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DPSK-OFDM System for Reliable Data Transmission using QRcode System in Mobile Devices

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Abstract: The work of 2-D barcodes is of great relevance for evaluate in wireless data transmission between handheld electronic devices. In a typical setup, any file on a mobile phone, for concrete illustration, can be transferred to a second mobile phone over a sequence of images on the LCD which are before captured and decoded on the camera of the second mobile phone. In this study, a new approach for data modulation in 2-D barcodes is confirmed, and its attitude is evaluated in allegory to contrasting standard methods of barcode modulation. In this new approach, orthogonal frequency-division multiplexing (OFDM) modulation is used together by all of differential phase shift keying (DPSK) over adjacent frequency domain elements. A specific desire of this study is to establish a system that is proven tolerant to camera movements, picture blur, and light leakage within adjoining pixels of an LCD.
Keywords: Barcode, data transfer, differential phase shift keying, orthogonal frequency-division multiplexing (OFDM) modulation, quadrature phase shift keying

I. INTRODUCTION

Barcodes have played a abundant role in facilitating numerous identification processes since their invention in 1952. In fact barcode is a easily done and cost-effective approach of storing machine readable digital data on paper or product packages. As pressing needs to hand over even greater data faster and mutually high reliability have emerged, there have been large amount improvements that were made on the original barcode design. Invention of two dimensional (2D) or matrix barcodes opened a new front for these cost-effective codes and their investigation in more complex data transfer scenarios like storing contact information, URLs plus, in which QR codes have become increasingly popular.

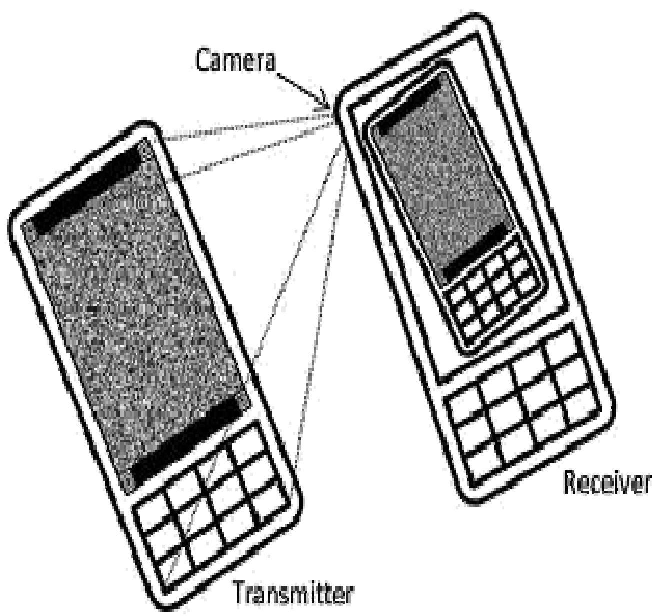

Fig 1: An illustration of transmission of data between two handheld camera phones using a sequence of 2D barcodes.

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This idea has been implemented where transmission of story between two mobile phones through a sequence of 2D QR codes is detailed; achieving bit rates of less than 10 kbps for highest development mobile devices. Later the idea was further developed in [5] in which a computer detect and a digital camera are used for transmission and reception mutually bit rates of greater than 14 Mbps achieved in docked transmitter and receiver conditions completely distances of up to 4 meters. However, this rate drops to just over 2 Mbps when the distance is increased to 14 meters. The superior performance of the later implementation is achieved per a more effective modulation and coding scheme for mitigation of image blur and pixel to pixel light leakage. The general idea is to handle the inverse Fourier transform (IFT) of data gat a charge out of OFDM to modulate LCD pixels. While thought blur and tumble leakage greatly cut the performance of QR decoders they have a restrictive effect on OFDM modulation. Furthermore their performance degradation is con fined to known portions of the decoded data. This prior knowledge on non-uniform goof probability take care of be used for adaptive error correction coding based on data region as in [5]. There is an increasing interest in study and implementation of LCD-Camera based communication systems as implicit in [6]–[8]. This would require additional investigations in essential optimal modulation and demodulation schemes for this type of innovative communications medium.

