

# Certificate Authentication Using QR Code and Smart Phone

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**Abstract – An institution issued a degree certificate to those students who have successfully completed all studies included in the degree. The degree certificate awarded by the University is of prime importance in the person's life but the production and circulation of fake certificates is cheap because a paper document can easily be forged with the availability of advance printing and copying technologies. Hence, there is a need to adopt a process that can verify and ensure the authenticity of a document. In order to prevent the circulation of fake degree certificates a method is proposed where the integrity of the contents within the certificate can be verified with the use of QR Code and Smart Phone Application. A QR Code will contain a digital signature over the data such as degree holder's name, enrollment number, roll number, total marks obtained etc. which will be signed by university authorities. In order to verify the digital signature a person need to use a specific smart phone application which will scan the QR Code and authenticate the certificate.**

**Index Terms – Quick Response Code, Digital Signature, Data Masking.**

## 1. INTRODUCTION

The incident of fraud and forgery of a degree certificate has increased with the advance technologies which are easily available at cheaper costs such as printing and copying the document which threat to the integrity of both the certificate holder and the educational institution that has awarded the certificate. The manual verification of these documents is a tedious task because it involves multiple level of human interaction and it also a time consuming task which imposes an extra burden to the university or colleges because they have to verify all the students who have passed from their college. Hence, it is necessary that the universities adopt a process that

can ensure security of information and authenticity of the issued certificates.

## 2. QR CODE

The proposed method enables to combat this menace by embedding the QR Code on the degree certificate and by introducing the smart phone application which will read the digital data from the QR Code. It enables the verification of the certificate without depending on the certificate issuing institute. It brings in greater reliability and security in the existing process of issuing the degree certificates to the university students.

Digital signatures are widely used in networks to prove authenticity of electronic information. These signatures link the data to the identity of the signatory, ensuring that manipulations would be detected and forgery is prevented. Concern during this phase is to find a space that not offers various facilities of everyday living in the vicinity but is also well connected with other parts of the city and state to ensure easy approachability and hassle free access to major business and transportation centers in the area. Our aims providing good value for money invested in our projects by our clients constantly inspires us to choose the best location that suits their needs in every report.

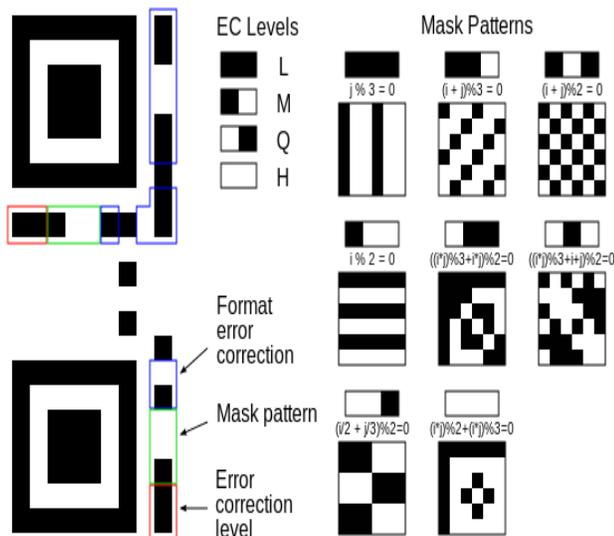
The Quick Response (QR) Code was designed as an improvement in comparison to its predecessor, the 1D barcode because it can contain more information. It was first designed for the automotive industry in Japan but later it become so popular outside the automotive industry due to its fast readability and greater storage capacity compared to standard

UPC code.

The smallest QR Codes is of size 21x21 modules which is called version 1 QR Code and with each successive version the size of the QR Code gets increased by 4 modules so the largest QR Code is of size 177x177 modules which is version 40.

QR Codes also include some error correction information which is some redundant data that will help a QR reader accurately read the code even if part of it is unreadable. There are four levels of error correction: L, M, Q, H. The lowest is level L which allows the code to be read even if 7% of it is unreadable. The another level is M which provides 15%, then level Q which provides 25% and then level H which provides 30% error correction.

“A QR Code consists of black modules arranged in a square grid on a white background, which can be read by an imaging device then the data can be extracted from patterns which are present in both horizontal and vertical components of the image.



