**Documentation for MATLAB Signal Processing Project**

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**Overview**

This MATLAB project is designed to generate, add noise to, and filter a signal. The user can interactively choose the type of signal (sine, cosine, or square) and the type of filter (moving average, Gaussian, or Savitzky-Golay). The signals are then plotted and written to a file.

**Features of Design and Implementation**

**Worked Well**

1. **Interactive Menu**: The interactive menu allows users to choose the type of signal and filter. This makes the program flexible and user-friendly.
2. **Signal Generation**: The generate\_signal function successfully creates different types of signals based on user input.
3. **Noise Addition and Filtering**: The add\_noise and filter\_noise functions effectively add noise to the signal and filter it out, respectively.
4. **Plotting and File Writing**: The plot\_signals function provides a visual representation of the original, noisy, and filtered signals. The signals are also written to a file for further analysis.

**Did Not Work Well**

1. **Error Handling**: The program does not handle invalid user inputs. For example, if the user enters a number that is not in the menu options, the program may crash or behave unexpectedly.

**Ideas for Additional Features and Design Improvements**

1. **Error Handling**: Implement error handling to ensure that the program can handle invalid user inputs gracefully.
2. **Additional Signal and Filter Types**: Include more types of signals and filters for the user to choose from.
3. **Additional frequency feature**: ability to choose specified frequency value by the user for their specific application.

**Determination of Necessary Changes**

The need for these changes was determined through testing and user feedback. Users reported that the program crashed when they entered invalid inputs and their need to choose the frequency in addition to more signal types such as the square wave and cosine wave.

**Justification for Changes**

Implementing error handling will improve the robustness of the program and enhance the user experience. We added some conditions to the interactive menu to enhance the user experience so they don’t experience errors that would hinder the program. We added the feature to choose a specific frequency number and implemented it in the signal creation function. And we added more than one signal type. These changes will address the issues identified and enhance the overall functionality of the program.