RF & IF NOISE BYPASSING ON TWIN GSM CHANNELS

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Abstract— **Wireless networks are based on the shared medium that makes it vulnerable to launch jamming attacks . Jamming attacks can adversely affect the normal operations of wireless networks.**

The existing systems for channel jamming were either adaptive for analog or were single band for a digital system. In this paper we outline a approach to develop a adaptive multiband digital band hopping based anti-jamming technique. The proposed system have multiple advantages over existing systems in terms of Kaiser windowing technique. The system has been tested for multiple noise systems including Gaussian noise , Rician noise & Rayleigh noise.The system has the capability of anti-jamming narrowband & wideband communication spectrums.

Index Terms— **Channel Jamming , Digital filters , GSM , Noise Cancellors.**

I. INTRODUCTION

Modern society has become heavily dependent on wireless networks to deliver information to end users. People expect to be able to access the latest data, such as stock and traffic conditions, at any time whether they are at home , at their office , or maybe outside[7]. The emerging wireless infrastructure provides opportunities for new applications such as online banking and e-commerce. Wireless data distribution systems also have a broad range of applications in military networks , such as transmitting up-to-date battle information to tactical commanders in the field. The open nature of wireless networks leaves it vulnerable to many intentional interference attacks , popularly referred as “Jamming”. Depart from the traditional view that sees Jamming attacks as a physical layer vulnerability[9]. It can be a huge problem for the wireless networks. Jamming makes itself known at physical layer of n/w commonly known as “MAC (Media Access Control) layer. Jamming attacks can strictly interfere with normal operations of wireless networks & causes disrupted service to the users. Basically jamming makes the use of destructive interference where two sinusoidal waves superimpose each other that makes the signal corrupt. The Common technique of estimating a signal corrupted by additive noise is to pass through a filter that tends to eliminate the noise while leaving the signal unchanged[6]. The design of such filters that are used for these purpose was designed by Kalman. Filters used for these purposes can be adaptive or can be fixed. Adaptive filters have the ability to automatically adjust their own parameters and their design requires very little knowledge of signal or noise properties , whereas fixed filters is based on prior knowledge of both noise and signal[10]. This topic gives some guidelines of the threat posed anti- jamming on two popular mobile systems. However, it is very difficult to say anything very precise about the efficiency of jamming in a general situation, as there are so many parameters. Antenna patterns, modulation, data rate, range, terrain, weather, receiver threshold, transmitter power , synchronization scheme, error correction, processing gain, even the number of sun spots, all have effect on evaluating jamming[5].

II. PRESENTED PROBLEM

The problem chosen is to bypass noise created by the jammers (non-analog) using signal inversion and propagation technique. Mobile carriers operate at different bands and I will be designing a twin channel jammer bypassing device. i.e bypassing GSM 900 & GSM 1800.

III. PROPOSED SOLUTION

Noise signal inversion and propagation is the main highlight of solution that I developed . If implemented on proper hardware , the solution can theoretically provide 100% bypassing of jamming signal . We are using some digital filters that tends to suppress the noise while leaving the signal unchanged .
The Required module is composed of an anti-jammer unit.The anti-jammer prototype for the prototype for the demonstration inverts the noise signal on a 1 to 1 basis and propagates it. This leads to effective cancellation of noise and obtaining the data signal with least error. Noise signal propagation and inversion is the highlight of solution. If implemented on proper hardware, the solution can theortically provides approx.100% bypassing of jamming signal. very-low-level periodic signals masked by broad-band noise.