Features of a QR code

1. High data encoding capacity: The maximum QR code symbol has the ability to encode about 7089 characters.
2. High speed Scanning, and reading: a QR code reader has the ability to recognize many QR code symbols and therefore is

read fast.

3. Capable of reading Japanese and Chinese encoding: QR codes can also read Japanese and Chinese characters just as fast as English characters.
4. Can be read from any direction: Since it is a 2D matrix code, it can be scanned and read from any direction.

Creating a QR Code

1. Data Analysis

A QR code encodes a string of text. The QR standard has four modes for encoding text, numeric, alphanumeric, byte, and Kanji. Each mode encodes the text as a string of bits (1s and 0s), but each mode uses a different method for converting the text into bits, and each encoding method is optimized to encode the data with the shortest possible string of bits. Therefore, your first step should be to perform data analysis to determine whether your text can be encoded in numeric, alphanumeric, byte, or Kanji mode, and then select the most optimal mode for our text.

2. Data Encoding

Now that you have selected the appropriate encoding mode for your text, the next step is to encode the text. The data encoding section describes this process in detail for each encoding mode. The result of this step is a string of bits that is split up into data code words that are each 8 bits long.

3. Error Correction Coding

As explained above, QR codes use error correction. This means that after you create the string of data bits that represent your text, you must then use those bits to generate error correction code words using a process called Reed Solomon error correction. QR scanners read both the data code words and the error correction code words. By comparing the two, the scanner can determine if it read the data correctly, and it can correct errors if it did not read the data correctly. The error correction coding section explains the process of generating error correction code words in detail.

4. Structure Final Message

The data and error correction code words generated in the previous steps must now be arranged in the proper order. For large QR codes, the data and error correction code words are generated in blocks, and these blocks must be interleaved according to the QR code specification. This process is explained in the structure final message section.

5. Module placement in Matrix

After generating the data code words and error correction code words and arranging them in the correct order, you must place the bits in the QR code matrix. The code words are arranged in the matrix in a specific way. During this step, you will also

place the patterns that are common to all QR codes, such as the boxes on the three corners. This process is explained in detail in the module placement in matrix section.

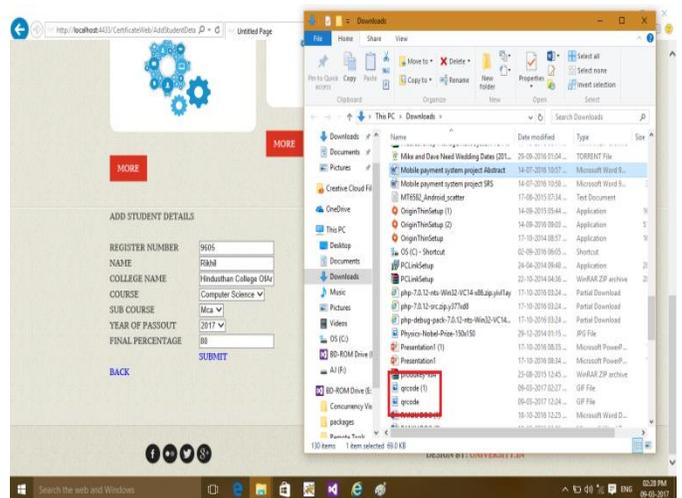
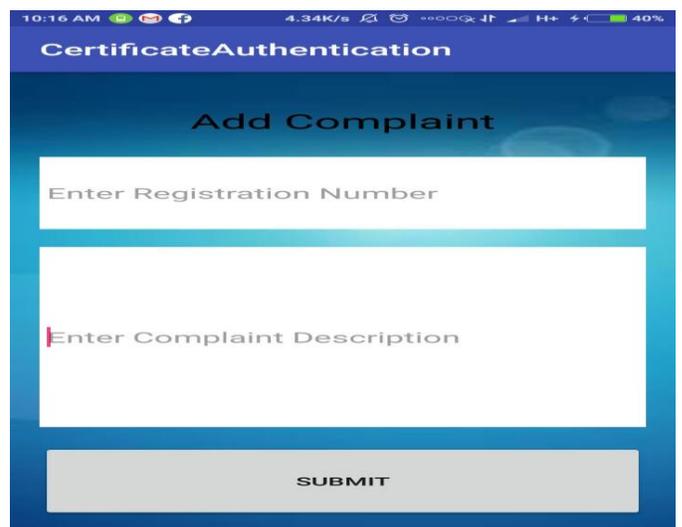
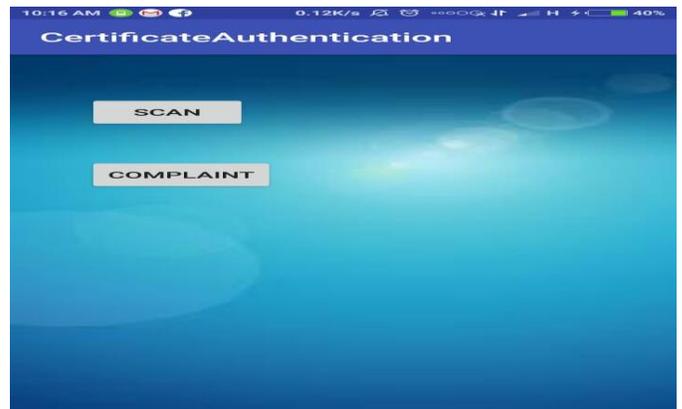
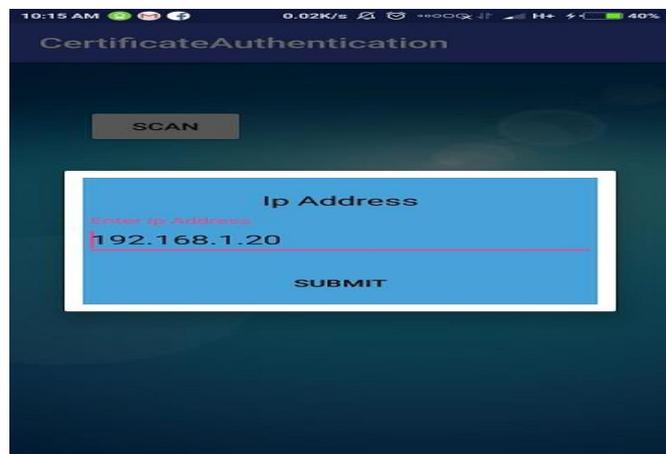
### 6. Data Masking

