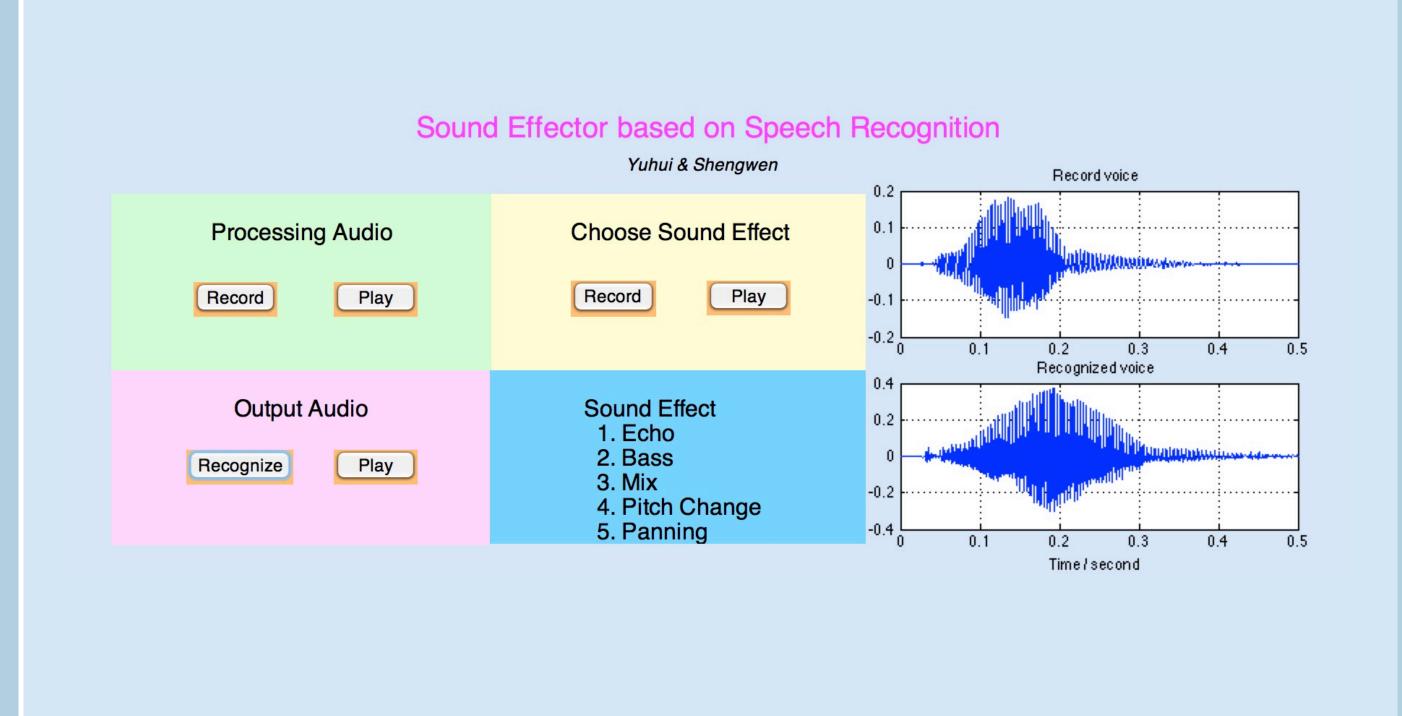
- Echo
 - adding echo effect to the audio
- Bass
 - creating bass effect
- Mix
 - mixing another audio signal with the input
- Pitch change
- resampling
- Panning

