

Noise Reduction in Mobile Phone by Using FIR, IIR and Adaptive Filter

Bharti¹, AP Shelej Khera²

University of Maharshi Dayanand, Department of Electronic and Communication Engineering, India

Abstract: This paper provides the noise reduction for dual microphone in mobile phone. The method for noise reduction is based upon the filtering technology. In this paper compare the desired signal with the IIR, FIR, Adaptive filter output and improve the performance of mobile phone by reduction of noise in mobile phones. Noise suppression has application in virtually all field of communication (channel equalization, radar signal processing etc).

Keywords: noise reduction, dual microphones, IIR filter, FIR filter, Adaptive filter, speech enhancement

1. Introduction

In mobile phones speech signal is captured by the microphones of a speech communication device is often distorted by interfering noise source as well as room reverberation. Such degradation may reduce the listening comfort and speech intelligibility. Degradation can be reducing by using filtering method IIR, FIR, Adaptive filter. The target of a future speech enhancement algorithm should be a reduction of unwanted background noise and room reverberation. Each method has its own advantage and efficiency depend on the type of noise. In mobile phone, unwanted noise consume energy and deteriorates the audibility of the signal there are a variety of method to reduce noise both analog and digital. Each method has its own advantages and efficiency is often dependent upon the type of noise. The noise suppression has application in virtually all field of communication (channel equalization, radar signal processing etc.) and other field In this paper our experiments on filtering technology; IIR filter, FIR filter, and adaptive filter. The output signal from the filter is compare with the desired signal which we want to obtained and find the best filter for noise reduction. After conclusion the adaptive filter is best than the IIR filter, FIR filter and adaptive filter to achieve the best performance of mobile phone.

2. Overview of Filter

The IIR, FIR, Adaptive filter is used for noise reduction and result has been proposed by research. Following filter is:

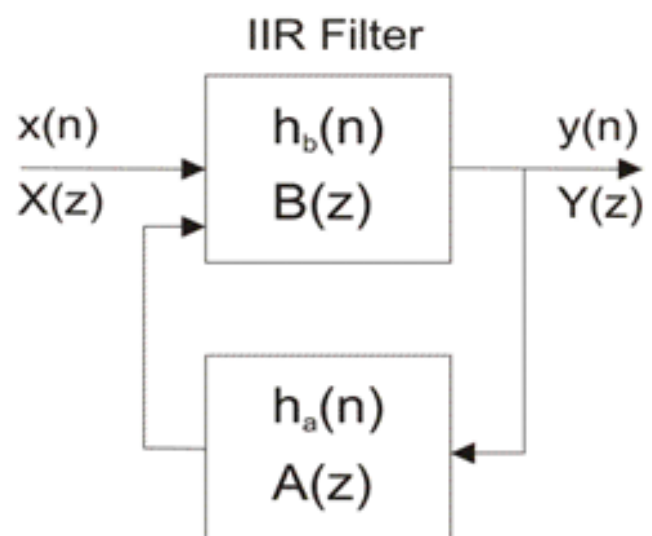
2.1 FIR Filter

Finite impulse response in which impulse response $h(t)$ does become exactly zero at time $t > T$ for some finite T , thus being of finite duration. FIR filter can have linear phase characteristics. FIR filter can be discrete-time or continuous time and digital or analog. FIR requires no feedback. FIR Filter has many advantages over The IIR filter.



2.2 IIR Filter

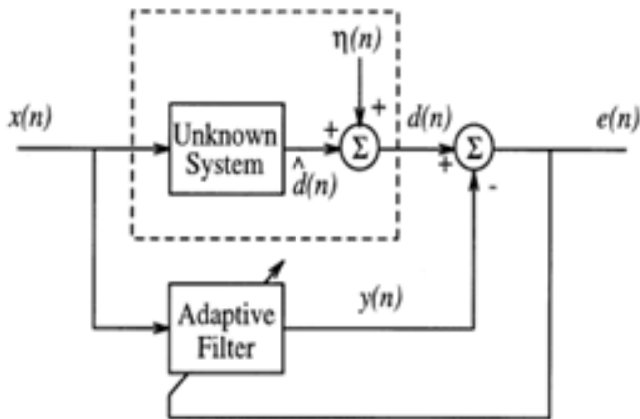
Infinite impulse response (IIR) is a property applying to much linear-time-invariant system. Common example of linear-time-invariant system is most electronic and digital filter. The IIR filter having an impulse response which does not become exactly zero past a certain point, but continuous indefinitely. IIR filter are digital filter with infinite impulse response. For this reason IIR filter have much better frequency response but their phase characteristics is not linear which cause a problem to the system which need phase linearity.



