QR Code Implementation in Photo I-Card for Photo and Text Credentials using .NET

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ABSTRACT
Barcode are used for storing the different type of data. Today different type of barcode is used for different purpose. In market lots of barcode are available. There are three type of barcode i.e. one dimensional barcode (1D), two dimensional barcode (2D) and three dimensional barcode (3D). In this paper we provide a secure and optimal approach for implementing quick response code in two dimensional barcode. Quick response code is 2D barcode. Now days, it is used for security purpose. Now a day's QR code is used for publically to save the information. But our main purpose is that information will be secured which are stored in QR code. So we use AES algorithm to encrypt the data. But the maximum capacity of QR code is 3KB. So store the more information we compressed the data or image using compression algorithm and after that create QR code. So we use AES algorithm to encrypt the data and use the lossy compression to compress the image. In this paper, we consider I-Card System for a private secret agency as a real case scenario i.e. implementation of our work.

General Terms
Compression, Algorithm

Keywords
QR code, Data compression, Lossless Compression, AES algorithm

1. INTRODUCTION
Barcode are of three types one – dimensional (1D), two dimensional barcode (2 D) and three dimensional barcode (3D) [1]. One dimensional barcode store the information in only one direction i.e. horizontal direction. While two dimensional barcode stores the data in two directions. I.e. horizontal and vertical direction.3D barcode do not use any barcode labels. They are embossed or engraved directly on the product during the manufacturing process [1]. So 2D is more powerful barcode. There are some other advantage of two dimensional barcode is that the data can be read easily and write correctly. 2D barcode is very popular for

communication public relation and security point of view [1]. The durability of 2D barcode is much high as compared to the

1D barcode. This paper presents a brief description of QR code and how QR code make secure and compressed to store

the more information. This algorithm is generally divided in to two steps. The following step is involved:-

Step1- Convert the data into QR code
- When the data is too large then compress the data using compression algorithm.
- For security we encrypt the compressed data.
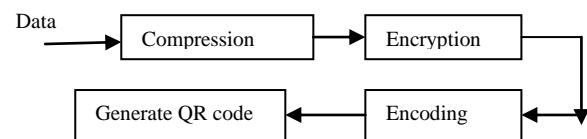- After that QR code generated.

Fig 1: Process of creating QR code

These steps are easily understood by flow chart in figure 1.

Step2- Convert the QR code into data

After getting the QR code we decrypt the data using decryption algorithm.

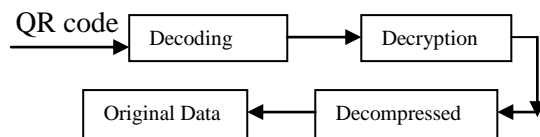Then decompressed the data.

After that we get original data.

Fig 2: Process of creating data

These step is easily understand by flow chart in figure 2 [2].

2. QUICK RESPONSE BARCODE
QR code stands for Quick response code which is 2D Matrix Barcode which is seen in figure 3. It was developed by the Japanese Corporation Denso Wave in September in 1994. QR code store the more information as compared to the other barcode such as one dimensional and stacked two dimensional barcode because its store the data in two direction horizontal as well as vertical direction.

Fig 3: Structure of QR 2D barcode

In Quick response code there is some special device or software that is used and that device is known as barcode scanner. A quick response barcode is capable of storing the some special type of character alphanumeric character 4296 character and numeric character 7089, binary bytes 2953 and kanji character 1817[3].

But the main focus of this paper is to provide the store the more data and image that are stored in quick response code, using any of the compression technique and encrypt the information that are stored in QR code. So we use the two main concepts in this paper compression and encryption. Compression is used to compress the image which is stored in QR code. And the AES encryption is used to encrypt the information which is stored in QR code.

2.1 Advantage of QR Code

It stores the more information as compared to the other 2D barcode.

It stores the information in two sides such as horizontal and vertical.

It allows error correction method.

