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DATA ENCODING AND DECODING USING DATA MATRIX

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Abstract: The barcodes are used all over with high popularity in many applications. Data Matrix is one of the best barcode. It is a two dimensional barcode with high density. From the 254 byte ASCII character set it will encode to 3126 characters set. In this type a scanner used to identify the data barcode which is having a pattern called as "finder" pattern present all over around the all edges of the present symbol and the symbol can be built over square or rectangle grid. The barcode can be read easily using finder pattern without effect of the physical structure of that code. The two-dimensional data matrix code contains error correction technique even if there is physically code is damage. Data matrix barcodes make an efficient use of older types of convolution error correction method (ECC) .The Data matrix types ECC 000- ECC 140 is called as an older ECC version and can be considered as an expired and cannot be used in any new applications. In this Method use Reed - Solomon code for error correction which is highly efficient. Experimental results of data barcode matrix having more efficient and correct results as compared to existing techniques with great improved speed of performance.

Keywords: *Data Matrix, Reed Solomon, Error Correction, ECC 200.*

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I INTRODUCTION

The Bar codes are used to encode the machine readable information on various products with more reliably. This barcodes may be in the form of one or two dimensional. There is recent technology in progress which is very vast and advanced, with the implementation of advanced camera phones. The data matrix technique becomes popular reason of it is camera phones consist of optical imaging system features. One dimensional barcodes can discovered two dimensional bar code. It is having much information storage capacity as compared to one dimensional barcodes. Data matrix bar codes having two types such as first one is ECC000-140 and second ECC200.

Each Data Matrix bar code is made up of some square blocks which is build according to the specific rules .In this a new barcode pattern which is specific for 2D data matrix code is developed. In this type the barcode having four sides which are surrounded by the some specific graphics which can be named as Finder Pattern. In data matrix first 8 bits of data are represented by 11111111 that can used in alignment (involving concepts of dimension reduction, reduction of size) as two main key issues present in the framework of information exploration.

Two Dimensional Data Matrix code used in many industry for implementing various small parts because of its small size it is provides high reliability. Data matrix barcodes can be build of square cells which is dark and light cell. Each matrix codes having dimensions ranges from 10×10 to 144×144. Data matrix Encoded information which is in the form of a string of characters or string of numbers. As huge amount of data is encoded in the form of symbol, then it increases the number of cells. Data matrix code technique provides an broader and great reading of angles which gives high reliability because of error correction algorithm is present. From the entire 254 byte ASCII data set character can be used to encode characters up to the 3116 characters.

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II LITERATURE SURVEY

Sr. No.	Description	QR Code	Data Matrix(ECC 000-140)
1	Meaning	QR Code stands for Quick Response Code	ECC stands for Convolution Error Correction
2	Structure	The QR code contain square shaped dots which is block modules and it build in a square pattern present on a white as a background.	A Data Matrix code is a 2D barcode consisting of "cells" or modules which is classified in black and white cells. Placed in either a square or rectangular form.
3	Versions	Version 1 To Version 40	ECC 000-ECC 140
4	Types of Data Encoded	• Numbers or Digits • Alphanumeric means Capital ASCII characters and numbers) • 0 and 1 means Binary (Bytes - Hexadecimal)	The encoded information is in text or numeric data form.
5	Error Correction	• Type "L" (7% Loss recovery possible) • Type "M" (15% Loss recovery possible) • Type "Q" (25% Loss recovery possible) • Type "H" (30% Loss recovery possible)	Error correction in data matrix codes increase reliability of code when one or more cells of code is damaged and code is u unreadable, using error correction algorithm the message can still be read.
6	Data Size	In QR Code version 40 contain 10.208 data bits.	Data size in data matrix barcode from a minimum bytes to 1556 bytes.
7	Place of Data	The information of code can be plot on both x-axis and y-axis	In data matrix coding "light" cell can be represented as a 0 and 1 as "dark" cell, or vice versa its depends on type of coding. Each Data Matrix barcode is consists of two adjacent borders which is in an "L" shaped called as the "finder pattern" and remaining two borders composed of alternating light and dark cells.
8	Advantages	1. There is no necessity to write details in bottom. The desired information data can be captured by using a simple scan. 2. QR Codes can be used many web based applications such as to store several URLs and many addresses that can present in many magazines, buses, business cards or any product from which users might required information about of it.	1. The information can be read even if some cells are damaged and it is unreadable 2. Data Matrix code symbol can have capacity to store up to 2,335 records alphanumeric characters set size.
9	Disadvantages	Many Users having a phone with camera and the contain the correct feature reader software which can used to scan the image made up of that QR Code. Recently only Smartphone's are used to find QR Code. Many users mobile phones consists of cameras which are unable to obtain correct QR code reading software for their phones.	ECC 000 to ECC 140 is called as the older ECC version and should not be used longer. It is not be used in any new applications.

