International Journal of Research
Available at https://edupediapublications.org/journals
e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 04 Issue 17
December 2017

Barcode Data Transmission through Mobile Devices for Relaible Ber Performance in Ofdm System

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Abstract---***In wireless communication, mobile devices attains more prominent role in this generation. In todays world everything is connected to mobile devices. Barcode is also one of the best way to transfer information or data from one device or other. In this we proposed a technique to transfer a data from one mobile to other mobile with barcode modulation. Many of the pervious methods are failed to acquire a better BER performance with different modulation techniques such as PAM, QPSK and DPSK. In proposed method, DPSK modulation technique is used to improve the BER and to reduce PAPR. The simulation result shows the comparision of both the previous and the proposed schemes. The data rate as well as the reliability of proposed scheme yields better performance over traditional state-of-art methods in terms of complexity and efficiency***

Keywords: Barcode, DPSK-OFDM, FFT, Data transmission

1. INTRODUCTION

Communication industry has grown enormously in past six decades and supports various applications belong to different research fields. Wireless communication is major constituent of communication industry which has 75% of total market share. Wireless communication takes the communication domain to next level in terms of reliability and performance. Mobile data transmission is considered as 21st century system which offers higher data rate but suffers from complexity.

The stability of communication systems depends on modulation technique, if a system is deployed with equipped modulation mechanism it helps to achieve high efficiency and as well as better performance. Traditional modulation systems have limitations in its architectural design which restrict them to operate in proper way and the abnormal restriction results in complexity which eventually decline the total system performance. The research on modulation system reveals an interesting fact that the modulation scheme alone cannot perform entire task with accuracy and it needs additional barcode system to perform the modulation scheme with security. Barcode system based modulation framework achieves high performance along with nearly low complexity.

Barcode implementation in late 1950's has emerged as solution to security problems and became popular system for secured data transmission. Transfer of information is an interesting area in communication domain and transferring more information in less bandwidth is an assumption in analog systems while it became reality with introduction of barcode in digital systems. Encoding the information into un-understandable form provides security and the process is well accomplished by using barcode and 2-D QR code.

A novel barcode modulation system is proposed in this work to handle the complexity with ease and yields better performance with respect to low run time complexity. DPSK modulation along with OFDM is used for attaining higher data rates while barcode system is implemented in this work for high security provisions providing to data which is transferred between two devices with high accuracy. DPSK- DWT OFDM system has shows its supremacy over traditional algorithms in terms of performance and efficiency.

2. JUSTIFICATION

Digitalization and its dependent digital gadgets make human life easy and comfortable. Invention of internet has take digitalization to next level. Mobile device invention is designed to meet various requirements in well defined manner. According to international statistics, in 1990 for every 1 million people there is one mobile while in 2016 for 7 billion there are almost 15 billion mobiles are in usage. Although mobile device is considered as most prominent thing in daily life but still data transmission through mobile device is still concerned area in digital world. Various drawbacks are addressed in well organized way in literature but still it is unresolved issue and the proposed work is proposed to solve the all issues in mobile transmission and justification of the proposed work relies how effectively proposed method handle the complexity issue.

2.1 New Knowledge to be generated by the Research

A. Conventional algorithms proposed for handheld device transmission area miserably fail to achieve low complexity. Traditional barcode modulations mechanisms are based on PAM, BPSK and QPSK attains complexity levels more than 30% and high complexity levels makes handheld device transmission an unresolved issue in wireless transmission.

B. DPSK based barcode modulation scheme along with OFDM is newly implemented to handle the complexity issue in efficient way.

C. Handling the complexity with increasing performance another new thing implemented in this work

2.2 Objectives

1. High speed mobile transmission

2. Low complexity

3. Barcode scheme

4. High performance

5. Better efficiency

6. Reliability

3. LITERATURE REVIEW

The 2D Barcodes 2D barcodes improve the working of single dimensional barcode by providing better data rate. Here the data is encoded in both height and width of barcode. Almost 30 different types of barcodes are known. Of these some are commonly used like data matrix code, Shot code, Visual code etc. The 2D barcodes can be widely divided into two categories: Index-based barcodes and Database 2D Barcodes.

