Comparative Analysis of Masking Properties of Noise Generators

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The methods for protecting against eavesdropping:

- structural hiding, that include:
- encryption of semantic speech information in functional communication channels;
- technical closure of electrical and radio signals in telephone communication channels;
- misinformation;
- energy hiding by:
- soundproofing the acoustic signal;
- sound absorption of acoustic waves;
- noise of the room with other sounds (noise, interference), providing masking of acoustic signals;
- detection, localization and withdrawal of embedded devices.

Proposed methodology for testing noise generator.

Popular indoor noise generators today are white and pink noise generators. White Noise contains the same total amount of energy within each frequency. Pink Noise contains the same total amount of energy within each octave. Both white and pink noise are considered broadband noises. Both of them are made of all frequencies that are audible to humans, so all frequencies anywhere between 20 and 20000 hertz. But the way their signal power is distributed among all frequencies radically differs. For understanding masking properties, the authors propose for consideration 2 types of generators: a physical white noise generator and a physical pink noise generator. As a signal that needs to be masked, a dialogue of two women is used for a duration of 20 seconds.

Characteristics of noise generators

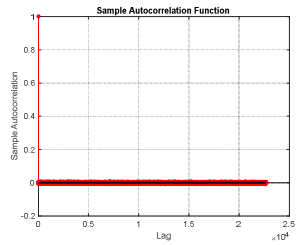

Figure 1: Autocorrelation function of white noise signal

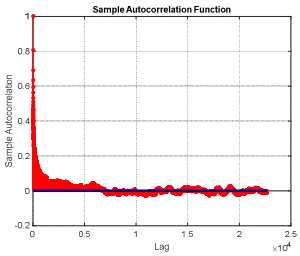

Figure 2: Autocorrelation function of pink noise signal

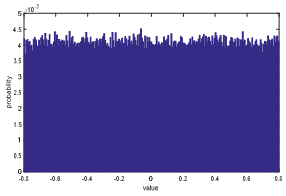

Figure 3: Histogram of white noise signal

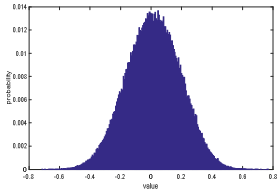

Figure 4: Histogram of pink noise signal

Characteristics of noise generators and speech signal

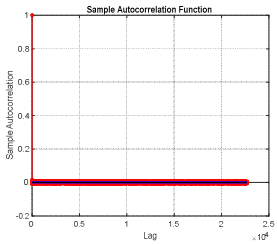

Figure 5: Autocorrelation function of white noise and speech signals

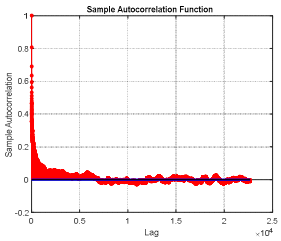

Figure 6: Autocorrelation function of white noise and speech signals

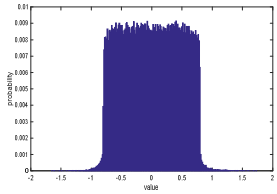

Figure 7: Histogram of white noise and speech signals

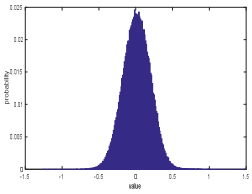

Figure 8: Histogram of white noise and speech signals

Conclusions. Analyzing the numerical data, authors can conclude that the presence of a speech signal introduces minor changes in the numerical data of the signal. But such changes are so minor that they can be neglected. At the same time, examining the graphical data, the changes in the histogram of the white noise generator are clearly visible. This makes it possible for an attacker to understand that there is a speech component in the audio signal that was filmed. However, when considering the graphical characteristics of the pink noise generator, it will be quite difficult for an attacker to make out the presence or absence of a useful speech message in the received signal.

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