3. WHY WE NEED COMPRESSION AND ENCRYPTION IN QUICK RESPONSE CODE

In Quick response code there is some limitation of the storing data. So increase the capacity of the quick response code we use the concept of compression. In this paper we use the lossy compression in quick response code. Lossy compression is used to compress the image not for data because the 3KB data is sufficient for Intrusion detection system. We need to encrypt the data to provide the security. So our approach is to make a QR code is more secure using various encryption algorithms such as AES (Advanced Encryption Standard). So we use the two concepts in this paper first compression and second encryption.

3. COMPRESSION

Compression is used to decrease the amount or length of the data that is to be transmitted or stored. It reduces the file size which in turn reduces the required storage space and makes the transmission of data quicker through Bluetooth [4] Basically compression means that to eliminate the redundancy in the data or generally used to reduce the size and take the less time to transmit the data because of the compressed data.

But in this paper we use the lossy compression to compress the image because in image there is no effect of the loss data compression image, the block diagram is given in figure 4.

.   **Fig 4:   Image of Compression**

4. LOSSY COMPRESSION

As per the name lossy, In the lossy compression the information is loss. In the lossy compression the output is not same as the input. It is used in that application where information is loss then there is no effect. lossy compression is generally used in audio and video and we are the lossy compression to compressed the image. Lossy compression techniques can be used in images where some of the finer details in the image can be sacrificed for the sake of saving a little more bandwidth [5].

So we use the lossy compression in our paper, we did not use the lossless compression because we only compressed the image not the information. Our requirement is compressed only image. There are various advantage and disadvantage of lossy compression.

4.1 Benitfit of Lossy Compression
- It use the less disk space because of information is loss.

- The compression ratio is good.

5.   ENCRYPTION & DECRYPTION

Encryption is the process of encoding information in such a way that only authorized person can read it [6]. If we need to secure the data or information we have a concept like encryption or decryption. In encryption scheme the simple message is called plain text and encrypted message is called cipher text that can only read if decrypted. A drawback is that both DES and 3DES use a 64 bit block size. So we use AES algorithm to encrypt or decrypt data in QR code [7].

5.1 Advance Encryption Standard

AES is more secure algorithm. It is established by U.S. National Institute of Standards and Technology in 2001[8]. AES is symmetric key algorithm that means same key is used for encryption and decryption. So we use the AES algorithm to secure the information i.e. stored in QR code. After that we can say that our QR code is secure QR code.

6.   OUR APPROACH

In this paper we have the following two approaches first we compressed the user signature and second user information which stored in QR Code, we need to encrypt this information using AES algorithm which is done in two steps.

STEP 1: We compress the user signature.

STEP 2: We make the secure information which is stored in QR code.

These two steps are further discussed in details.

STEP 1: COMPRESS THE USER SIGNATURE

 Step A: In this step we generate a compressed QR code using various step which is given below-

- We take an image.

- After that we convert an image in to character format or string.

- Using base 64 algorithm, we tcompressed the character or string using compression algorithm.

- Finally we get a compressed QR code.

Step B: In this step we retrieve the original data after decompression. This is also done by various steps.

- We take a compressed QR code.

- After that we retrieve the compressed data that are stored in QR code.

- After that we convert the data in to original data that are stored in QR code.

STEP 2: SECURE USER INFORMATION

- We take the information of the candidate to provide an I-card.
- Encrypt that information using AES algorithm and make a QR code that is loaded in to an I-card.

- After that we need compressed signature that is also needed in to I-card.

- Then final I-card is created of a candidate.

- After that if we decrypt the QR code then we have information of the candidate that process is known as verification process.

7. RESULTS

In this paper, first we compressed the user signature. So we use the lossy compression and information is not lost because we only compressed the image not data [9]. This is done in various steps and secondly we take the user information in the form and then we encrypt the user information using AES algorithm and after thar we stored this information in QR code.

Step 1: We take an original image i.e signature of size 3 KB that is publicized in figure 5. Aadhar card is basically used for identification of a citizen [10].