The type index-based 2D barcodes take into account the reading limitations of these built-in cameras. The Visual Code, Shot Code, and Color Code belonging to this have a much lower data capacity than database 2D barcodes, but they offer robust and reliable barcode reading. The database 2D barcodes—QR Code, VS Code, and Data Matrix—were initially invented to improve data capacity for industrial applications. However, when integrated into mobile phones with built-in cameras that can scan and decode data, these 2D barcodes can operate as portable databases, letting users access information anytime, anywhere, regardless of network connectivity. Now let us move to important and popular 2D barcodes-QR codes.

The quest to relevant information sources Furthermore existing Examine might have been directed throughout december 2008 – february 2009. The sources for majority of the data were Joensuu school Library, IEEE Xplore Furthermore ACM scientific databases, Internet sources and publications in English. Those quest criteria held those taking after keywords: mobile technologies, RFID, 2D barcodes, usability, MUPE

4. ORTHOGONAL FREQUENCY DIVISION MULTIPLEXING (OFDM)

Orthogonal frequency division multiplexing (OFDM) and compatible usage in wireless standards like DVB, WIMAX, IEEE802.11a and LTE has been gained interest from worldwide research organizations. Recently an international meeting has

conducted in order to discuss importance of orthogonal frequency division multiplexing (OFDM) and its usage in advance wireless standards makes Orthogonal frequency division multiplexing (OFDM) as an emerging technology to meet the requirements in practical scenario. Orthogonal frequency division multiplexing (OFDM) has high data rates compared to traditional communications systems and it suited well for frequency selective channels. Large delay spreads is a drawback which commonly occurs in the high speed wireless communication system and orthogonal frequency division multiplexing (OFDM) modulation scheme has ability to transform the wide frequency selective channel to narrow ones which creates the robust environment to resists against occurrence of the large delay spreads and preserves the Orthogonality in perfect way in the frequency domain. Orthogonal frequency division multiplexing (OFDM) has one more unique advantage to reduce the complexity in the system by introducing the cyclic prefix at the transmitter end and performing scalar equalization at the receiver end in the wireless standards like WIFI and WIMAX.

In 21st century, the role of the technology to offer high data rates and mobility is crucial and the technology is changing its face every other because of immense research work carried out on the advance wireless communications. Actually the research on parallel data transmission is traced out in the mid 1960's but it takes 25 long years to make it compatible to real time applications. The OFDM gradually seen its presence in the various application and now various international standards consider it as promising modulation scheme which initially supports wireless standards like WIFI, WIMAX, LTE etc. The two important parameters required better transmission of data from one entity to another are data rate and the modulation scheme should support different channel conditions to obtain better spectral efficiency.

The evolution of the third Generation Partnership Project (3GPP) development based on the Long term evolution (LTE) supports two networks namely Radio access network (RAN) and core network. The transformation of the 3G to 4G observes the changes in terms of data rate and spectral efficiency. International Telecommunication Union Radio communication Sector (ITU-R) initialized a set of requirements for the 4th generation cellular system and requirement of the high data rate is specified by International Mobile Telecommunications Advanced project (IMT-Advanced) for 4G. OFDM is a modulation scheme which is one of the techniques employed in LTE to enhance the data stream.

5. PROPOSED METHOD

Demand for high data rate communication system leads to design of OFDM architecture which offers high data rate up to 100mbps. Introduction of blur in digital images has become a major concern area in the data transfer and usage of orthogonal subcarriers from OFDM has successfully handled the problem of image contamination. Orthogonal frequency division multiplexing scheme utilizes the low pass filter in efficient way to ensure the transfer of low frequency bits in uncontaminated way and only requirement needed is high phase coherency which helps in detect data bits in accurate and reliable way. A detailed explanation with well defined modification is presented in this paper based on above study and the proposed idea mainly relies on equipped modulation scheme along with LCD camera [9] movements which is used in capturing the single frame and the acquired images are perceived in better way.

DPSK modulation scheme is literally called as heart of the proposed work and adjacent frequencies phase differences leads to DPSK modulation. DPSK modulation usage comes into implementation when data is inscribed in phase differences based on the required movement tolerance. Finally DPSK-OFDM termed as DPSK method in entire project till end. Generally phase differences in data transfer results in phase distortion may affect the relative neighboring components in negligible way and usage of DPSK modulation handle the distortion situation in better way which paves way for transmission even in high LCD vicinity and in camera relative motion. A related figure composed of LCD camera movements along with communication standards is shown in figure 1 and the mechanism presented above successfully eliminates the unnecessary channel estimation requirements which results in low processing power.

