

## **A new approach Data hiding in 2D data matrix and tilt correction algorithm**

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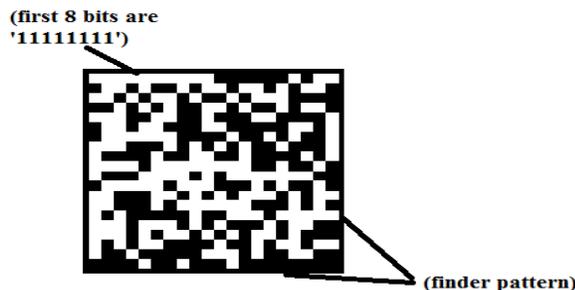
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**Abstract-** Today barcodes are very much popular and present all around us. Not only on groceries in the super-market, but also in industrial manufacturing. Barcodes are designed for automated reading and interpretation. This paper presents two algorithm, first for data hiding in 2D data matrix provides a high level security and second for decoding purpose, independent of orientation of data matrix in any direction. This method also provides de noising of data matrix images captured by a webcam in real time YUY2\_640x480 resolution. Experimental results shows this technique provides more accurate results as compared to previous methods with improved speed.

**Keywords-** Blind source separation, coordinate detection and slope detection, rotation detection.

### **I. Introduction**

Bar codes are very much popular and reliable method of encoding of machine readable information on different products and services. These codes can be one dimensional or two dimensional. Now a day's technology is very vast, with the invention of camera phones this technique becomes quite popular because camera phones provide us optical imaging system. Two dimensional bar code is developed from the traditional one dimensional bar codes. It provides us more information capacity rather than 1D codes[1]. Data matrix two dimensional bar codes are of two types of ECC000-140 and ECC200. Each Data Matrix two-dimensional bar code is formed by some square blocks according to specific rules[2]. Here a new pattern for 2D data matrix is designed. The four sides of the bar code are surrounded by the specific graphics, naming Finder Pattern. First 8 bits are 11111111 here that will help in alignment.



**Figure 1.** 2D Data Matrix

### **II. Encoding of data**

Security is first requirement, for this purpose an encryption technique is used here technique called blind source separation. By using this encryption technique an unauthorized person will not be able to decode data. The size of data matrix can be changed according to our requirement. Here 'i' represent the maximum length of data string. The dimensions of data matrix can be varied according to your need with a finder pattern of 10x10. The size of square blocks is 20x20. The data is encoded within this finder pattern with the help of black and white blocks.

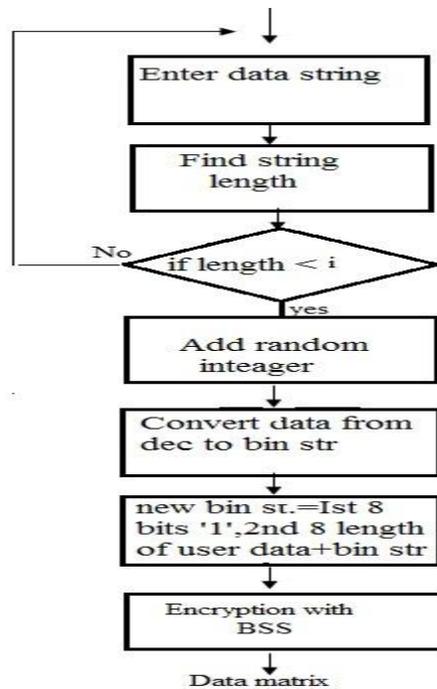


Figure 2. Encoding process

### III. Decoding process

To extract data from data matrix, firstly image of that data matrix is to be decoded. Experimental results show that if images are tilted, it is impossible to be decoded correctly[3]. Some the traditional two-dimensional bar code correction algorithms, such as: algorithm based on projection method, Hough transform method, Fourier transform method are there[4]. But these are quite complex and more time consuming. This algorithm has the ability to correct the position of data matrix aligned in any direction. Angle of orientation will be detected with the help of slope finding. The objective of this paper is to solve the rotation problem, noising and decoding image correctly.