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III SYSTEM DEVELOPMENT

In this system a unique ID of product and person will be generated whenever user will store information about it. In stage 1 for identification of user or object this Unique ID will be used. In Selective algorithm by entering Unique ID of each product or person as an Input will generate and provide a unique Image for that respective ID. The Unique image will be considered as identification for Object or User in stage 2. The respective unique image can be hashed and then mapped it to the respective Users ID and both unique image and unique user ID will be used to make identification of an object.

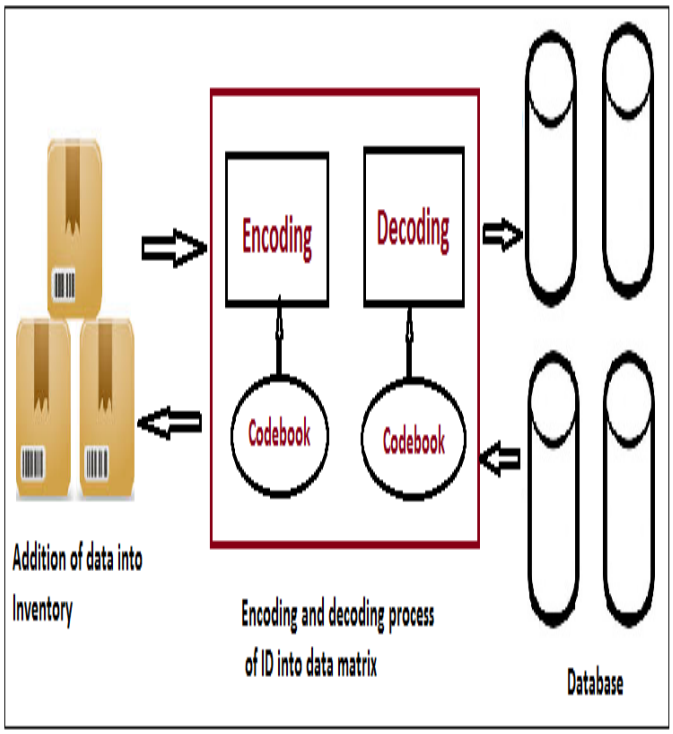


Figure 1: Architecture of System

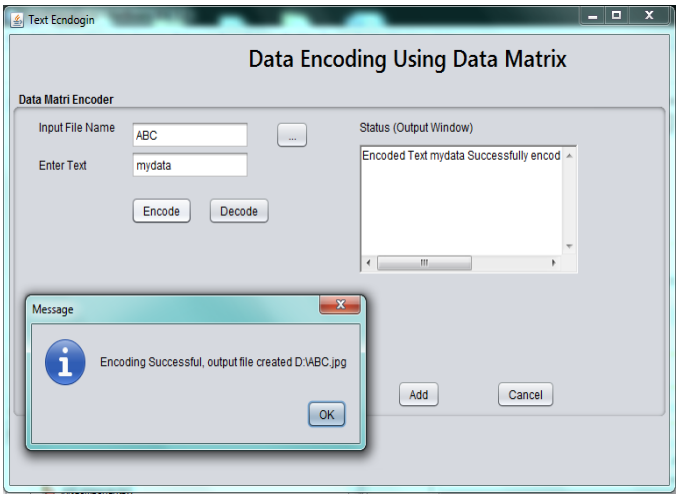
- **Working**

1. From Unique ID generate a unique image and the image can be map to a specific.
2. The Unique ID for each product and person will be generated whenever user will store information about it.
3. This Unique user ID will be stage 1 identification made for the User or Object.
4. In Selective algorithm by entering users Unique ID as an Input string will proposed a unique Image for that user ID.
5. This Unique image will use in stage 2 identification for User or Object.
6. This unique image can be hash and then mapped it to the respective User Unique ID and both image and ID will be used to make identification an object.

IV PERFORMANCE ANALYSIS

1. Execution Details of System

Encoding in Data matrix using following methods



Screenshot 1: The GUI for the system

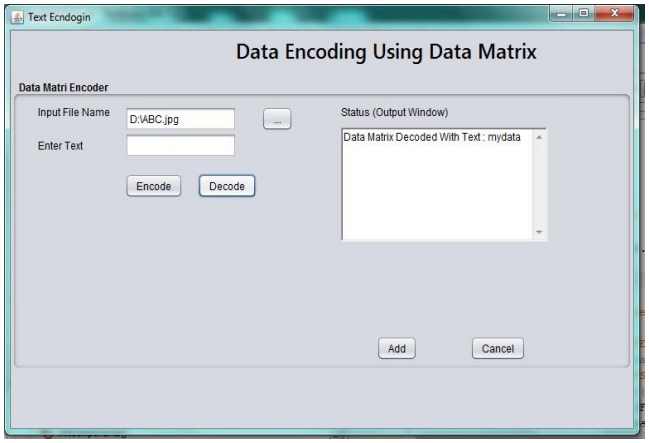
1) Encode the characters string into type of Base64 string using following method:

System.Text.Encoding.Unicode.GetBytes()

2) The Method of System.Convert.ToBase64String() can be used to convert the bytes into Base 64 characters string.

