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Picode: A New Picture Embedding with 2D Barcode

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Abstract - *: Nowadays a 2D barcode are very important to make an interface between the user and advertisement content. The 2D barcode are widely used in various applications such as Marketing, Manufacturing, advertisement, Product Tracking etc. This Paper proposes a new picture embedding 2D barcode called as Picode. Once the Picture is embedded via 2D barcode the user can get the info. Of that object if & only if that barcode is successfully decoded. No visual hint or any information is provided before the successful decoding of that barcode. Picode proposes two limitation of an existing 2D barcode such as perceptual quality & decoding robustness of embedded image. As comparing with existing 2D barcode the Picode achieves one of the best perceptual quality of the embedded image and also maintains better trade-off between image quality & decoding robustness in various applications. The Picode is implemented in java on PC.*

Key Words: **2D barcode, embedded picture, perceptual quality, decoding robustness**

1. INTRODUCTION

There are many types of barcodes that can be used to track the mail, to purchase any product, making of online payment etc. It may be a 1Dimensional or 2 Dimensional Barcode. It is used in retail industry & food industry. An UPC (i.e. Universal Product Code) is a linear barcode. When the person wants to purchase a product from any retail industry then the UPC is printed on outside of that product.
Code 39 is also a linear barcode. It can be used in manufacturing industry. This barcode which can encode the digits from 0 to 9 & uppercase letters from A to Z & also encode the special characters.
Code 39 is also a linear barcode. It can encode the one hundred twenty eight ASCII characters.
PDF417 is a two dimensional barcode. It can encode the signatures, fingerprints, and photographs.
Data matrix code is a two dimensional barcode. It can encode the small items whatever the items are very small for 1 Dimensional barcode. It consists of small black & white blocks.
Aztec code is a two dimensional barcode. It can be used in Airline as well as railway Tickets.
QR Code is a 2 Dimensional barcode. It can be used in tracking and marketing such as advertisements, magazines, and business cards.
The two dimensional barcodes are widely used in advertisement business so that the user can access the info. In such an application a web link is attached to an advertisement to engage the customers with an increasing power of mobile phone. The customer can retrieve the information about advertisement content by scanning the barcode with their mobile phones. This process includes the barcode scanning software & phone camera so that camera can point to barcode.
The existing 2D barcodes such as QR code & Data matrix code are not originally designed for barcode application. But the Picode system is designed for Barcode applications.

1.1 Existing system

Before QR code is an invention of Denso wave Inc. And it has been also included in ISO Standard since 2000.firstly it was created for industrial applications.

The QR code consists of black and white pattern which consist of fixed pattern to give the guarantee of detection decoding robustness. QR code contains position, alignment and timing pattern. QR code also uses Reed Solomon code for the error correction levels such as L, M, Q, and H that allow the correction up to 7%, 15%, 20%, and 30% of codeword's in error. The structure of QR code consists of Timing pattern, finder pattern, alignment patterns. The timing means small alternating black and white squares. Which are placed adjacent to finder pattern and alignment pattern. The finder pattern means large square of black and white pattern which is placed at top left, top right & bottom left corner. The total no. of finder patterns in QR code is 3.The alignment patterns are placed in bottom right region of QR code.

The decoding procedure of QR code includes capturing of QR code, after that binarization of that barcode into black & white image. Then detection algorithm is used so that three squarish finder pattern can be located. The detection is done by searching black-white-black-white-black pattern with the ration of 1:3:1:3:1 in both the horizontal as well as vertical direction. The alignment pattern is also located in the same way. Whatever the barcode part is detected that also checked by some criteria of image dimension; the no. of modules in both horizontal and vertical direction should be the same. The positions of finder & alignment pattern should be rectangular in shape.

Whatever the four detected patterns, an appropriate perspective transform, which compensate for perspective distortion incurred in the image capturing process, if found

then it is applied to convert the detected barcode region into square region. The position of module is calculated by black and white timing patterns. Within each binary module the central pixel is demodulated as '1' if it is black & it can be demodulated as '0' if it is white pattern. Once the demodulation process is over the sequence of bits are obtained. Finally we get our encoded message.

1.2 Proposed System

The proposed Picode system which describes the two main Sections.

