3 Band Filter Design – Essay Plan

Introduction

Digital audio augmentation

* Filters
* Usage of EQ being widespread

Principles of IIR filters

* Second order feedback IIR filter (diagram)
* Designing a butterworth filter
* Z transform

Principles of Shelving/Peaking

Equaliser

* Types of equalisers
* Cascade equalisers (Diagrams)

Loudness

* Perceived loudness of frequencies
* A weighting curve

Methodology

Peaking/Shelving

* High/Low filters differences
* Mid filter usability
* Implementation proofs

Cutoff Frequencies

* High and low calculating & mid being set
* Usability for audio

Bass, Mid, Treble

* How to calculate each
* MATLAB prototypes

Cascading Filters

* invfreq() to generate filter response
* Placing filters in series using product of impulse response

MATLAB implementation

* Flowchart of equalisation program
* Using audio toolbox/ DSP toolbox
* Using filter()
* Generating a UI as a MATLAB script and MATLAB APP

Results

Examples from EQ

* Frequency response graphs for different attenuations and cutoff frequencies
* MATLAB application loading audio and playing audio with set filter choices

Results from Application

* Screenshots of different stages
* Audio IO implementations
* Erratic behaviour of invfreq() sometimes breaking the app

Discussion and Conclusion

Conclusion

Successful points

* Successful implementation of IIR Filter design in a MATLAB context
* Usability of application

Future Work

Improvements to be made

* Non real time
* A higher order providing more usability
* Change to convolve signals together instead of inverting frequency to aid with potential flaws.
* Include a real time plot of the frequency response on the App