3) Finally encode this base64 characters string to two dimensional Data Matrix Code.

Figure 2: Respective Data Matrix



Screenshot 2: Decoded Message

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V RESULT ANALYSIS

Reed Solomon Code: In Data Matrix the Reed-Solomon codes algorithm are used as an error correction system. Reed Solomon Code have a great capacity of identification ,detection of error and correction of errors which are defined early, that are depends upon the size of used data matrix. Consider the body C as is a set of item elements consist of two operations which is in same assembly and called as binary operations means addition and multiplication. By performing both operation on two different elements of assembly results a new elements which is also in the same assembly that's means both operation being closed.

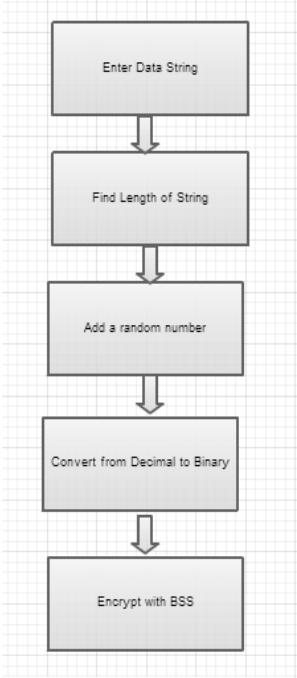


Figure 3: Encoding in using Reed Solomon Code

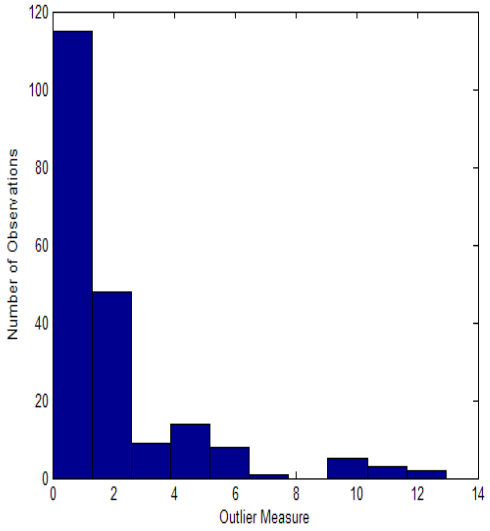
Symbol Size		Data Region		Mapping Matrix	Total Codewords		Reed-Solomon Block		Inter leaved	Data Capacity			Error Correction Overhead %	Max. Correct-able Codeword Error/ Erasure
Row	Col	Size	No.	Size	Data	Error	Data	Error	Blocks	Num. Cap.	Alpha num. Cap.	Byte Cap.		
10	10	8x8	1	8x8	3	5	3	5	1	6	3	1	62.5	2/0
12	12	10x10	1	10x10	5	7	5	7	1	10	6	3	58.3	3/0
14	14	12x12	1	12x12	8	10	8	10	1	16	10	6	55.6	5/7
16	16	14x14	1	14x14	12	12	12	12	1	24	16	10	50	6/9
18	18	16x16	1	16x16	18	14	18	14	1	36	25	16	43.8	7/11
20	20	18x18	1	18x18	22	18	22	18	1	44	31	20	45	9/15
22	22	20x20	1	20x20	30	20	30	20	1	60	43	28	40	10/17
24	24	22x22	1	22x22	36	24	36	24	1	72	52	34	40	12/21
26	26	24x24	1	24x24	44	28	44	28	1	88	64	42	38.9	14/25
32	32	14x14	4	28x28	62	36	62	36	1	124	91	60	36.7	18/33

Figure 4: Reed Solomon Code

Reed Solomon Time Efficiency in the Quadratic Equation form as follows:

Table 1: Reed Solomon Code Time Efficiency

No. of Column (x,y)	**(130, 246)**	**(522, 1024)**	**(16784, 32968)**
Value in Quadratic	4.61/9.18	1.16/2.32	0.034/0.069