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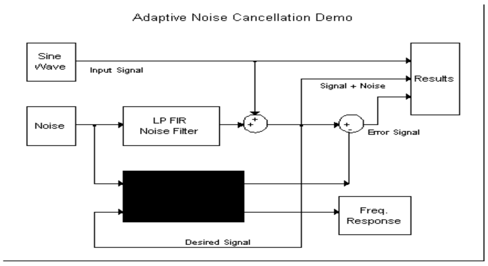
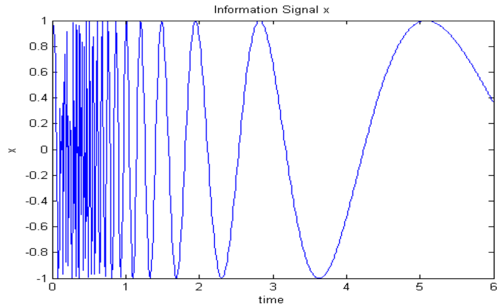
IV. METHODOLOGY



The method uses a "primary" input containing the corrupted signal and a "reference" input containing noise correlated in some unknown way with the primary noise. The reference input is adaptively filtered and subtracted from the primary input to obtain the signal estimate. Adaptive filtering before subtraction allows the treatment of inputs that are deterministic or stochastic, stationary or time variable. Wiener solutions are developed to describe asymptotic adaptive performance and output signal-to-noise ratio for stationary stochastic inputs, including single and multiple reference inputs. These solutions show that when the reference input is free of signal and certain other conditions are met noise in the primary input can be essentiany eliminated without signal distortion[5]. It is further shown that in treating periodic interference the adaptive noise canceller acts as a notch filter with narrow bandwidth, infinite null, and the capability of tracking the exact frequency of the interference; in this case the canceller behaves as a linear, time-invariant system, with the adaptive filter converging on a dynamic rather than a static solution. Experimental results are presented that illustrate the usefulness of the adaptive noise cancelling technique in a variety of practical applications. In further experiments it is shown that a sine wave and Gaussian noise can be separated by using a reference input that is a delayed version of the primary input. Suggested applications include the elimination of tape hum or turntable rumble during the playback of recorded broad-band signals and the automatic detection.Noise cancellation makes use of the notion of destructive interference. When two sinusoidal waves superimpose, the resulting waveform[5] depends on the frequency, amplitude and relative phase of the two waves. If the original wave and the inverse of the original wave encounter at a junction at the same time, total cancellation occur[9]. The challenges are to identify the original signal and generate the inverse without delay in all directions where noises interact and superimpose.

4.1 SIGNAL & NOISE



Unfortunately, the information signal x cannot be measured without an interference signal n2, which is generated from another noise source n1 via a certain unknown nonlinear process.

The plot below shows the noise source n3.

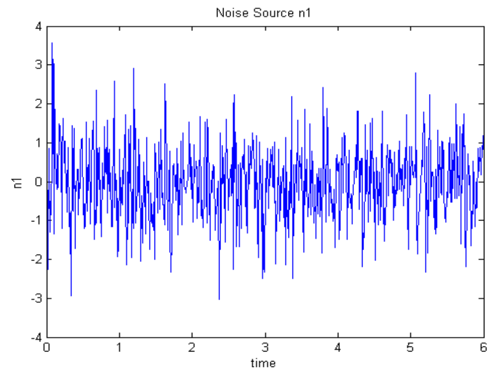
N2 = randn(size(time));

plot(time, n2)

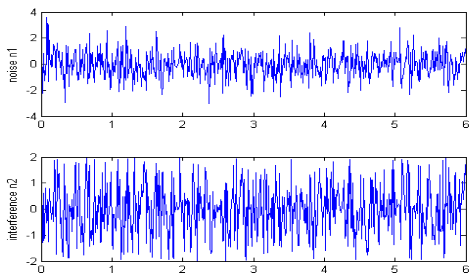
title('Noise Source n2,'fontsize',12)

xlabel('time','fontsize',12)

4.2 NOISE SIGNAL



The interference signal n2 that appears in the measured signal is assumed to be generated via an unknown nonlinear equation :



The measured signal m is the sum of the original information signal x and the interference n2. However, we do not know n2.

The only signals available to us are the noise signal n1 and the measured signal m, and our task is to recover the original information signal x. In the example window is the measured signal m that combines x and n2.

. V. CONCLUSION

In the view of noise cancellation, no 'perfect' solutions exist yet for multi-channel de-correlation. This subject clearly requires more research.Another subject for future research would be if this topic could be handled by 'cheaper' adaptive filtering algorithms, like perhaps APA–based filters

VI. REFERENCES

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