

Implementation of Equalization technique for 5G wireless network

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ABSTRACT

This paper present the concept of Next generation wireless communication system over the existing 4G systems like long term evolution (LTE). LTE-uplink generates significant Inter-symbol interference especially for high bandwidth, Due to this rise in mutual interference among active users with an increased error rate. This paper proposed that ISI will be reducing by channel equalization with the help of artificial neural network. Let us take Next Generation as 5G.

Keyword: - Future Technology, Inter Symbol Interference, Channel Equalization, Neural Network

1. Introduction

The 1st Generation cellular system is mainly analog system and the range of bandwidth is from 10 to 30 KHz. It uses FDMA service. It provides voice services at 10 Kbps. The 2G GSM system offers data rate at 14-64 kbps. It uses TDMA/FDMA services. The 3G scheme with CDMA service offers the peak data rate from 2-50 Mbps with the bandwidth of MHz All this schemes use Circuit Switching and/or Packet switching, where as in 4G cellular systems the peak data rate starts at 100 Mbps with the OFDMA / SC-FDMA systems. 5G denotes the next stage of mobile telecommunications in advance to the 4G wireless standards. By 2020 the number of connected IoT is estimated to reach 50 Billion, while the mobile data traffic is expected to grow to approximately 24 Exabyte's per month. All this can be overcome by 5G technology. It will make IoT a reality that is; it has the ability to provide network connectivity to all connected devices regardless of location, and time without human intervention like Smart store, Smart Home, Smart Office and Connected Car.

1.1 Next Generation Wireless communication

As we assume next generation wireless communication as 5G,4G and 5G are both mobile wireless access technologies offers Ethernet speed on mobile devices to experience the triply play services. Currently 4G is being deployed in several countries in Europe and North America.4G offers theoretically closer to Gigabit Ethernet whereas users expect multiple Gigabit speed from 5G.4G is being used in Backhauling Networks as well as user access networks whereas users expect 5G to be backhauling backbone networks.

1.2 Inter-Symbol Interference

ISI is InterSymbol Interference. ISI is form of distortion of a signal in which one symbol interferes with next symbol in the sequence. So it causes noise or a less reliable signal. The main causes of intersymbol interference are multipath propagation or non-linear frequency in channels. In telecommunication, equalization is the reversal of distortion incurred by a signal transmitted through a channel. It is process to remove the ISI and noise.

2. Ease of Use of Next generation wireless communication

Somehow in future we can imagine the world will lie on IOT (Internet of Thing). For use of IOT the required data rate will be very high as compared to recent technologies. Next Generation wireless communication lies in providing very high data rates, extremely low latency, quality of services (QoS) compared to current 4G LTE networks. Here some advantages of Next generation wireless communication.

2.1 Advantages

1. Key benefit of the 5G is the greater capacity.
2. 5G has reduced Latency. (Latency is defined as the amount of time taken for data transfer to take place.)
3. Improved Coverage
4. Signaling efficiency will enhance
5. Latency will reduce comprehensively with respect to 4G LTE

2.2 Application of Next generation wireless communication

- 5th generation will make unified global standard for all.
- Network availability will be everywhere and will facilitate people who want to use their computer and such kind of mobile devices anywhere anytime.
- Because of the IPv6 technology, visiting care of mobile IP address will be assigned as per the connected network and geographical position.
- Main application of 5th generation will make world real Wi Fi zone.
- Cognitive radio technology will facilitate different version of radio technologies to share the same spectrum efficiently.
- 5th generation wireless communication system will facilitate people to avail radio signal at higher altitude as well.

3. Methodology

Intersymbol interference will reduce with the channel equalization. In channel equalization technique this paper proposes to use neural network algorithm, which has many key benefits, So use of Neural network widely now a day. It is act as like human brain.

3.1 MMSE equalization

In the signal processing, minimum mean square error (MMSE) estimator is an estimation method which minimizes the mean square error (MSE), which is a common measure of estimator quality of the fitted values of a dependent variable. The term MMSE more specifically refers to estimation with quadratic loss function. In such case, the MMSE estimator is given by the posterior mean of the parameter to be estimator is usually constrained to be estimated. Since the posterior mean is cumbersome to calculate, the form of the MMSE estimator is usually constrained to be within a certain class of functions. Linear MMSE estimators are a popular choice since they are easy to use, calculate, and very versatile.

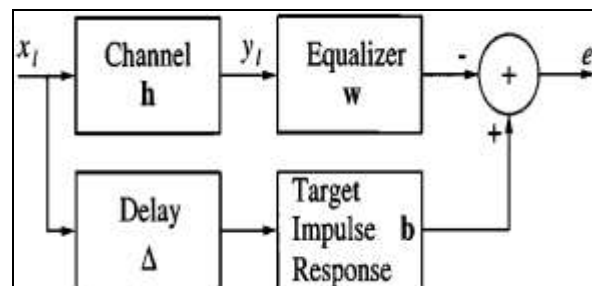


Fig -1: MMSE Equalizer [7]

3.2 Neural Network

Neural networks are a computational approach which is based on a large collection of neural units loosely modeling the way a biological brain solves problems with large clusters of biological neurons connected by axons. Each neural unit is connected with many others, and links can be enforcing or inhibitory in their effect on the activation state of connected neural units. Each individual neural unit may have a summation function which combines the values of all its inputs together. There may be a threshold function or limiting function on each connection and on the unit itself such that it must surpass it before it can propagate to other neurons. These systems are self-learning and trained rather than explicitly programmed and excel in areas where the solution or feature detection is difficult to express in a traditional computer program. Neural networks typically consist of multiple layers or a cube design, and the signal path traverses from front to back. Back propagation is where the forward stimulation is used to reset weights on the "front" neural units and this is sometimes done in combination with training where the correct result is known. More modern networks are a bit freer flowing in terms of stimulation and inhibition with connections interacting in a much more chaotic and complex fashion. Dynamic neural networks are the most advanced in that they dynamically can, based on rules, form new connections and even new neural units while disabling others.

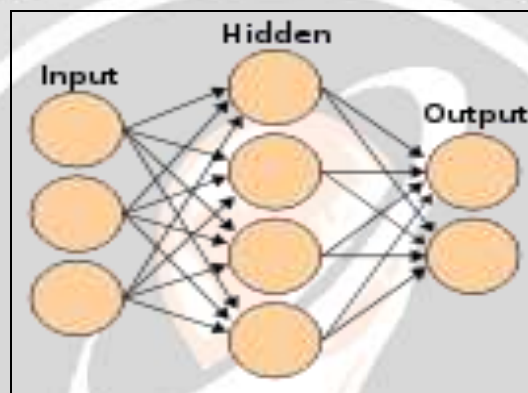


Fig -2:- Architecture of Neural Network

The goal of the neural network is to solve problems in the same way that the human brain would, although several neural networks are much more abstract. Modern neural network projects typically work with a few thousand to a few million neural units and millions of connections, which are still several orders of magnitude less complex than the human brain and closer to the computing power of a worm. New brain research often stimulates new patterns in neural networks. One new approach is using connections which span much further and link processing layers rather than always being localized to adjacent neurons. Other research being explored with the different types of signal over time that axons propagate which is more complex than simply on or off.

4. CONCLUSIONS

The paper aim to conclude that 4G has advantages still has some limitations and cons. Main limitation of existing system is inter-symbol interference. Existing systems uses MIMO-OFDM technique but still there are some limitation like high PAPR. Other way to reduce the inter-symbol interference from the channel is the channel equalization with the help of artificial neural network algorithm.

5. REFERENCES

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