International Journal of Engineering and Advanced Technology (IJEAT)
ISSN: 2249-8958 (Online), Volume-2 Issue-3, February 2013

Automated Examination Using QR Code

Nitish Soman,Ulhas Shelke, Shahanawaj Patel

Abstract- ***QR codes are developed by a Japanese company has been around for over fifteen years. With the advent of smart and Web capable mobile devices, we witness a steady growth of interesting commercial applications using QR codes. It cannot be denied that documents in the form of hardcopy are still being used, especially important documents such as land titles, application forms, contracts and tickets. However there are reports of forgery cases over the years and as such, it is imperative to have a mechanism for integrity verification of hardcopy document. The research proposed the usage of two-dimensional (2D) barcodes, which has the capability of storing data, to assist in reducing the action of hardcopy forgeries. We introduce an application for the automated examination using the QR code. In this, we make use of QR code to generate an question paper, the snap of the QR code is taken by every student and the required data is decoded and question paper is generated on the mobile phone. Students can give the answers by using their mobile phone itself.***

(Keywords: QR Code, MCQ, SCA, MCA)

I. INTRODUCTION

Examinations generally fall into two categories: objective and subjective. Our product will set up of automated examination systems to process, mark, score, grade and report on these assessments. Objective examinations are suited to this automated process, as there is little or no room for interpretation or conjecture over the outcome. Within objective examinations there are also several categories, such as the commonly known Multiple Choice Questions (MCQ), True/False and Extended Matching variety. Other variations such as Single Correct Answer (SCA) and Multiple Correct Answers (MCA) can complicate the picture further. Our product will generate a QR-Code of each question paper and students will scan the code to generate the question on their mobile screen. Students will then answers the question on their screen and send the results to server. We propose a QR Code based examination system to automate this process. Basically we wanted to propose client server architecture where in server will be used to generate qrcode of exam paper and client (student) will give exam on their phone or PDA. Teachers will prepare question paper using server and our system will generate final QRCode of the paper which then be displayed to students. A QR code (abbreviated from Quick Response code) is a type of matrix barcode (or two-dimensional code) first designed for the automotive industry.

Manuscript published on 28 February 2013.
***** Correspondence Author (s)
Ulhas Shelke ,Department Of Computer Engineering, Padmabhooshan Vasantdada Patil Institute Of Technology, Bavdhan, Pune, Maharashtra, India.
Nitish Soman ,Department Of Computer Engineering, Padmabhooshan Vasantdada Patil institute of technology, Bavdhan, Pune, Maharashtra.
Shahanawaj Patel, Department Of Computer Engineering, Padmabhooshan Vasantdada Patil Institute Of Technology, Bavdhan, Pune, Maharashtra, India.

More recently, the system has become popular outside of the industry due to its fast readability and comparatively large storage capacity. The code consists of black modules arranged in a square pattern on a white background. Although initially used to track parts in vehicle manufacturing, QR codes are now (as of 2011) usedover a much wider range of applications, including commercial tracking, entertainment and transport ticketing, product marketing and in-store product labelling. Many of these applications target mobile phone users. Users may receive text, add Vcard contact to their device, open a Uniform resource identifier (URI), or compose an e-mail or text message after scanning QR codes. They can generate and print their own QR codes for others to scan and use by visiting one of several pay or free QR code-generating sites or apps. E-mail has a popular API to generate QR codes, and apps for scanning QR codes can be found on nearly all Smartphone devices. The system is flexible. With a few changes it can be used by other organizations as well.

