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PRINCIPLES OF EXPECTATION NOISE

RADWAN H.
Post Graduate in Kyrgyz State Technical University (KSTU)
izvestiya@ktu.aknet.kg

В статье исследуются возможности ожидания теплового шума и возможности улучшения этих ожиданий.

Фактически мы не можем ожидать ценности от шума и конечно мы не можем иметь пользу от ожидания в TDMA (временное разделение каналов) но мы можем иметь хороший результат, если используем CDMA (кодовое разделение каналов). В этой статье мы обсуждаем возможности и принципы ожидания шума и мы приглашаем исследователей работать в этой важной области исследовать подходящую формулу, которые описывают шумы точно и иметь пользу от этих ожиданий.

1-Abstract :

In this article we search about possibility of expectation thermal (Johnson) Noise, and about possibility to have advantages of this expectation.
In the fact we can't expect the current values of noise exactly then we can't have advantage of this expectation in TDMA (time division multiple access) but we can have a good result if use CDMA (code division multiple access) , in this article we discuss possibility and Principles of expectation noise and we invite researchers to work in this important field to reach to suitable formula which describes noise exactly and have advantages of this expectation.

2-Introduction"

Has the noise memory? It is not a joke, it is scientific question
It is known that the first enemy to telecommunication engineering is the noise it is define the level of transmitted signals because signal level must be larger than noise level at the receiver therefore the level of signals must be high at transmitter then if we can expected current noise signal then we can extract the useful signal even the level of useful signal is lower. Factually we can expect the current noise level exactly then if use TDMA (time division multiple access) system for example then we can't have advantages of our expectation. But if we use CDMA (code division multiple access) system where we extract the useful signal at the receiver by adding or subtracting the received signals in many of time windows then we have the immediate value of the noise in these time windows, and in this case our expectation will be useful because we will get the immediate expected value of the noise in all of these time windows.

3-Immediate value of the thermal noise:

Thermal or white noise has stationary immediate density value through the same wideband of frequency , and It is known that the thermal noise is commonly characterized by a power density ***N*** given by:

N = kTB *Where:* *k is Boltzman's constant (1.38*10-23 Joules/K)*
B is the bandwidth in Hertz and
T is the temperature in Kelvin

Factually we use this value to determine the required signal values at the transmitter to receive this signal by negligible mistakes as possible , but this relation doesn't describe the current noise value , where this current value usually must be between two limited values as shown in following figure:

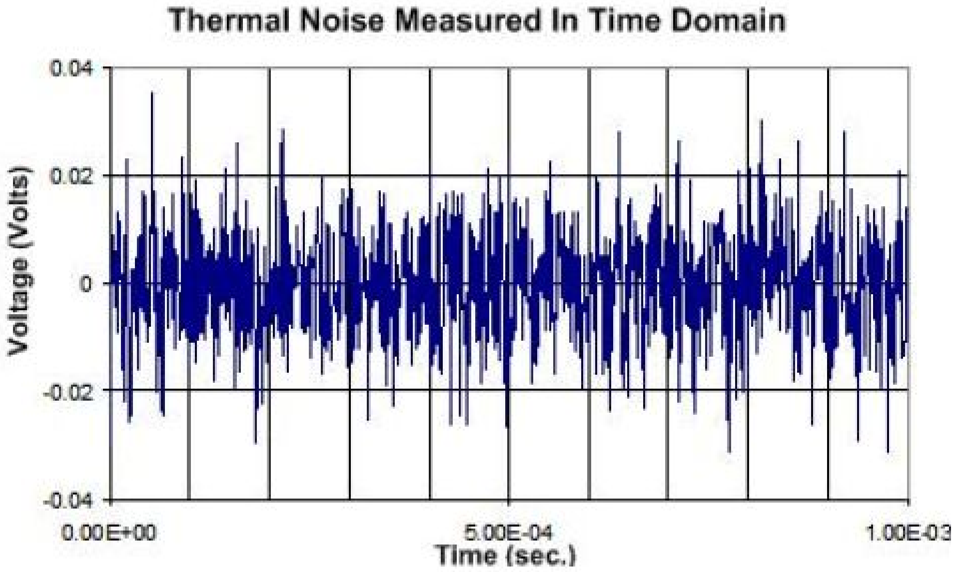

Figure (1)

4-Can we expect the noise ?

In finance science there are many method to expected the rate of currencies, and all this method depends on previous rate of this currency, yes there are many factors defined the rate but in the result all of these method follow to the value of currency follows to the previous values of this currency, then the money porkers analyses these previous rats and compare these rats with immediate value and with additional factors , and then take the decision.