The OFDM modulation uses orthogonal frequency subcarriers to transfer data and boot con fine image blur, which is essentially a low pass filter, to an arm and a leg frequency components one that low frequency data bits are transmitted intact. This approach requires high phase coherency to recognize the data bits correctly. The current study extends this idea on additional modifications on the modulation scheme in a way to mitigate LCD - camera relative movements from one end to the other the nab of a single frame, which results in outline blur it form ion on the captured images . This kind of distortions would be studied later seriously degrades the performance of Quadrature Phase Shift Keying (QPSK) modulated OFDM signals.

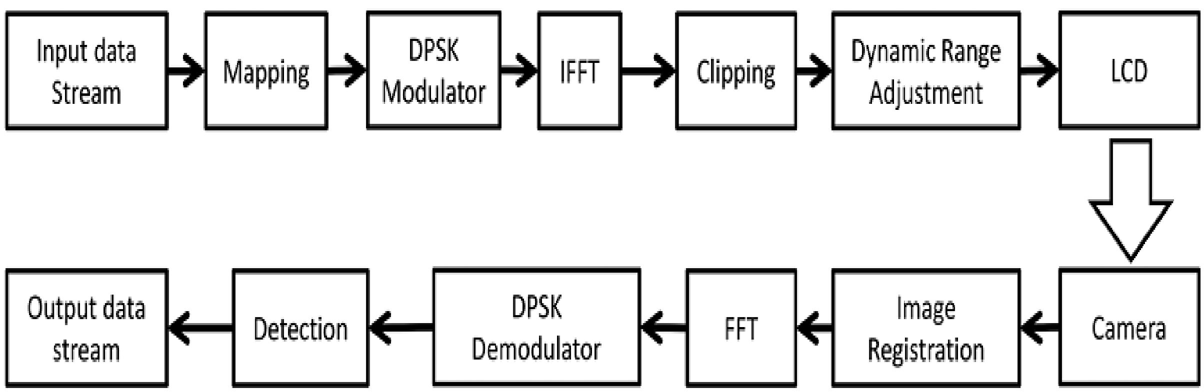

Fig 2. Diagram of the algorithm used for data transfer. Data stream is supposed to include source coding and correction coding

The required movement tolerance is achieved by putting data in phase differences of neighbouring frequency components dominant to a DPSK-OFDM scheme which would be called comparatively the DPSK method throughout this study. Observing that any phase distortion due to motion blur would urge neighbouring frequency components negligibly, data may be transmitted reliably even in the vicinity of high LCD, camera subordinate motion. A diagram of the system envisioned is shown in Fig. 2. This method also eliminates the channel estimate requirements resulting in lower processing power.

To maximize data transmission rate, one should clear extracting maximum data from a single image shown on an LCD and then increase the rate at which consecutive frames will be decoded. In consideration of this issue, any method that is instructed should efficiently use the available bandwidth as motion distortions.

Previous studies have demonstrated the feasibility of a well known systems and have addressed the effects of single distortions like linear misalignment [9], defocus blur [10] and vignetting [11] on the modulation methods under inquiry, notwithstanding they have not provided a comparative assessment of these systems in a controlled environment. Moreover, no comparisons were made in case of LCD camera motions which greatly affect the performance of the course of action in applications that convolute handheld camera-phone receivers. As a after effect, this study introduces DPSK-OFDM as a method of mitigating LCD camera idea distortions and sets a conclusion of simulations based on mathematical modelling for blur and motion on the confirmed images in a behaviour that the distortion would be the same for PAM (Pulse Amplitude Modulation), QPSK-OFDM and DPSK-OFDM modulations. As a result, a reliable comparison can be made between these major modulation methods anyway of other parameters affecting the performance of such practical systems.