2.3 Adaptive Filter

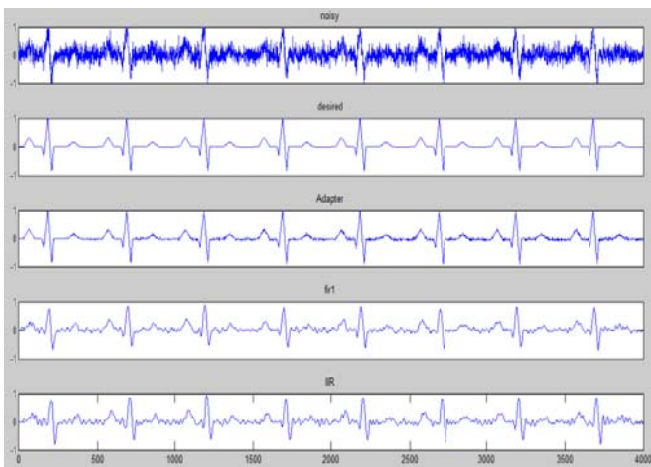
An Adaptive filter is a computational device that attempts to model the relationship between to signal in real time in

an iterative manner. Adaptive filters are used for non-stationary signals where a sample-by-sample adaptation process is required. Applications of adaptive filtering include multi-channel noise reduction, radar or sonar signal processing, channel equalization for cellular mobile phones, echo cancellation and low delay speech coding.



3. Method and Result

The method is based upon the filter technology. IIR, FIR and Adaptive filter technology is used for the noise reduction. Result shown in the fig. this fig shows the signal vs. time waves after noise cancellation are drawn for FIR, IIR and adaptive filter.



4. Conclusion

Our conclusion that the adaptive filter is more effective than FIR and IIR filter as their response can be seen in the figure. Adaptive noise cancellation provides low output noise and its low signal distortion as compare to FIR and IIR.

References

[1] Gillian M.Davis, "Noise Reduction in Speech Applications". 2002, CRC Press, Boca Raton, Florida
 [2] Vorgelegt von, "Joint Dereverberation and Noise Reduction for Binaural Hearing Aids and Mobile Phones", 2012

[3] Marco Jeub, "noise reduction for dual-microphone mobile phones Exploiting power level differences", 2012, Institute of Communication Systems and Data Processing
 [4] Ekeroth, Andreas. "Improvements of the Voice Activity Detector in AMR-WB".2002, Master Thesis, Luleå University of Technology
 [5] Douglas, S.C. "Introduction to Adaptive Filters", 1999
 [6] Simon Christensson, "Noise Reduction in Mobile Phones", 2011
 [7] Petr Tichavský, "Noise Reduction in Dual-Microphone Mobile Phones Using a Bank of Pre-Measured Target-Cancellation Filters", 2013
 [8] Ms. Mugdha. M. Dewasthale, "Acoustic Noise Cancellation using Adaptive Filters: A Survey", 2014
 [9] Joachim Thiemann, "Acoustic Noise Suppression for Speech Signals using Auditory Masking Effects", 2001
 [10] Jie Zeng, "Feed forward Noise Cancellation in an Airduct using Generalized FIR Filter Estimation", IEEE, 2003
 [11] Ravikanth N, "Design and Development of Noise Cancellation System for Android Mobile Phones", 2012
 [12] Yifeng Tu, "Multiple Reference Active Noise Control", 1997
 [13] Michael Broddfelt, "Design of a Finite-Impulse Response Filter Generator", 2003
 [14] Cesar Augusto Azurdia Meza Yaqub Jon Mohamadi, "Implementation of the LMS Algorithm for Noise Cancellation on Speech Using the ARM LPC2378 Processor", 2009
 [15] Anthony Chan Carusone, "Digital Algorithms for Analog Adaptive Filters"