II. WHAT IS QR CODE??

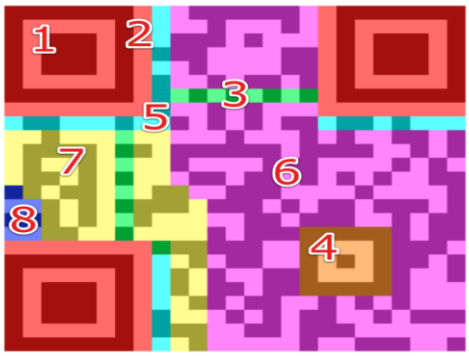
The Japanese company Denso-Wave originally invented the QR code in 1994 as a means of tracking vehicle parts during the process of manufacturing. Under optimal conditions these two-dimensional barcodes can hold up to 7,089 characters of numeric data, 4,296 characters of alphanumeric data, 2,953 bytes of binary data, and 1,817 Kanji or Kana Furthermore, they are very resistant to damage with high-levels of error correction possible, meaning that they can still function correctly when disfigured or marked. In addition to the flexibility of sizing, QR codes are also very easy to create. There are numerous free web-based generators offering the user a range of simple options. This simplicity makes them extremely appealing to those teachers and students who possess little or no technological knowledge. Perhaps, most attractive, though, is the fact that these QR codes are readable with standard software preinstalled on almost every Japanese mobile phone which has picture-taking capabilities. This has been a major factor in the rapid advancement of such technology within Japan compared to other parts of the world. In keeping with the original function of the QR code they are still widely used to give an object an identity, which allows a person to interact with it through the use of a mobile phone.

Published By:
Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP)

In addition to giving objects identities the QR code can be used as a means of transferring information directly to a mobile phone without the reliance on manual input methods such as email and texting. This is particularly useful when transmitting long URL information or entering contact information into an address book. Currently, within Japan the QR code can be found throughout the social landscape: on advertising billboards, product information labels, business cards, website URLs and even vending machines.

A. Fields in QR Code

The purpose of this Software Requirements Specification (SRS) document is to provide a detailed description of the functionalities of the Automated Examination using QR Code. This document will cover each of the system's intended features, as well as offer a preliminary glimpse of the software application's User Interface (UI). The document will also cover hardware, software, and various other technical dependencies. Understanding the QR Code. QR Codes consist of different areas that are reserved for specific purposes. In the following we refer to version 2 of QR because version 1 does not contain all patterns.



Finder Pattern (1): The finder pattern consists of three identical structures that are located in all corners of the QR Code except the bottom right one. Each pattern is based on a 3x3 matrix of black modules surrounded by white modules that are again surrounded by black modules. The Finder Patterns enable the decoder software to recognize the QR Code and determine the correct orientation.

Separators (2): The white separators have a width of one pixel and improve the recognisability of the Finder Patters as they separate them from the actual data.

Timing Pattern (3): Alternating black and white modules in the Timing Pattern enable the decoder software to determine the width of a single module.

Alignment Patterns (4): Alignment Patterns support the decoder software in compensating for moderate image distortions. Version 1 QR Codes do not have Alignment Patterns. With growing size of the code, more Alignment Patterns are added.

Format Information (5): The Formation Information section consists of 15 bits next to the separators and stores information about the error correction level of the QR Code and the chosen masking pattern.

Data (6): Data is converted into a bit stream and then stored in 8 bit parts (called codeword's) in the data section.

Error Correction (7): Similar to the data section, error correction codes are stored in 8 bit long codeword's in the error correction section.

Remainder Bits (8): This section consists of empty bits of data and error correction bits cannot be divided into 8 bit codeword's without remainder. The entire QR Code has to be surrounded by the so-called Quiet Zone, an area in the same colour shade as white modules, to improve code recognition by the decoder software.

B. Capacity and Error correction code

The capacity of a QR Code depends on several factors. Besides the version of the code that dense its size (number of modules), the chosen error correction level and the type of encoded data nuance capacity.

Version: The 40 different versions of QR Codes mainly dicer in the number of modules. Version 1 consists of 21x21 modules, up to 133 (lowest error correction level) of which can be used for storing encoded data. The largest QR Code (Version 40) has a size of 177x177 modules and can store up to 23,648 data modules.

Error Correction Level: Error Correction in QR Codes is based on Reed-Solomon Codes a specific form of BCH error correction codes [3, 8]. There are four levels (Table 1) of error correction that can be chosen by the user at creation time.