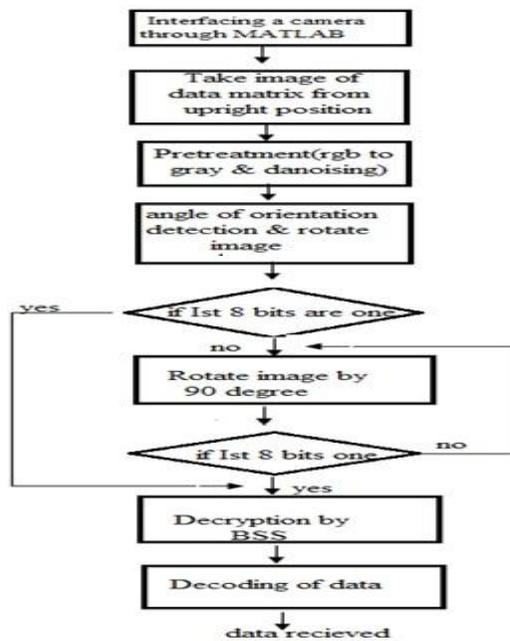


Figure3. Decoding process

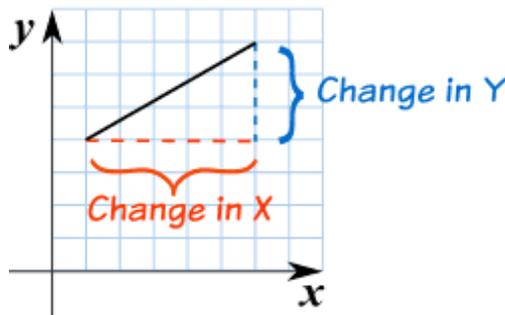
any direction. Angle of orientation will be detected with the help of slope finding. The objective of this paper is to solve the rotation problem, denoising and decoding images correctly.

**IV. Image processing**

This approach analyzes the image captured by camera using MATLAB software. Image processing techniques are used in this approach for the detection of angle of orientation and resizing the images. This approach requires the camera to focus on the data matrix. Camera should be exactly at upright position of data matrix while capturing the image. The distance between data matrix and camera can vary. For this purpose it requires precise camera focus adjustment

**V. Angle of orientation**

To detect orientation of image ,coordinates of image have to find[3], with the help of these co-ordinates slope will be detected. Equation of line is given below



**Fig. 4** Slope detection

$y=mx+c$  (1)

here m represents slope

$m=dy/dx$  (2)

After finding angle of orientation image will be rotated to that angle by using imrotate command in MATLAB.

**VI. Cutting of image**

Second step is cutting of image, only required portion of image will be cut from the whole image. With the help of imresize command in MATLAB image can be resized to original dimensions.

**VII. Decoding of data matrix**

If first 8 bits of data matrix are ‘11111111’ decryption process will start , it will convert binary string into original binary string, then it will be decoded into original information, otherwise image will be rotated to an angle of 90 until first 8 bits will be‘11111111’.

**VIII. Rotation process**

After cutting image with the help of slope finding rotation of image will be processed to find the actual data Matrix. This will be done with the help of following procedure.

Detection of first 8 bits	Rotation of image
if bits not equal 11111111	Rotate image anticlockwise
If bits equal to 11111111	Rotation stop, start decoding

**Table1-**Bits detection vs rotation

## **IX. Conclusion**

A new method is proposed here which is a hybrid model for data hiding in data matrix and provides decoding algorithm which is independent of image orientation in any direction and de noising is one of the main advantages of this. It runs at 640×480 resolution for real time scenarios. For practical implementation dimensions of data matrix image is 420×420 includes finder pattern of 10×10 and size of squares is 20×20. This proposed system provides an accuracy of 97.6%. Our experiments show that the proposed system produces accurate results with improved speed.

## **X. Reference**

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