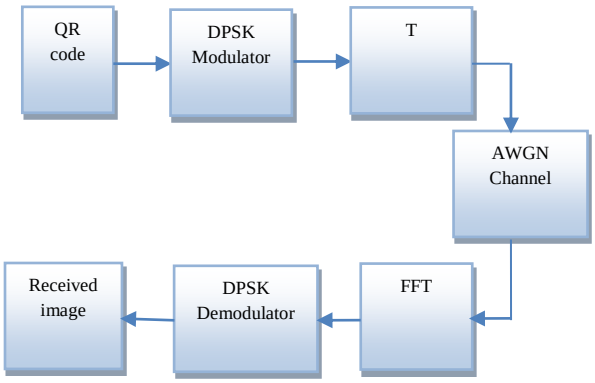

Figure 1: Transmission of information using DPSK Algorithm

Transmission information from the transmission end at maximum level is a concerned area especially from a single image and in order to meet the criteria, maximum data must be extracted from the single which is followed by increasing the data rate of the consecutive frames for decoding purpose. Extraction of the information depends on the LCD display design while in some cases it depends on the receiver end camera respectively.

(A) DATA CAPACITY

Data capacity is crucial part in data transfer from transmission end to receiver end though channel. Number of bits viewed on LCD screen especially of raw image. A color image shown on display composed of rows and columns as 'M' and 'N' and transmission of data is done through channel represented as L_D and depth of color bit $B_D$bits per channel. The maximum information is represented as

$$C_I = M_D \times N_D \times L_D \times B_D \; bits\; per\; image \; \ldots (1)$$

The discrete nature of the LCD display puts serious limitations to perceive maximum information as shown in above notation and desired information rate cannot be achieved due to certain limitations as described below.

(i) Power related Limitations

According to the Shannon hypothesis theory, the power passing through channel is directly depends on the signal force. The signal force represents the speed achieved by the respective signal while it sent through the medium in effective way. So power limitations deployed in the communication theories pose major limitation is transmitting the information using barcode modulation. The major reasons which vividly cause power limitations are as follows

- Signal compression while transmission results in distortions. These compression distortions are the one of the predominant reason for causing power limitations.
- Subjective relative motion

(ii) Finding the relevant patterns

Modulation/demodulation is considered as heart of the modern day communication system which is offering high data rates to various indoor and outdoor applications by international communication standards. Extraction of inscribed information from respective barcode modulation is highly affected by power distortions. Standard finder pattern used for QR code is 1:1:3:1:1.

(C) DPSK – OFDM

Transmission of information through wireless scenario is possible because of reliable modulation schemes. In traditional approaches vast amount of modulation schemes along OFDM has implemented but none can achieve low complexity. In this work, DPSK-OFDM modulation scheme has implemented for better transmission of information from transmitter end to the receiver end. The transmission of information through DPSK OFDM approach is shown in following figure 1.Here the respective input taken is 'TEXT'. The encoding process helps in achieving secured QR code for reliable transmission. Encoding and decoding of QR code is achieved by Zxing open link source [10]. Cyclic extension is used to prevent the inter carrier interference (ICI) in a OFDM system [7].

(i) DPSK Modulator

DPSK takes the converted data as a input source. Each symbol is converted to a complex phase by following rules

$11 \rightarrow e^{\frac{j1\pi}{4}}$, $10 \rightarrow e^{\frac{j7\pi}{4}}$, $01 \rightarrow e^{\frac{j3\pi}{4}}$, $00 \rightarrow e^{\frac{j5\pi}{4}}$,

First bit modulates the Real component & second bit modulates the imaginary component of the phase of each symbol.

S matrix converted into Differential matrix D using following method:

• D(0,0)=S(0,0); (2)

• D(0,n)=D(0, n-1) × s (0,n)1≤n<N-2 (3)

• D(m, n)=D(m-1,n)×s(m,n)1≤m<M/2-1, 0≤n< N-2 (4)

D matrix is converted into two matrices:

• D_1(m,n)=D(m,n); (5)

• D_2(m,n)=D(m,n+N-2/2 ; (6)

Where 0≤m<M/2-1, 0≤n<N/2-1

These two matrices are used to fill regions 1 and 2 of the transmission matrix.