Correction Levels: Higher error correction levels increase the percentage of codeword's used for error correction and therefore decreases the amount of data that can be stored inside the code.

Encoded Data: QR Code can use different data encodings. Their complexity nuances the amount of actual characters that can be stored inside the code. For example, QR Code Version 2 with lowest error correction level can hold up to 77 numeric characters, but only 10 Kanji characters.

C. Assumption and Dependencies

Time Dependencies:

As mentioned previously, the features of *Automated Examination using Qr code* are divided into two groups: core features and additional features. Core features are crucial to the basic functionality of the Qr Code application. These features must all be implemented in order for the application to be useful. Optional features, however, are *not* critical to the function of the application. They are usability improvements and convenience enhancements that may be added after the application has been developed. Thus, the implementation of these features is entirely dependent upon the time spent designing and implementing the core features. The final decision on whether or not to implement these features will be made during the later stages of the design phase.

Hardware Dependencies:

Some of the additional features rely on hardware components present in Android handsets. The application will use the handset's camera to capture the image of a device at specific instance of time. Consequently, this feature is entirely reliant upon the ability and megapixel of the camera.

D. System Features

The following list offers a brief outline and description of the main features and functionalities of the *Automated Examination using Qr code*. The features are split into two major categories: core features and additional features.

Published By:
Blue Eyes Intelligence Engineering
and Sciences Publication (BEIESP)

Core features are essential to the application's operation, whereas additional features simply add new functionalities. The latter features will only be implemented as time permits.

QR Code generator:It allows us to create the qr code of the required data i.e. we get the data in the pictorial form.

QR Code decoder:It allows us to decode the qr code i.e. we fetch the data from the qr code.

Start exam:It will allow the end user to start the exam after fetching the qr code.

End exam:It will terminate the exam, it can be done manually or can be automatically done after the given time has completed.

III. FUNCTIONAL REQUIREMENTS

A Server Side:

1. Teacher registration Form
2. Teacher Login Form
3. Teacher Profile Form
4. Question paper setting Form
5. Results & Report Form
6. Admin Login Form

B Client Side:

1. Welcome page
2. Camera Open Interface
3. Examination start/stop Form
4. Question viewing Form
5. Answer Submission Form

C Hardware Interfaces

Mobile application will get installed on mobile devices. These mobile devices should have WIFI device thorough which it will connect to server.

D Software Interfaces

Operating System: Windows XP/Windows Vista/Windows 7.
Database: MySql 6.0.
Android 2.2 supported mobile handset

E Communications Interfaces

Here we will be using WIFI network and going to create our own communication protocol. Software will also support BASE64 encryption logic while sending data to server. Server will support HTTP protocol for web based access.

F Performance Requirements

For good performance the server should be tuned to server only server process and most of the RAM should be used for our application. Mobile application should use as much possible RAM. KVM should be tuned on mobile to provide extra address space to application.

G Safety and Security Requirements

All the data will be shared using BASE64 algo with convert binary data into text form. Only sender and recipient will understand the content. Also as we are not using GPRS or internet so system has not more security threads.

H Software Quality Attributes

The graphical user interface of Automated examination is to be designed with usability as the first priority. The application will be presented and organized in a manner that is both visually appealing and easy for the user to navigate. There will be feedbacks and visual cues such as notifications to inform users of updates and pop-ups to provide users with instructions.

To maintain flexibility and adaptability, the application will take into account situations in which a user battery drains off for whatever reason These users will still be able to use the application, while disconnected details will be cached until the mobile is restored. With Location Alert being ported solely for the Android platform, this software application has the advantage of being portable and convenient to use whenever and wherever. Overall, the application balances both the ease of use and the ease of learning. The layout and UI of the app will be simple enough that users will take no time to learn its features and navigate through it with little difficulty.