1. Picode Encoding
2. Picode Decoding

Picode Encoding Process which consists of four main parts. Block division, source & channel coding, Modulation, & last is finder pattern generation.
The whole process of Picode encoding is described as follows.
The input message is selected it may be word or digits etc. Then the input image is selected such that the input message can be encoded in image. Once the message is selected the Source coding and channel coding is applied on that message. After the source & channel coding we get two outputs i.e. message length & bit stream (0, 1, 0, 1 ...) of that message. Then the input image is divided into no. of blocks according to the length of that message. After that the adaptive modulation scheme can be applied according to image blocks & bit stream of the input message. Then the Picode modules can be generated. Finder pattern of Picode modules can be generated.

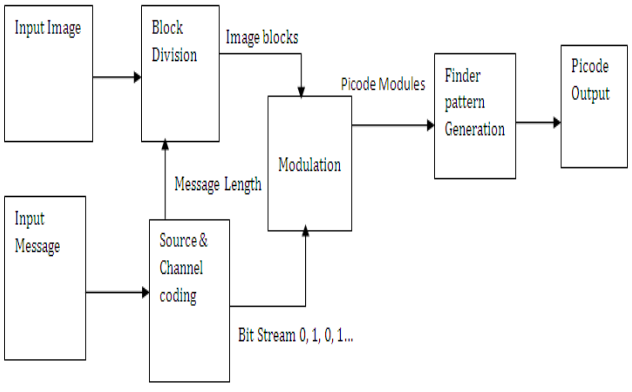

Fig.no.1 Picode Encoding

Picode Decoding Process which consists of seven main parts. i.e. RGB to greyscale, Binarization, Corner detection, perspective transform, module alignment, Demodulation, Source & channel coding etc.

The whole Picode decoding Process can be described as follows.

Take an input image as picode image. Convert that RGB image into greyscale image. After that Binarization of greyscale image can be done. The output comes as Potential barcode regions. Then the corner Detection algorithm can be applied on binarized image. Then we get the barcode location of image. After the perspective transformation Module alignment of squarish barcode can be done. Then we will get the picode modules. Once the demodulation is applied on those picode modules we get the bit stream of our original message. Finally by applying the source & channel coding on bit stream we get our original message.

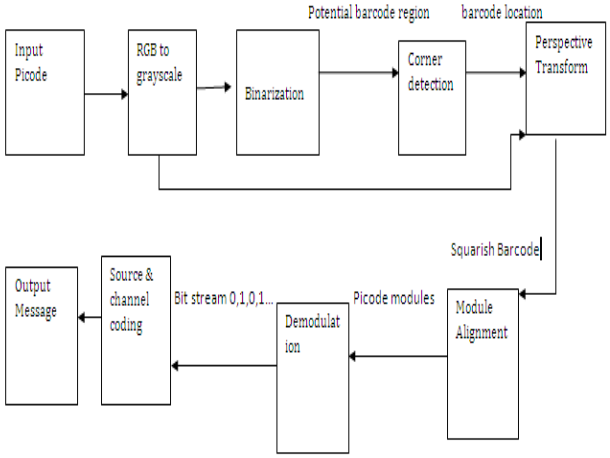

Fig.no.2 Picode Decoding

2. System Design

2.1 Login

To avoid unauthorized entry login form is designed, it contain two fields as username and password. If new user comes then he or she firstly registers by
Clicking on Register button, for registration user have to submit name, email-id, password, Gender, Address and Phone No. and then he or she can login. The following Figure shows login form.

Fig.no.3 Login Page

2.2 Registration Form

New user comes on this page by clicking registration button and he or she have to fill name, email-id, and password, Gender, Address and Phone No. for complete registration. It looks like following figure.

Fig.no.4 Registration Page

2.3 Successful Login Form

User enters correct username and password then login successfully and gets access to next Process of Picode encoding & decoding. It shows in figure.