Graph 1: Reed Solomon Error Correction code for Bar Graph of Outlier Measure

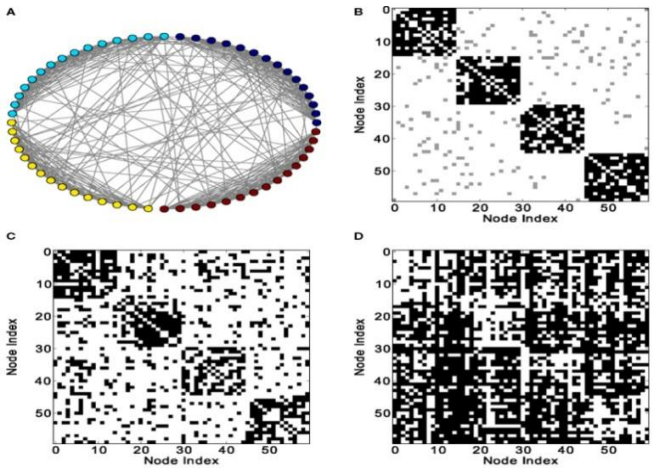


Figure 5: Building Node Index Stage

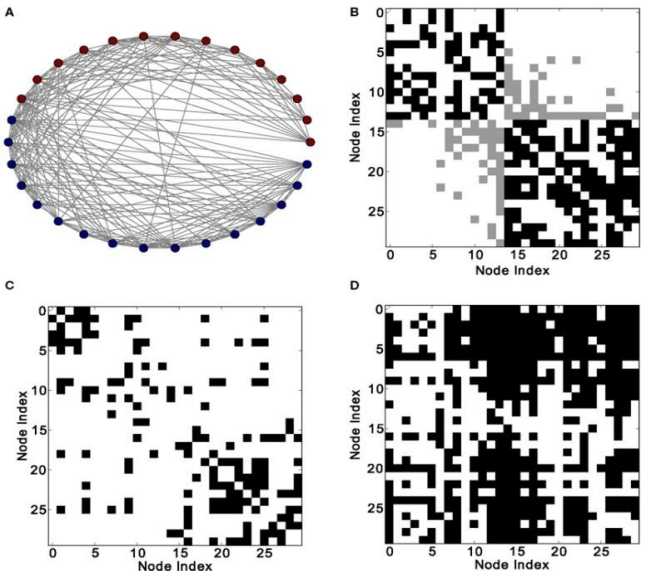


Figure 6: Building Node Index Stage2

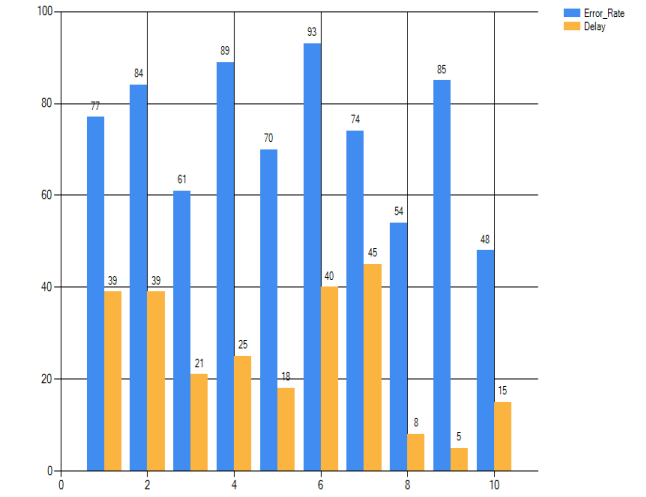
Result Statement:

The simple node index will sharply by reducing the total amount of processing duration time from 1.8 secs to 0.39 secs, that's provides a performance gain of all over 76%.

Testing:

By creating many data code matrix files for different types of data item and then run project for all created data matrix repeatedly and obtain proper correct result.

No. of Column (x,y)	**(126, 246)**	**(516, 1024)**	**(1628 4, 32668)**
Value inQuadratic	4.61 /9.18	1.16 /2.32	0.034/ 0.069



Graph 2 : Graphical representation of reduced time.

Above graph shows that data matrix algorithm will reduced the time certainly and improves error detection in data and error correction of data with respect to given time and space.

VI CONCLUSION

5.1 Conclusion

The Data barcode matrix is a new method can be implemented which is consists of a hybrid model used for method of data items encoding and method of error data correcting in 2D barcode that means data code matrix and also provides an decoding algorithm. It runs at 620×460 resolution capacity for real time features. Using this technique obtain an accuracy of 96.7% overall. Result of experiments show that respective system will be produces more accurate and efficient results with improved speed of performance.

5.2 Future scope

In this system which is a hybrid model used for method of data hiding in respective data code matrix and proposed data decoding algorithm which is not depend of any image attributes in any direction and removal of noisw is one of the best and main advantages of this method. It runs at 640×480 resolution for real time scenarios. For practical development required a dimensions of item data matrix image is as of 410×410 consists of finder pattern of 12×12 and size of squares is 18×18.This proposed system provides an accuracy of 97.6%. Our experiments show that the proposed system produces accurate results with improved speed. Currently our system detects errors if any, however the system can be extended to correct error using Solomon Decoder Error Detection Technique.

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