(ii) IFFT

IFFT is used to convert the frequency domain data into time domain. Output of DPSK modulator is in frequency domain, so IFFT is used to convert it in Time domain representation using following equation:

$$\mathbf{X[n]= \sum_{k=0}^{N-1} X(k) . e^{\frac{jk2\pi n}{N}} n = 0, 1, 2, \dots, N-1} \quad (7)$$

(iii) AWGN channel

AWGN channel is widely used in OFDM. In OFDM multipath signals are transmitted then these signals are received as a train of pulses at the receiver .In this white Gaussian Noise are considered with constant spectral density.

(iv) FFT

FFT is used to convert time domain representation of data into frequency domain using following equation:

X[K]=1/N

$$\sum_{n=0}^{N-1} x[n]. e^{\frac{j2\Pi nk}{N}} k = 0, 1, 2, \dots, N-1 (8)$$

(v) DPSK Demodulator

Data can be extracted using phase differences between respective elements. Data corresponding to region 1 & 2 should be concatenated to form matrix R corresponding to transmitted matrix T.

• Rd(0,0) =R(0,0) (9)

• Rd(0,n) =R(0,n)×R*(0,n-1)0<n<N-2 (10)

• Rd(m,n)=R(m,n)×R*(m-1,n)0<n<N-2, 0<m <M/2-1

Finally, the received signal is to be detected as the phase differences have been extracted. Each input bit may be calculated using constellation map of the transmitter. Each element is evaluated using its real and imaginary components. The sign of the real component determines the first bit and sign of the imaginary components determines the second bit.

In wireless medium to increase the data rate with high performance orthogonal frequency division multiplexing (OFDM) is used which uses inverse fast fourier transform at the transmitter to modulate a high bit rate signal onto a number of carriers. The problem to this technique is that it requires more complex IFFT core. Over this, we can use discrete wavelet transform to generate the output with lower computational complexity. Extension diagram is as shown in figure 2. Wavelet transform is the most suited for use in AWGN channel and measures the performance in terms of Bit Error Rate (BER) and signal to noise ratio (SNR). It increases the spectral efficiency and decreases the bit error rate as compare to fourier transform and we get the better performance.

