A Multiple Access Technique for Differential Noise Shift Keying system

Anton Sytnyk

Abstract – **In this paper briefly described a multiple access technique for differential noise shift keying (DNSK) system.**

Keywords –**multiple access, noise signals, differential shift keying.**

I. Introduction

Multiple access systems are currently implemented for the binary data transmission based on chaotic samples of information signals [1]. On contrary, the use of noise samples based on multiple accesses has not been investigated at all. Since chaotic and noise signals are similar by nature, it makes sense to modify the existing multiple access model [2] for transmission of information based on noise signals.

II. A multiple access technique for DNSK

The multiple access system for the transmission of binary data using the noise signal consists of a transmitter, a communication channel and a receiver. Noise samples as a realization of Gaussian random process type are used as a carrier of the information component. The important feature of systems with differential shift keying is that the transmission of the information slot is divided into two components, the first one being a reference sample, which does not carry any information, and the second one being a data sample. If the information that is transmitted equals "+1" then the data sample stays the same; otherwise if the information that is transmitted equals "-1" then the data sample will be inverted to a reference sample. In the multiple access system, the reference sample and the data sample must be different for different users in order to avoid the interference and hence the misdetection.

The multiple access technique involves the transfer of information symbols for N number of users. Noise samples $x_{i,k+1}(i = 1,2,..N)$ are the values of Guassion normal distribution $x_{i,k+1} = f(x_{i,k}) = \frac{1}{\sqrt{2\pi\sigma}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$, in this case all users are provided with different information components. Assume the system starts at $t = 0$ and the binary data to be transmitted has a period of T_b. Define the spreading factor as 2α where α is an integer value. The spreading factor is an important parameter that influences on bit error rate when the data is transmitted for multiple users simultaneously.

The information frames formatting scheme for multiple access system, where the reference sample and the data sample are different for different users, is presented in Fig. 1. For the i -th user every frame will consist of 2^i half-bit slots, where the first i half-bit slot is used to transmit i reference samples, while the remaining i half-bit slot is used to transmit the data samples. If a "+1" is transmitted in slot $i+1$, the sample in slot 1 is repeated in slot $i+1$, otherwise the inverted copy is sent. The algorithm is repeated for $i+N$ slots within a frame. Reference samples and data samples will be transmitted sequentially within each frame for each user. The number of slots in a frame is a reflection of the number of users for whom the transfer of binary information is executed.

On the receiver's side the reference sample for each slot will correlate with the data sample that corresponds to it throughout the frame. Simultaneously the correlator output value is obtained that corresponds to the sum of the data samples per slot before the correlator is reset. Consequently this value goes to the threshold where it is determined whether "+1" or "-1" was assigned to the slot on the transmitter's side.

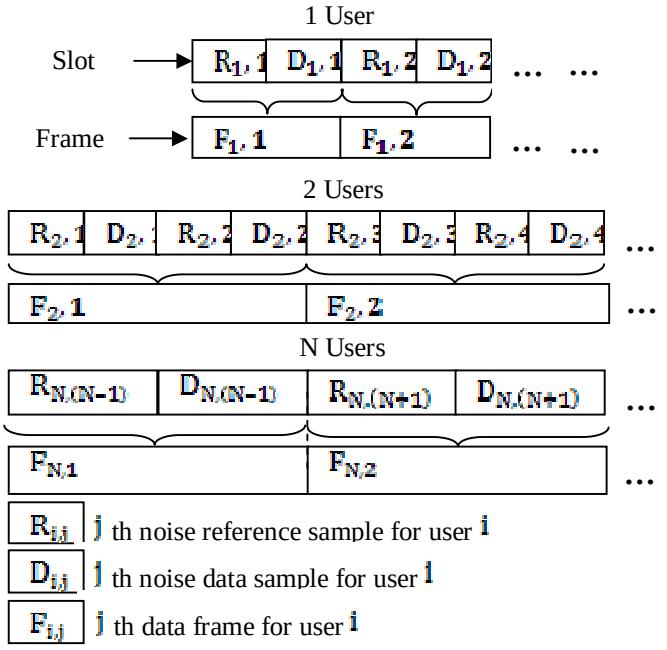

Fig.1 Scheme of building information frames

III. Conclusion

In these thesis briefly described a technique for multiple access system with deferential noise shift keying. Further investigation of this system is promising at least in terms of new results of bit error probabilities in case of multiple accesses.

References

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Anton Sytnyk – Cherkasy state technological university, Ukraine, Cherkasy, Shevchenko Boulevard 460, e-mail:sytnik.anton@gmail.com