BASCDSP MINI-PROJECT SPECIFICATIONS

MATLAB®-Based Audio player

Description:

The MATLAB-Based Audio player is to be created using the MATLAB GUIde. A user interface, shown in Fig 1, is to provide for the player main functions which include (1) audio equalizer, (2) volume control and (2) stereo (balance) control.

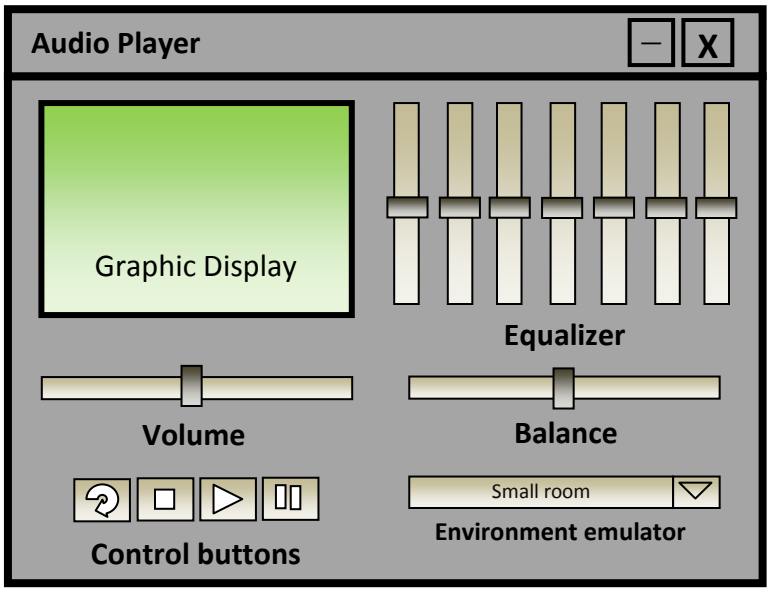

Fig 1: MATLAB-Based Audio Player UI

The *volume control* modifies the output sound level. The maximum volume level is 10dB and the minimum volume level is −5dB.

The *balance control* channels the audio signal to the left speaker or to the right speaker depending on its position in the sliding bar. As the control bar moves to the right (or left), the left channel (or the right channel) gradually fades such that if the balance control is on the extreme left (or right) of the sliding bar, the right channel (or the left channel) is suppressed, while the left (or right) channel works. If the control is at the center of the sliding bar, both channels work.

The *equalizer control* modifies the frequency components of the input audio file. The equalizer for this project is composed of seven bandpass (BP) filters corresponding to the eight frequency bands to be modified:

- fc = 60Hz, BW = 80Hz, (f_L, f_H= 20, 100)
- fc = 150Hz, BW = 100Hz, (f_L, f_H=100, 200)
- fc = 400Hz, BW = 400Hz, (f_L, f_H= 200, 600)
- fc = 1kHz, BW = 800Hz, (f_L, f_H= 600, 1400)
- fc = 2.4kHz, BW = 2000Hz, (f_L, f_H= 1400, 3400)
- fc = 6kHz, BW = 5200Hz, (f_L, f_H= 3400, 8600)
- fc = 15kHz, BW = 12800Hz, (f_L, f_H= 8600, 21400)

The frequency components of the input signal can be modified by varying the magnitude response of the bandpass filter from -5dB to +10dB. For example, if we don't want to hear too much bass (low frequency), the equalizer bandpass filter at fc = 60Hz is lowered to −5dB while maintaining other filter banks to 0dB. Also, if we are hearing too much high frequency from the speaker (*tunog lata*) and we want this to suppress, we set the equalizer bandpass filter corresponding to fc = 15kHz to a lower level.

Additional features, like graphic display, open file, play faster or slower, may be included for additional points. This only applies if your final score is greater than 85%

Grading System:

Basic Controls: 70%

- Environment control (25%)
- Equalizer (25%)
- Volume and stereo (10%)
- Main control (10%)

Functionality: 30%

- GUI (10%)
- Integration (20%)

Demo: 10%

Objective:

This mini-project aims to process audio signals using DSP techniques, in real-time. The project mainly requires knowledge on signal sampling, audio coding and digital filtering. Assume all inputs are wavfiles.