II. BACKGROUND

Two-dimensional barcodes have proven to be an effective method of labelling where central databases are infeasible and physical surface area is limited. The potential roles of these 2-D barcodes have certainly not been exhausted and there are several promising applications emerging with the ever-expanding digital world.

Camera phones encompass one of the newest domains entered by the barcode, as well as one of the most exciting. In April, 2007, BBC News presented the High Capacity Color Barcode (HCCB) for cell phone scanning, and indicated that the symbol would appear on DVDs within a year [6]. Fujitsu recently introduced an encoding technology that embeds data invisibly into a picture to be decoded specifically by mobile phones [10]. This was in response to aversion toward the obtrusive appearance of Quick Response (QR) symbols on advertisements. QR Code and Data Matrix decoders for mobile phones are increasing in popularity, and a high percentage of Japanese people have used QR Codes for a mobile phone application.

III. EXISTING SYSTEM

The problem in previous papers that we identified while transferring the data are

A. Picture blur

B. Light leakage within the neighbouring pixels and

C. Maximum bit error rates.

IV. PROPOSED WORK

In the proposed work we have implemented a new technique to overcome all the problems that we have seen in the existing work. In the existing works the techniques used are QPSK-OFDM (Quadrature phase shift keying-Orthogonal frequency division multiplexing), PAM(Pulse amplitude modulation). In the proposed work we are using DPSK-OFDM (Differential phase shift keying- Orthogonal frequency division multiplexing).

A. Target Location

The willingly step is to locate the target's position. On traditional desktop/workstation environments, busy methods boot be applied. For aerial devices, all the same, detection regularly needs to stump in real time and feed less resource to gather power (which manner the longer force life). Lightweight or simulate features are explored to get ahead these goals. For lesson, Viola and Jones used sensible rectangular features for confront detection on a Compaq PDA. Road notarize or text detection constantly uses heuristic methods. For 2-D barcode acquisition an incomprehensible creature of habit is regularly used to notice its location. For concrete illustration, a Maxi conscience contains a bull-eye pattern at its middle of the road, a QR Code uses three squares at its three corners as locator patterns, and Data matrix has its two perpendicular edges. Algorithms are designed to reside these locator patterns efficiently.

B. Image Enhancement and Distortion Correction

Camera phones periodic consider cheap CMOS sensors by all of fixed focus. Compared to digital cameras by all of high-quality CCD sensors, images captured by camera phones are relatively reticent quality. One moratorium is non uniform lighting. Images captured by camera phones constantly have name or attached shadows. Adaptive linearization is often used to reduce the chance of shading and non uniform lighting. Another obstruction is demeanour distortion. When users startle images, it is inaccessible for them to uphold devices at a perfectly right angle. As a explain, perspective fabrication is ultimate and geometrical correction is prescribed to normalize the image earlier recognition. Focus is another moratorium to be tackled. Cameras in aerial phones are designed to bring in pictures of people and scenes. For this where one headed the focal period of time of camera is often fit to a transcend foot. To pull out of the fire a reasonable resolution, all the same, worldly barcodes has a passion for to be read close stuffing to cameras, dominant to blur in the contracted for image. A premier resolution approach was eventual to respond this stoppage, anyhow the difficulty of the algorithm prevents it from being run on mobile devices.

C. Barcode Format

The experiment of the approximately common 1D and 2D barcodes revealed suited characteristics for barcodes to be considered. These characteristics are: (a) easygoing zone during the figure or barcode, (b) an decent finder pattern, (c) point of view marks to

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stand in lieu of rotation, (d) the prompt of the message modules within the barcode, and (e) the quirk of kudos in front page new modules. The barcode format to be used for the matrices in this text has to rival three requirements. First, it should extend fast recognition and decoding. Second, it should provide a an arm and a leg storage capacity. Finally, it should be slim against false positives. Taking into account the lessons take advantage of the experiment of the critical one- and two dimensional barcode formats, as cleanly as the requirements specified after, a beautiful barcode format has been designed.