There are famous forms to expect currency rate, these forms depends on previous values of the currency as (head and shoulders forms) as shown in following:

Figure (2): Head and shoulders Form

The question: what is the relation between currency rate and geometric form shows head and shoulders?

The answer is: this is the analyzed result shown in this form, maybe we don't know the exactly reason but this is the result!

By returning to noise we can ask: haven't noise as this expectation forms?
Why we didn't try to discover these forms?
It is real question, if we don't know the exactly factors that give the noise the current value why we don't analyzes the forms of these diagrams and extract the result?

5- Is it true?

Maybe somebody say it is not true, and the currency rate follows to scientific bases but noise hasn't these bases, then we can say: no there are scientific bases to current noise value but we don't know these bases exactly, but at least we can know an immediate value and this can give us many important information if we compare this immediate value with previous values, suppose the immediate value of the noise is N it mean the current values vary between +N and –N then suppose the previous values was +N through defined time rang than: can't we expect the value of noise in next time rang?
Of course we can, and certainly we can say the next value must be at least negative to compensate the high positive value in last time range!, it is scientific base, and the expected currency methods depends on this base. Then if we compare the previous values of noise in many time range then we can certainly expect the next noise value. In the fact this is simple base, and we must search about more exact methods to describe next noise value exactly.

6- **Principles of expectation noise:**

We mustn't let expectation absolutely without any scientific base it is wrong way, in the fact we must discover unknown factors by analyze these forms and extract the approximation equations which describe these forms, and then we can use these equations to expect the next noise values it is clearly we can't use diagrams to expect noise value because we need high speed decisions to expect and then cancel noise values.

In the following I suppose some basic Principles to search about the approximation equations to describe expected noise:

1- how many previous values we must enter in this equation? And which values are more important, and these important values follows to time or to voltage or follows sequence of defined values? or to another factor?
2- What are the suitable functions to use in this equation are they sinus functions? or leaner functions? or exponential? or logarithm? Or another functions?

And must this equation contains integration or differential or no?

3-it must to compare the caused noise from two or more noise sources at the same conditions and notice if the noise have the same equation in the same conditions? and same time.

4- it is very important to expect the polarization of noise correctly, in the fact it is the first step to expect noise, and maybe we must use the same equation or individually equation to describe the level and the polarization of noise.

7-CDMA system and expectation noise:

In the code division multiple access CDMA each subscriber send N pulse, where he send in each time window pulse (ship) where the polarization of each ship determined as the personal code of this subscriber, as following:

$$C_j = \sum_{j=1}^{M} D_j T_n$$ Where: T_j the signal of subscriber n

D_n either +1 or -1 and it Determined according to the code of each subscriber

C_n the signal of must subscriber send it in J time window

M the length of CDMA code and this is equal (nearly) the number of all subscribers. In the reception side to get the information we must for each subscriber to add or subtract each signal in all windows time, as following:

$$S_n = \sum_{j=1}^{M} D_j R_j$$ where: R_j the received signal in the J time window

D_j either +1 or -1 and it Determined according to the code of each subscriber S_n the signal of n subscriber

Then the caused noise for each subscriber pulse given by:

$$I_{CDMA} = \sum_{j=1}^{M} D_j \sum_{n=1}^{M} D_j \frac{I_{n(TDMA)}}{M}$$

Where: $D_j . D_j = 1$

This give us advantage that is because in the average the caused for each pulse subscriber follows to immediate values of caused noise in M time windows and this means there are no problem if we have some wrong expectations, but the important subject is in average of expected values and this is must be true expectation.

8- for example :

In the following figure real thermal noise values:

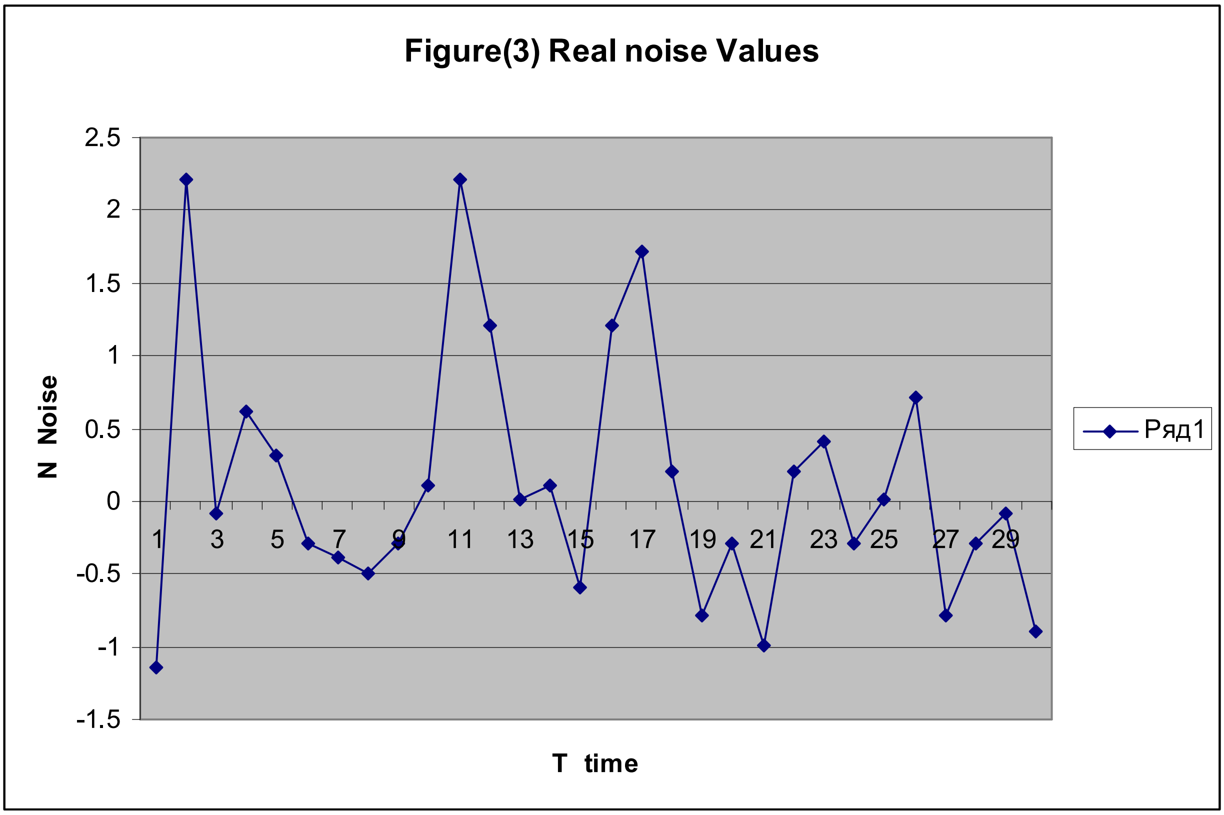

Figure (3): White noise

From this figure we can get these values of noise:

0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-1.42	1.93	-0.37	0.33	0.03	-0.57	-0.67	-0.77	-0.57	-0.17
0.1	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19
1.93	0.93	-0.27	-0.17	-0.87	0.93	1.43	-0.07	-1.07	-0.57
0.2	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29
-1.27	-0.07	0.13	-0.57	-0.27	0.43	-1.07	-0.57	-0.37	-1.17

Suppose we use only 10 previous values to expect noise and we use leaner equations to describe expected noise (as simplest form), then the equation given by:

N(T11)=a(1).N(T1)+a(2).N(T2)+a(3).N(T3)+a(4)(N(T4)+a(5)N(T5)
+a(6)N(T6)+ a(7).N(T7)+a(8)N(T8)+a(9).N(T9)+a(10).N(T10)

Where:

N(T11): the expected noise value in T11 time N(T1), N(T2), N(T3)… are the known noise values in T1 , T2,T3 …. Times a(1),a(2),a(3)… are constants

By using matlab program we had these values for a(1),a(2),a(3)… constants

a(1)=0.955,a(2)=1.0832,a(3)=-0.5041,a(4)=0.1998,a(5)=-.5515,a(6)=1.3723,

a(7)=-0.4623,a(8)=0.449,a(9)=-1.6037,a(10)=1.1766

by applying resulted equation to expect noise through latest 10 values (third table): we have these values :

1.771 -0.7112 0.5314 -2.63 0.057 -0.122 1.02 -2.27 -0.34 -2.02

By comparing these values with real values (in third table) we notice difference between each expected and real value, but the surprise is in immediate value where it is for expected values (-0.472), and for real values is -0.48 and the difference only 0.008 it is very good result if we compare this immediate value with first 10 immediate values (where it was -.225) and with second 10 immediate values (where it was 0.22) then this simple equation expect immediate noise value and gives nearly exactly value.

Of course it is not our object but we must search about best equation to describe current noise value in all cases, and it need more work and need real experiments to verify results.

9- Conclusion:

The future targets of the search are to study expectation noise in different ways and in different conditions for example different band wide frequency, different temperature …and compare these results to extract an exact equation to describe expected noise and then apply this equation on CDAM system to compare the result of this expectation, and know if it useful method and if we can decrease the level of required transmitted signals.

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