I The Basis of Automated Examination Using QR Code:

1. Mobile Client:

- System should support Android handset.
- System should allow user to take snap shot of QRCode.
- System should put user handset in "offline" mode before starting exams.
- System should start exam ones it capture qrcode image.
- System should not allow user to open anything else while examination is going on.
- If user moves to any other screen, then exam should get terminated.
- System should send results of all questions to server ones exam get over.
- System should shuffle question sequences with random order.
- System should maintain its own timer.
- System should use BASE64 algorithm on answers before sending to server.

2. Server:

System should proved web based access (HTTP support) System should allow users (teacher) to create update their own profile. System should allow users to prepare question paper. System should save all question papers with proper ID.System should generate QR-Code from the data entered by user. System should allow user to view results of current as well as previous questions. System should use encryption logic before embedding data into QR-Code

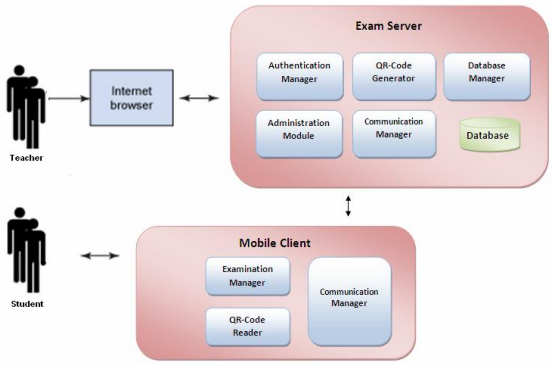
IV. WORKING

A. System Architecture

We propose a QR Code based examination system to automate this process. Basically we wanted to propose client server architecture where in server will be used to generate qrcode of exam paper and client (student) will give exam on their phone or PDA. Teachers will prepare question paper using server and our system will generate final QRCode of the paper which then be displayed to students. A QR code (abbreviated from Quick Response code) is a type of matrix barcode

Published By:
Blue Eyes Intelligence Engineering
and Sciences Publication (BEIESP)

(or two-dimensional code) first designed for the automotive industry. More recently, the system has become popular outside of the industry due to its fast readability and comparatively large storage capacity. The code consists of black modules arranged in a square pattern on a white background. Although initially used to track parts in vehicle manufacturing, QR codes are now (as of 2011) used over a much wider range of applications, including commercial tracking, entertainment and transport ticketing, product marketing and in-store product labeling. Many of these applications target mobile phone users . Users may receive text, add Vcard contact to their device, open a Uniform resource identifier (URI), or compose an e-mail or text message after scanning QR codes. They can generate and print their own QR codes for others to scan and use by visiting one of several pay or free QR code-generating sites or apps. E-mail has a popular API to generate QR codes, and apps for scanning QR codes can be found on nearly all Smartphone devices.



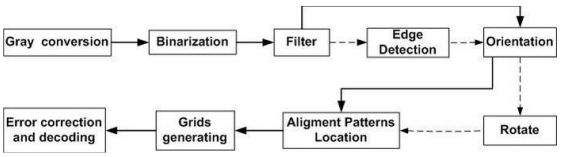
System Architecture

This section describes the hardware system architecture for implementing the barcode reading system in mobile phones, and its processing flow. The camera device and application processor are necessary hardware components for this system. The application processor is needed to implement the camera interface, LCD controller, DSP for image processing, and application host CPU for real-time computations. The application processor works for displaying of the menu and preview in the display and computing of code recognition and decoding in real-time. With these systems, the user can control the position of the camera and decide the capture timing.

The processing flow is as follows.

1. **Execute the barcode reader application** the application processor is changed into barcode reader mode by user menu selection.
2. **Capture from embedded camera device** the source images are captured by the embedded camera device via the camera interface, and these image are sent to two units, the DSP for image processing and the LCD controller for displaying the user preview.
3. **Process the image in DSP** The code is detected and processed in the DSP from the captured source image, and the processed image in this phase is output as the normalized size and binarized image of the code area.
4. **Decode the code** the processed code data in the previous phase is decoded in the host CPU, and the decoded code is derived to the application software.
5. **Display the results** the host application displays the decoded results. In this paper, the algorithm of code recognition in the DSP is introduced mainly, and in the implementation and performance discussions, we estimated based on this system, because we believe the mobile phone system point of view is very important in practical terms.