Fig 5: Signature of candidate

Step 2: After that we convert the image in to the character or string format seen in figure 6.
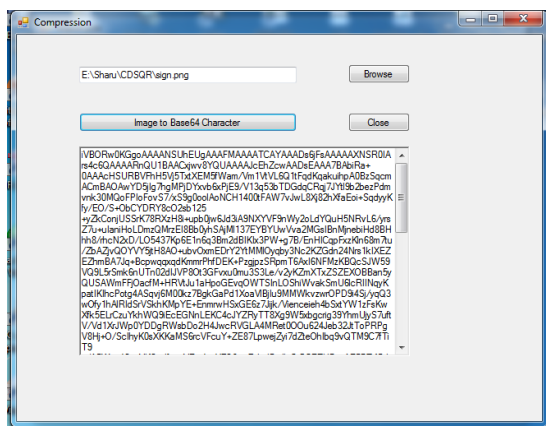

Fig 6: Character format of QR code

Step 3: Then we generate the original QR code without any compression algorithm and check the size of QR code seen in figure 7.

Step 4: After that we compressed the data using lossy compression algorithm and generate the compressed QR code and then check the size of the compressed QR code seen in figure 8.
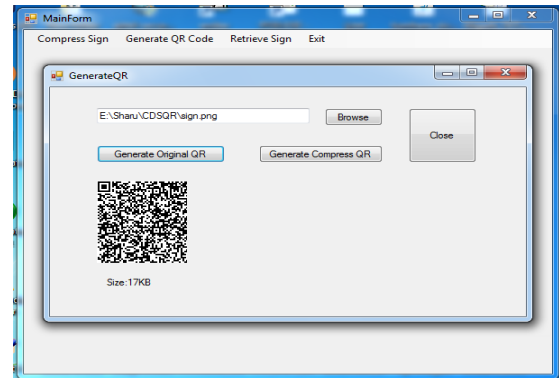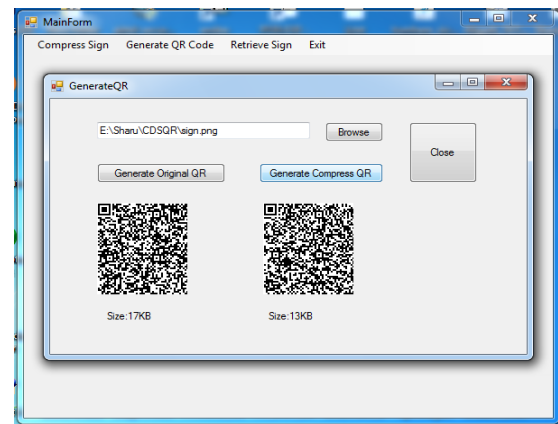

Fig 7: Original QR code

Fig8: Compressed QR code

Step 5: In the final we get the original image after the decompression of the QR code. In the final result we see the original image without any loss of the data. So in the image there is no meaning of any type of compression. The main aim is that we compressed the image using any of the technique seen in figure 10.

