

Project – FilterDesigner

Overview

In this project, you will be building a filter design tool to help users design, and test filters you have studied in the course. You are expected to use the minimum number of built-in functions in the programming language of your choice (e.g., MATLAB, Python, C++, etc.). The required implementation uses offline processing, but real time implementation will be worth bonus points as noted below.

Requirements

1. The user interface allows lets the user choose the
 - a. **Input signal:** record from microphone, or use .wav prerecorded audio file.
 - b. **Filter Type:** Low Pass, High Pass, Band Pass, or Band Stop.
 - c. **Filter Design:** Analogue (Butterworth, Bessel, Chebyshev I or II), vs Digital (Moving Average, Windowed-Sinc, and Chebyshev).
 - d. **Window functions:** choose between Rectangular, Blackman-Harris, Hamming, and Kaiser windows, if required by the chosen filter design.
 - e. **Filter minimum requirements:** corner frequencies, order, etc.
 - f. **Visualization:** shows the user the time and frequency response (magnitude and phase) of
 - i. The input signal
 - ii. The filter's frequency response
 - iii. The output signal

Rubric

		Percentage of Project Grade	
	Point of Comparison	Undergraduate	Graduate
Option A	Uses built-in MATLAB functions to design the filter	20 (Required, but waived if option B is selected)	0 (Not required)
Option B	Team developed filter design functions from scratch	30 (includes 10% bonus)	30 (required)
	Custom FFT function	20 (required)	20 (required)
	Excellent User Interface and plots	20 (required)	20 (required)
	Interview per student	40 (required)	30 (required)
	Realtime implementation	20 (bonus)	20 (bonus)

Constraint: A team can only submit one of the options (either A or B).

Deliverables: (1) Full software implementation and sample audio files. (2) Readme.txt stating capabilities and shortcomings of your design. (3) A short video less than 3 mins presenting your design and a demo of its capabilities.