B Actual Working



Actual working of QR Code

1. Gray conversion

QR Code symbol is captured by embedded system with camera, and it is a colourful image. QR Code symbol is a set of dark and light pixels. It is needless to deal with colour information and the gray image calculated quickly with little space, so gray conversion is needed to do firstly.

2. Binarization

Binarization of gray scale images is the first and important step to be carried out in pre-processing system. Selection of a proper binarization method is critical to the performance of barcode recognition system. In binarizing an image, a simple and popular method is thresholding. There are two types of thresholding methods: global and local thresholding. Among more than 20 thresholding methods, concluded that Otsu's method is the best, which chooses the threshold that minimizes within-group variance. By using a global thresholding method, if an image has variable lighting conditions, the resulting binary image will be very bad. In this case, a local thresholding method performs better. A goal-directed performance evaluation of eleven popular locally adaptive thresholding algorithms was performed in for map images. His experimental results indicated that Niblack's method with post processing step appears to be the best. The main problems with a local thresholding method are hard to set a right window size, eliminate the block effect, and reduce the execution time. However, memory restrictions and embedded system requirements preclude the use of binarization algorithms that require a priori knowledge of the full image and large execution time, thus a number of well-known locally adaptive algorithms cannot be use.

3. Filter:

Standard opening and closing techniques are applied to the bitmap to remove noise .After the filter, edge detection is used in most recognition algorithm. But the QR Code has quick orientation. So the step of the edge detection is omitted in QR Code analysis phase. This will increase the recognition rate.

4. Orientation

There are the three identical position detection patterns located at three of the four corners of QR Code. Three dark - light –dark squares are over palled in every finder pattern, and the dark-light ratio is 1:1:3:1:1.

Published By:
Blue Eyes Intelligence Engineering
and Sciences Publication (BEIESP)

There is off chance of that similar graphic existed in barcode symbol. So the approximate ratio area should be quickly found. But when one of the finder patterns is partially dirty or damaged, we can use the timing pattern. The timing pattern provides the secondary information which can help us to locate the symbol, decide the ratio direction of symbol and width of module. Rotated images are handled after orientation in common. But the interpolation operation is used in rotation operation .The amount of calculation is great and is not accurate. So we skip this step. A modular distance offset algorithm was used without rotating symbol after located finder pattern, the module width and height and the angle of rotation were known. We get the grid moving along the line which connects the central of three finder patterns. This method avoids the rotation and interpolation, increases the computing speed.

5. Alignment patterns Location

In order to correct the contorted QR Code symbol, there are many alignment patterns in symbol. With the version increasing, the number of alignment pattern adding. When version is 3, the number of alignment pattern is 1, but when version is 7, the number of alignment patterns is 6.Link the central point of the alignment pattern and three position detected patterns, the small sampling grid is formed. The small sampling grid, distortion is omitted. Therefore, located the central coordinate of alignment pattern is critical for recognition of barcode.

Using the known alignment patterns and detection patterns scans estimate the central co ordinate. In internationals standard of QR code, a reference method that locates the centre co-ordinate of alignment pattern is provided. But the pre condition of this method is estimated the central co-ordinate just inside of the alignment patterns. A large of actual captured image are tested ,the probability of estimated central value inside of the alignment patterns is only 70% .the other 30% image will be located failure using this method. A new estimated method is provided which used 8-directions of the estimated point. The method scans the nearly 8 directions of the estimated point to find the central co-ordinate of the alignment patterns which are satisfied conditions. This method expands the scanning range, and 99.3% captured QR-Code image is successfully decoded.

6. Grid generation:

When the finder patterns and alignment patterns were located successfully, the segment is easy to do, and the grid is easy to generate. Then the corresponding pixels are getting to ready for decoding.