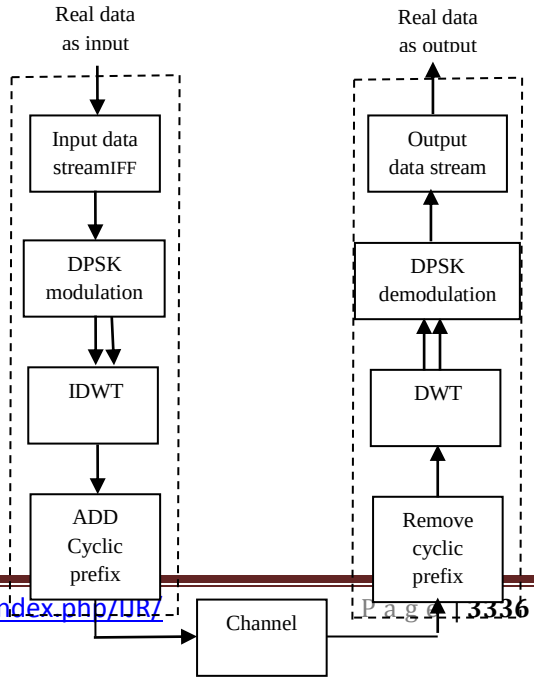

Figure 2: Extension method block diagram for data transfer using DWT

6. RESULTS

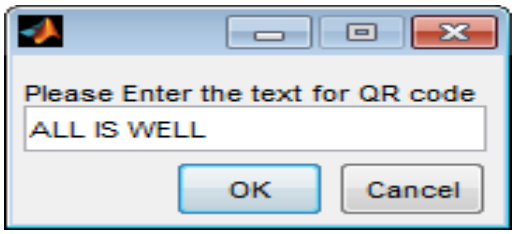

Figure 3: Input Text

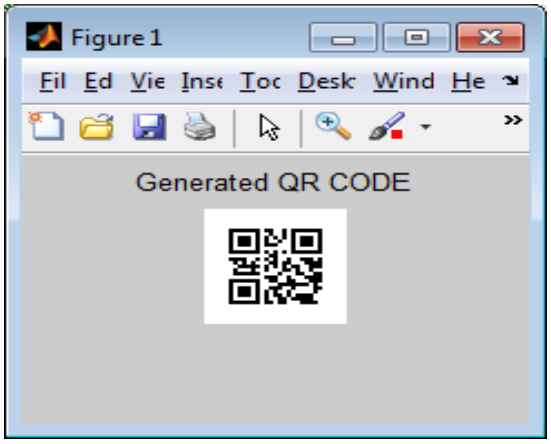

Figure 4: Generated QR Code for given text

Figure 5: Received Image to other device

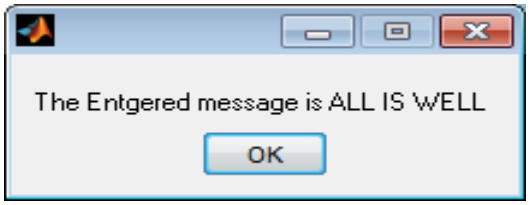

Figure 6: Shows Entered Text from QR code

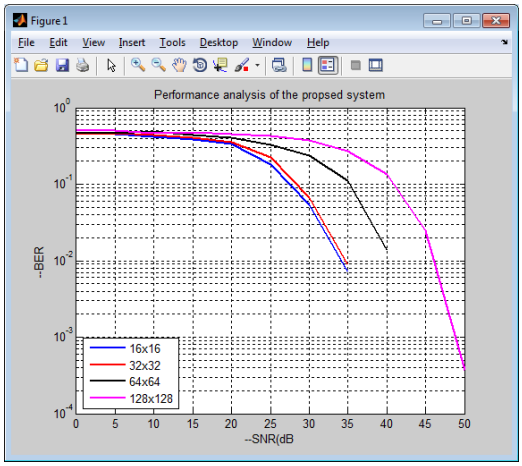

Figure 7: Performance Analysis of Proposed Method

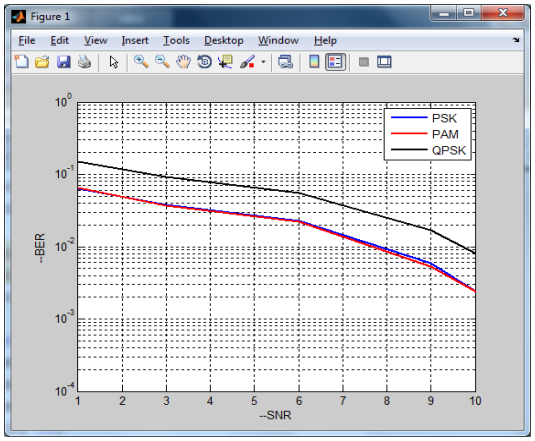

Figure 8: Performance Analysis of Previous Methods based on SNR

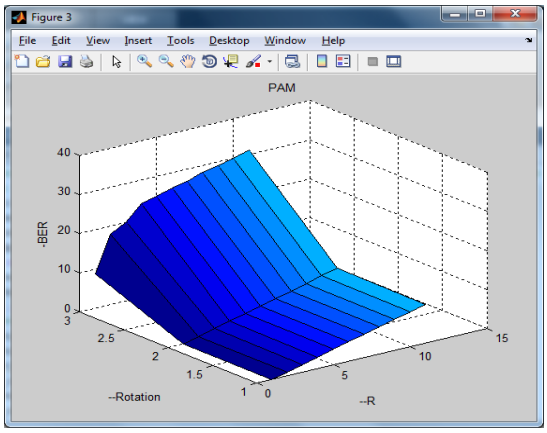

Figure 9: 3D representation of PAM based on BER, R and rotation

7. CONCLUSION

In this paper, transmission of data is performed through handheld devices as we seen. To develop this many of the researches have been worked out to provide better efficiency and reliability in this today's hacking world. In Mobile handheld devices, barcode is used to transfer information from one device to other for security purpose. DPSK-FFT is used to transform a signal through channel and achieves better BER performance. Compared to previous modulation techniques such as PAM and QPSK the performance of BER is reduced upto 8%.Discrete Wavelet Transform is used to improve the transformation performance of the signal. DWT has the ability to transform a signal from one format to other without any data loss. So the generated barcode is transformed without any data loss. Such that the DWT based OFDM yields better BER performance compared to FFT.

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