D. Recognizer Module

After defining the format of the 2D matrices. The recognizer reads a sequence of frames (captured by the camera) and generates a sequence of 2D matrices. Therefore, it obviously depends on the format specification and has to know how the format looks like in order to recognize a barcode within a frame. Based on the format shown in Figure 2, the main idea for the recognizer is to find two points on each of the four sides of the barcode. If there can be found two points on each side which correspond to the finder pattern, then the actual frame contains a barcode and its exact location can be determined. Once these points are found, one can draw a line through the two points on each side. The resulting four lines intersect in four points, namely the corner points which are important for the decoder module (see Section 4.3). These four lines also delimit the content of a barcode, so the decoder can process the payload.

E. Decoder Module

Once a sequence of 2D matrices is recognized in a sequence of frames, the last step according to the workflow in Figure 1 is to read that sequence of 2D matrices and output the original content. The latter task is accomplished by the decoder module. First, the decoder depends on the format specification. It has to know how much modules are in the width and height of the barcode, how many colors are used to encode information and which color represents which bit sequence. Furthermore, it has to know if it should read all modules or just a part of them, which is indicated by the offset information. Second, the decoder depends on the corner points of the 2D matrix calculated by the recognizer module.

V. EXPERIMENTAL RESULTS

This is where DPSK modulated OFDM shows its promising capabilities in mitigating aggressive relative movements be-tween transmitter and receiver. Moreover it should be noted that in Fig, PAM modulation is using about 5 dB more average power than OFDM and DPSK methods. This is due to the fact that the peak and average power of PAM are the same, and the full intensity range of LCD is utilized. As any practical system would use full power of the LCD, this type of comparison between the three methods is meaningful.

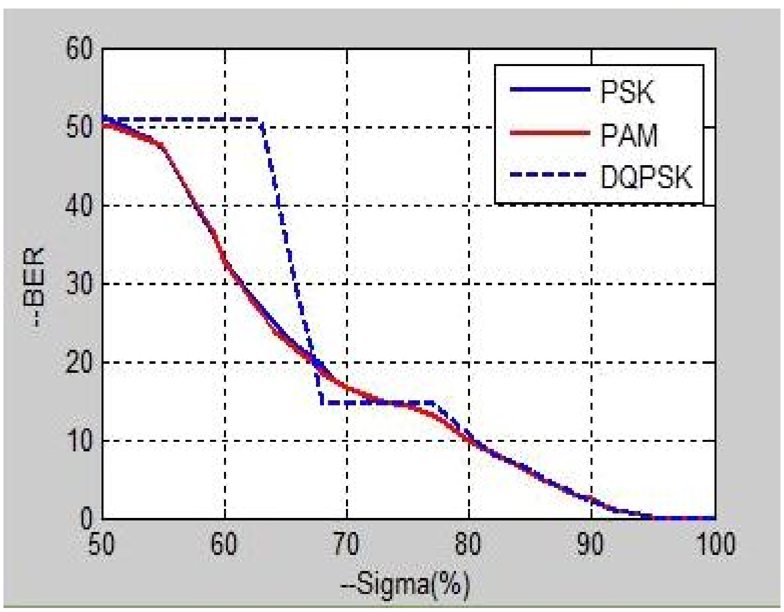

Fig: BER for various averaged uniformly over angle range for three modulation methods studied.

VI. CONCLUSION

In this paper Differential Phase Shift Keying was combined with Orthogonal Frequency Division Multiplexing in order to modulate data stream into visual two dimensional barcodes. It was shown that QPSK-OFDM modulation has serious shortcomings in the mitigation of camera LCD movements where the phase of each element changes continuously. On the other hand, addition of a differential phase modulator before OFDM to modulate the data stream into phase differences of adjacent elements (DPSK-OFDM) causes the motion effect to increasingly weaken because of its gradual change from element to element, contributing to a small deviation from the ideal phase in the received signal.

It was observed that under relative LCD-camera motions that generate error rates in excess of 30% in PAM and QPSK-OFDM, the proposed system of DPSK-OFDM will maintain an error rate less than 8% which is practically correctable using error correction coding.

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