creating stereo audio and panning from left channel to right channel

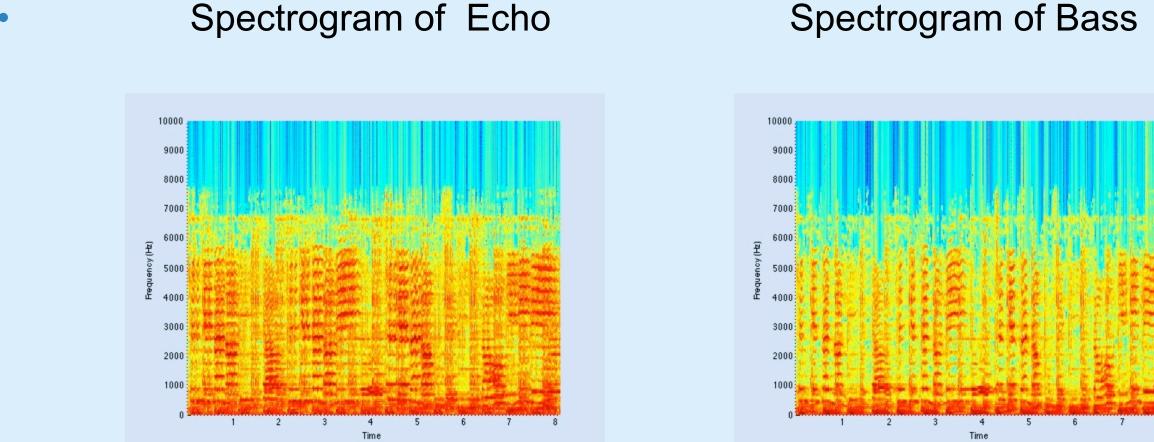
System Overview

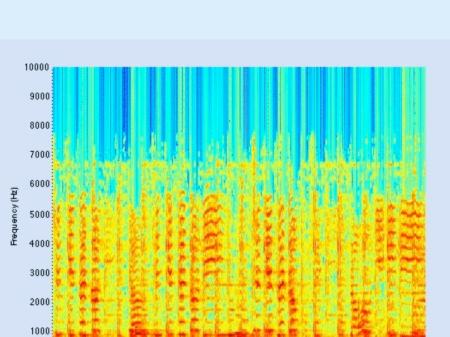


Graphical Users Interface

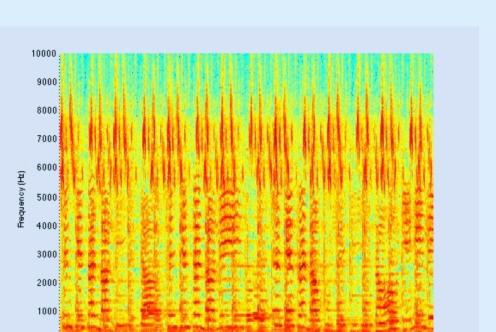


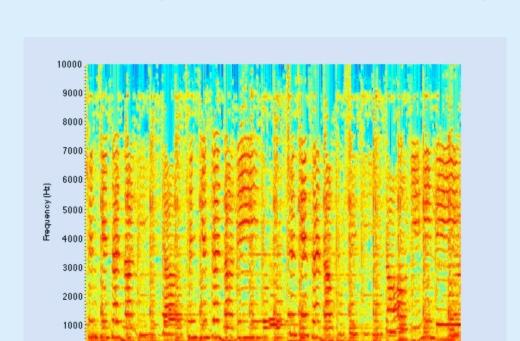
Sound Effector





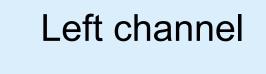


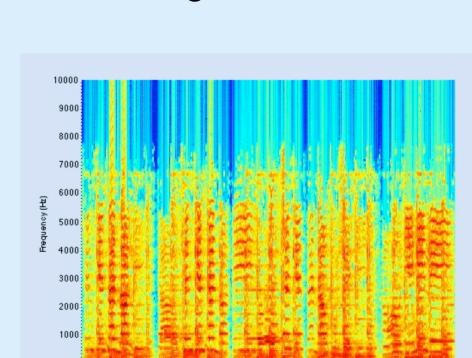




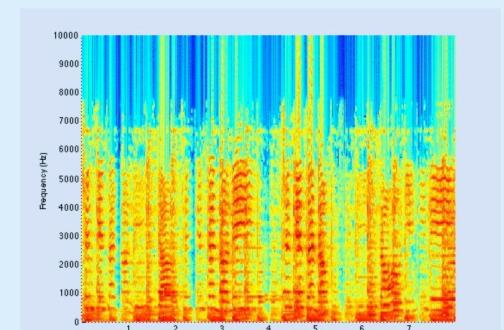
Spectrogram of Pitch change

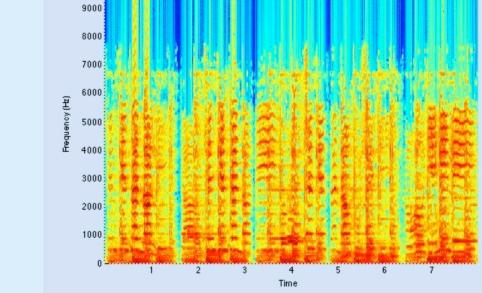
Spectrogram of Panning



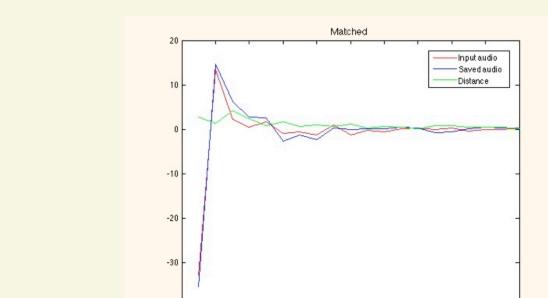


Right channel

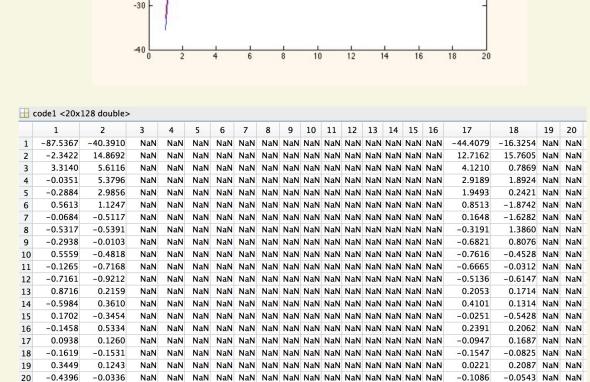


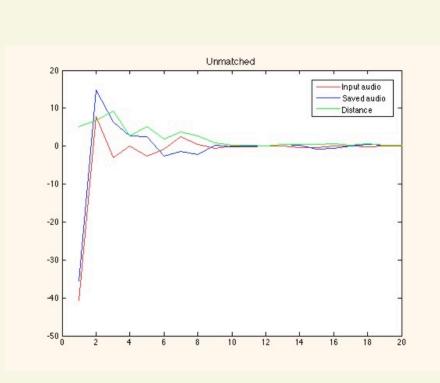


Feature Extraction



Feature extraction comparison





2 6.8937 7.1412 7.4372 7.2964 6.6192 5.5882 6.1035 7.7057 8.0876 8.1440 10.8205 14.1343 12.6229 14.0157 17.0997 14.5916 14.7152 14.2096 15.2368 11.4255 3 -5.9169 -4.4586 -3.8523 -3.7058 -3.4672 -4.2928 -3.9083 -1.8231 -0.9201 -0.5057 2.7720 4.5120 5.9560 7.2763 8.6586 7.1572 6.3044 5.5457 4.9589 3.0075 t -0.8206 -2.1392 -2.1107 -0.2514 -0.6647 -1.2578 -3.1184 -2.0011 -1.4205 -1.7692 0.6236 1.2045 3.1299 3.8660 3.2142 3.4978 2.6645 2.8186 1.6030 -0.8505 $-0.2689 \quad -0.9908 \quad 0.6999 \quad 0.2123 \quad 1.1260 \quad 0.6530 \quad -1.2290 \quad 0.0337 \quad 0.0339 \quad 1.2722 \quad 2.3248 \quad 2.6321 \quad 1.2912 \quad 1.6668 \quad 1.0758 \quad 1.9054 \quad 2.4727 \quad 2.2035 \quad 2.7236 \quad -0.7720 \quad 0.0337 \quad 0.0339 \quad 0.0339$ 7 4.3304 4.8069 2.0006 3.1315 3.2752 2.0709 3.1166 2.7587 2.4064 1.5865 1.6252 2.4256 -0.7724 -1.0155 -1.6454 -1.7905 -1.3121 -0.7963 0.6939 -0.8027 8 -0.9544 -1.7396 -2.2307 -1.2933 -2.0065 -3.1357 -2.2941 -2.3905 -2.0625 -1.1421 -0.5876 -1.5373 -1.0287 -1.1576 -1.5394 -2.0357 -2.2907 -1.3180 -1.6377 -1.6561 9 0.3924 -0.0070 0.5856 -0.3152 -0.9309 -0.6626 -0.0410 -1.6458 -0.3665 0.1027 -0.3267 -0.1542 -0.5293 -0.4081 0.4771 -0.3204 0.3428 0.4055 0.3446 -1.4921 10 -2.4600 -3.2243 -1.2678 -1.7424 -1.8409 -1.3748 -1.2868 -1.8577 -1.4180 -0.7904 -1.3768 -1.1786 -0.2795 -0.2818 0.6404 0.2106 -0.1438 -1.2616 -2.0831 -2.3015 11 -0.2454 -2.5703 -1.1629 -0.6391 -1.5642 -1.3406 -0.6544 -1.3921 -0.9469 0.2999 -0.0923 -0.8626 0.0379 -0.0746 0.3852 0.5920 0.0228 1.0302 0.4753 -0.3727 12 1.5335 1.0979 0.9373 0.2148 -0.1554 -0.6551 0.0193 0.1051 0.7079 0.1831 -0.0372 0.2791 0.0391 -0.4282 -0.8531 -0.2495 0.0660 0.5294 0.9047 -0.1477 13 -0.7534 0.1485 0.4013 -0.3211 -0.6203 -1.2288 -0.7691 0.0818 -0.1574 0.3173 0.3690 1.0827 0.3450 -0.3240 -0.7146 -0.1869 0.5147 0.1587 -0.0760 0.3744 17 -0.0232 -0.1441 -0.6934 -0.2271 -0.1600 -0.7117 -0.7371 -0.7809 -0.6962 -0.5211 -0.7865 -0.4892 -0.2095 0.2005 0.1909 -0.0540 0.1418 0.0779 -0.1785 -0.5227 18 - 0.4603 - 0.5805 - 0.3063 - 0.2890 0.0309 - 0.2843 - 0.9608 - 0.5248 - 0.0444 - 0.2529 - 0.0933 0.1419 - 0.0110 0.1344 0.0058 0.3428 0.4416 - 0.0400 0.4374 0.0263 19 -0.8611 -0.9143 -0.2559 -0.7694 -0.6042 -0.2674 -0.4223 -0.6162 -0.4580 0.0132 0.3376 0.0183 0.0637 0.0782 -0.0100 0.3441 0.2595 0.9723 1.2498 0.3545 20 0.7962 -0.4342 0.5939 0.7206 0.9241 1.1302 0.6807 0.8219 0.6633 -0.0599 0.2941 0.1924 0.0037 0.1191 0.0548 0.1263 0.3261 0.6192 -0.0103 0.0199