Certain patterns in the QR code matrix can make it difficult for QR code scanners to correctly read the code. To counteract this, the QR code specification defines eight mask patterns, each of which alters the QR code according to a particular pattern. You must determine which of these mask patterns results in the QR code with the fewest undesirable traits. This is done by evaluating each masked matrix based on four penalty rules. Your final QR code must use the mask pattern that resulted in the lowest penalty score. The masking process is explained in the data masking section.

### 7. Format and Version Information

The final step is to add format and (if necessary) version information to the QR code by adding pixels in particular areas of the code that were left blank in previous steps. The format pixels identify the error correction level and mask pattern being used in this QR code. The version pixels encode the size of the QR matrix and are only used in larger QR codes. For details about this final step, read the format and version information.

## 3. SAMPLE RESULTS



## 4. CONCLUSION AND SCOPE FOR FUTURE ENHANCEMENT

A QR Code will contain a digital signature over the data such as degree holder's name, enrollment number, roll number; total marks obtained etc. which will be signed by university

authorities. In order to verify the digital signature a person need to use a specific smart phone application which will scan the QR Code and authenticate the certificate.

The incident of fraud and forgery of a degree certificate has increased with the advance technologies which are easily available at cheaper costs such as printing and copying the document which threat to the integrity of both the certificate holder and the educational institution that has awarded the certificate. The manual verification of these documents is a tedious task because it involves multiple level of human interaction and it also a time consuming task which imposes an extra burden to the university or colleges because they have to verify all the students who have passed from their college. Hence, it is necessary that the universities adopt a process that can ensure security of information and authenticity of the issued certificates.

There is scope for future development of this project. The world of computer fields is not static; it is always subject to be dynamic. The technology which is famous today becomes outdated the very next day. To keep abstract of technical improvements, the system may be further refined. So, it is not concluded. Yet it will improve with further enhancements.

Enhancements can be done in an efficient manner. We can even update the same with further modification establishment and can be integrated with minimal modification. Thus the project is flexible and can be enhanced at any time with more advanced features, whenever the user needs an additional feature into it.

- The remote access security, in this feature is added to by remote access. It provide lack of security and keeps up the records in safe
- In future we can add GUI elements to the QR code like images, audio etc.,

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