Fig.no.5 Successful Login Page

3. Result Snapshots

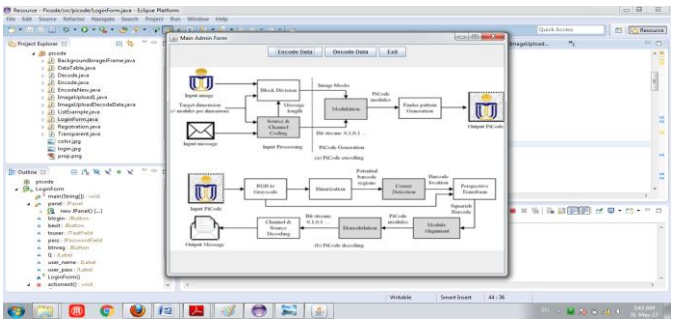

Fig. no.6 Picode Encoding

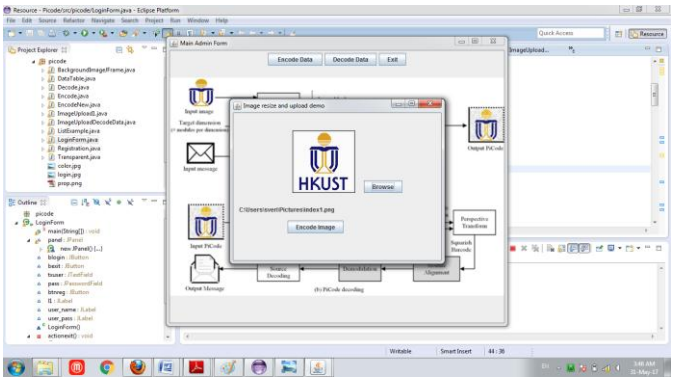

Fig. no.7 Selection of image to encode the message

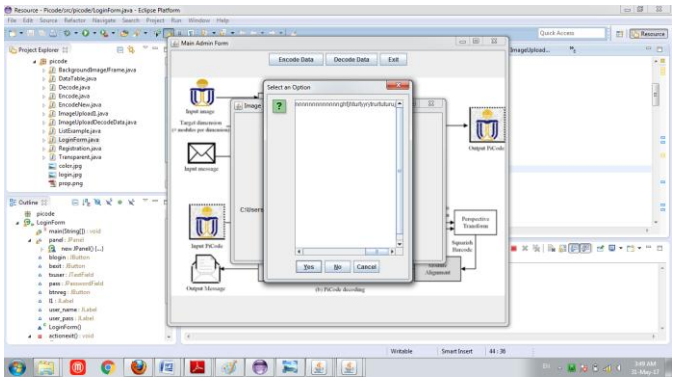

Fig. no.8 Entered message to be encode

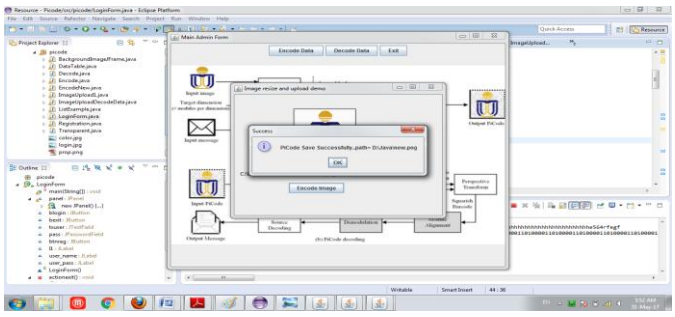

Fig. no. 9 shows the path where the Picode image is saved.

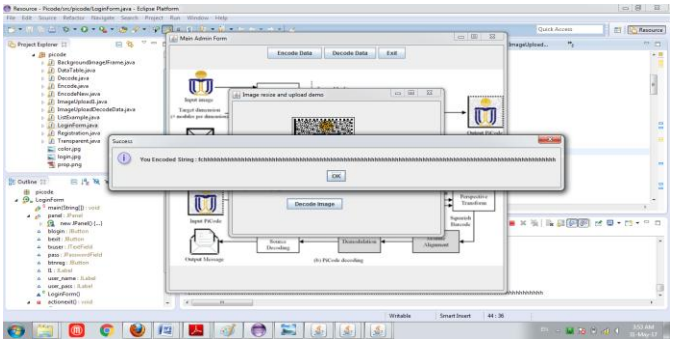

Fig. no.10 Original input message

4. CONCLUSIONS

Picode System is a new type of 2D barcode & it is very efficient technique in today's world. It is the extension part of the existing beautified QR code. In todays world for all applications this system can be used as much easily than the existing one. It provides the best perceptual quality in preserving aesthetic appearance of the embedded image & also maintains the decoding robustness.

One important thing is that while decoding of picode the coarse fine corner detection & module alignment algorithm can be used so that we get the information from all pixels in each module i.e. block.

From above result it shows that the Picode shows the better trade-off between the perceptual quality & decoding robustness as compared to existing beautified QR code.

ADVANTAGES:

- İt is easy and simple.
- Enable Pictures integrated with 2D barcode with Better Visual Appearance.
- Clear Appearance.
- To improve the efficiency and robustness of the encoded message.
- Provide a Clear Motivation to scan a barcode.

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BIOGRAPHIES

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