Step 6: After that we take a information on the form whose I card is create as shown in figure 11.
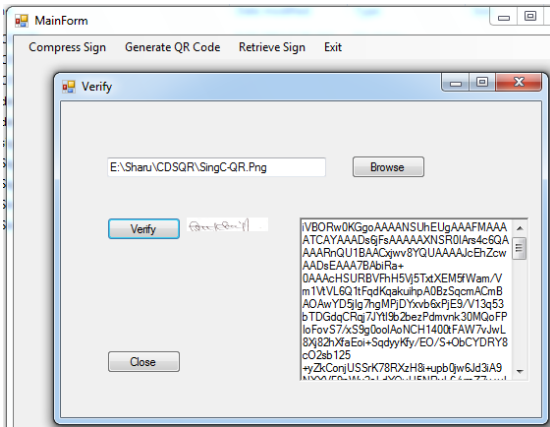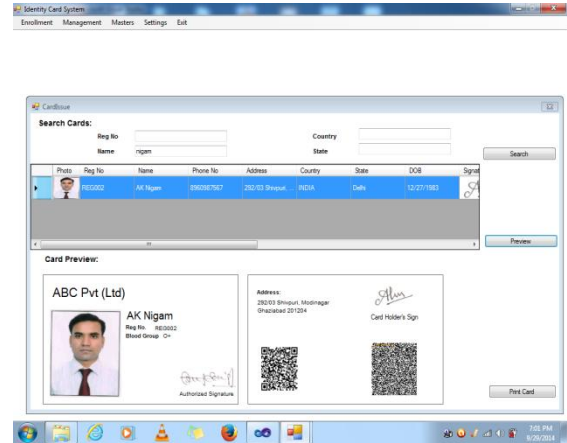
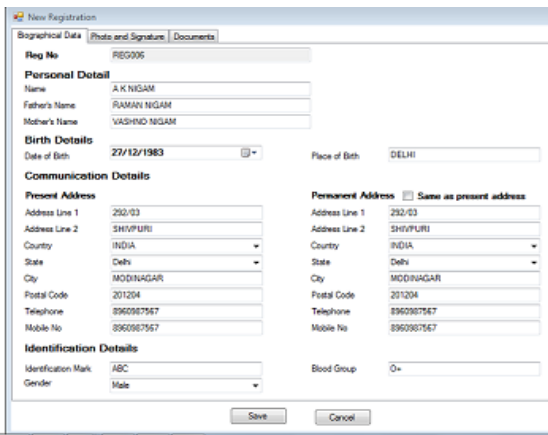**Fig 9: Character value correspond to signature image**

Fig 10: Registration for candidate to generate a I- card

Step 7: After uploading scanned photo and signature of the candidate will look exactly same as shown in figure 11. And signature is already compressed in step 1 to step 5.
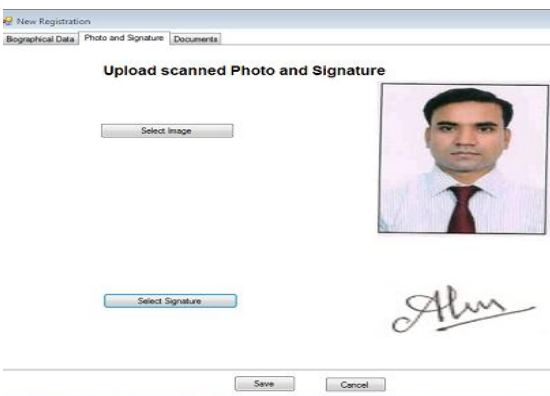

Fig. 11: upload scanned photo and signature

Step 8: Then we make an I-card using encrypted information that are loaded in to QR code as shown in figure 12. And compressed signature that are also loaded into another QR code in same I-Card.

Step 9: If we need original data then we need to decrypt the encrypted QR code [11-12] so this process is also known as verification as shown in figure 13.
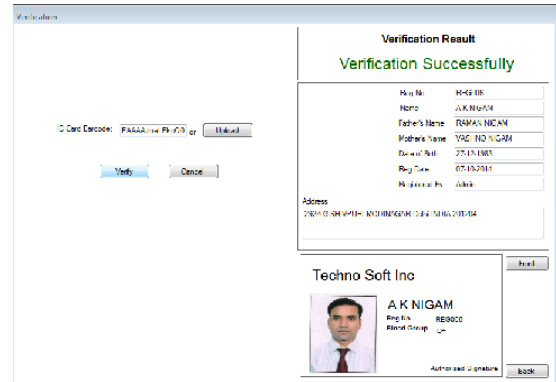

Fig 12: create I-card with encrypted information and compressed signature

Fig 13: Verification Process

8. CONCLUSION

In this paper, an identity-card having three requirements such as information, photo and signature. our main focus is compressed the image and that image is loaded in to QR code. The size of the compression QR code is 13 KB while the size of the Original QR code is 17 KB. So compressed QR code is better than uncompressed QR code and size is also increase. And the user information is more important. So we encrypt the user information using AES algorithm and that information is loaded in to QR code. This is completely known as compressed and encrypted QR code.

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