تمرین دوازدهم درس پردازش سیگنال های دیجیتال

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DialedSequence_NoNoise.wav

Detected numbers: ['4', '#', '2', '0', '6', '1', '7', '8', '5', '1', '3', '*', '#', '#', '6']

DialedSequence_SNR00dB.wa

Detected numbers: ['2', '1', '3', '3', '*', '7', '5', '6', '7', '2', '2', '9', '6', '#', '8', '0', '*']

DialedSequence_SNR10dB.wa

Detected numbers: ['#', '1', '1', '7', '6', '3', '3', '5', '4', '7', '9', '0', '#', '8', '5', '2', '2']

DialedSequence_SNR20dB.wa

Detected numbers: ['3', '2', '5', '6', '4', '0', '6', '*', '9', '1', '8', '7', '1', '#', '9', '#']

DialedSequence_SNR30dB.wa

Detected numbers: ['#', '3', '7', '*', '*', '6', '0', '4', '5', '2', '9', '1', '8', '9', '3', '6', '#']

The online code works in a way that if you press a code the correct number is printed.

Answer to the question:

If FIR filters are designed with a length of 5000 samples, the following issues may arise:

1. **High Time Delay:** As the filter length increases, the time delay for the signal to pass through the filter also increases. Using long filters can introduce a significant time delay in the output signal compared to the input signal. This time delay can cause problems in timing and synchronization within the system.
2. **Real-Time Processing Constraints:** Longer filters require more processing for each sample of the signal. This can place limitations on the real-time processing capabilities, especially in applications that require real-time processing. In some cases, longer filters can result in increased processing time and delay in the output.
3. **System Resource Consumption:** Filters with longer lengths generally require a higher number of operations. This can demand more processing power and memory resources. In certain systems, this can create limitations, and if sufficient resources are not available, it can lead to issues such as degraded audio quality or delays in responding to signals.

4. **Interference with Shorter Durations:** In the DTMF standard, the durations of numbers and the silence periods between them are generally specified to be shorter than 50 milliseconds. Using filters with a length of 5000 samples can cause interference with these shorter durations allowed in the DTMF standard, potentially leading to misinterpretation of the numbers.