7. Error Correction and decoding:

The error correction and decoding process is last step of the recognition barcode .It employs Reed Solomon error correction to enable accurate when substantial parts of the code are distorted. Decoding is just the reverse of the encoding procedure and the decoding steps can reference to international standard of the QR Code.

V. APPLICATIONS

Many examples of applying QR codes in business and industry can be found in Australia, China, Hong Kong, Japan, Korea, Singapore and Taiwan (ITSC, 2008) as illustrated below

- Blood test process management in Australia
- LPG cylinder bottle management in Australia
- Tracing of livestock with ID numbers in Australia
- Jewellery certification system in China
- Bus commuters pass issuing system in Japan
- Sushi freshness control system in Japan
- Betting ticket management in Japan
- Passenger management for a casino cruiser in Japan
- Patient identification in Japan, Hong Kong and Singapore
- Application in agriculture in Taiwan

Coupon codes and promotional offers

QR codes allow you to easily and immediately deliver coupons and promotional offers. Track lets you produce a QR code easily for each of your unique offers so you can track how each is performing. These codes may direct people to a website where they can redeem the coupon, for example, or present instructions on how to use the discount at a store.

Patient identification in Japan

VI. TECHNICAL HIGHLIGHTS

A .User class & characteristic:

The proposed system Location automated examination focuses on the user who is using the mobile phone with android Support and willing to reduce work load of manual checking.

Published By:
Blue Eyes Intelligence Engineering
and Sciences Publication (BEIESP)

The system is supported with the "How to use" option for the user who is not aware of this feature. Using this option even a layman can be able to use the applications easily. The layout and UI of the app will be simple enough that users will take no time to learn its features and navigate through it with little difficulty.

B. Operating Environment

The main component of the Automated Examination using Qr code project is the software application, which will be limited to the Android operating system (specifically Android 2.2 and above). The application has little resource or graphics-intensive, so there are little practical hardware constraints. The application will rely on several functionalities built into Android's Application Programming Interface (API), so ensuring appropriate usage of the API will be a major concern. Beyond that, the application is a self-contained unit and will not rely on any other Android-related software components. The application will, however, frequently interact with the image captured by camera of system. Software has two major component one the server and the second one is the mobile application. The server will required Windows XP/Vista/7 machine with minimum 1GB RAM and 100 GB hard disk. The server machine also required WIFI devices sing which it can create Wireless Ad-hoc network. Mobile application will support Android phones so at least 2 Android devices required getting the output.

C Design and Implementation Constraints

The primary design constraint is the mobile platform. Since the application is designated for mobile handsets, limited screen size and resolution will be a major design consideration. Creating a user interface which is both effective and easily navigable will pose a difficult challenge. Other constraints such as limited memory and processing power are also worth considering. Location Alert is meant to be quick and responsive, even when dealing with large groups and transactions, so each feature must be designed and implemented with efficiency in mind.

D Assumption and Dependencies

- Time Dependencies:

As mentioned previously, the features of *Automated Examination using Qr code* are divided into two groups: core features and additional features. Core features are crucial to the basic functionality of the Qr Code application. These features must all be implemented in order for the application to be useful. Optional features, however, are not critical to the function of the application. They are usability improvements and convenience enhancements that may be added after the application has been developed. Thus, the implementation of these features is entirely dependent upon the time spent designing and implementing the core features. The final decision on whether or not to implement these features will be made during the later stages of the design phase.

- Hardware Dependencies:

Some of the additional features rely on hardware components present in Android handsets. The application will use the handset's camera to capture the image of a device at specific instance of time. Consequently, this feature is entirely reliant upon the ability and megapixel of the camera.

References:
http://developer.android.com/reference/android/hardware/Camera.html
http://developer.android.com/guide/topics/location/index.html

VII. ADVANTAGES

1) Secured transactions.
2) Improves operational efficiency.
3) High speed.
4) Saves time.
5) Efficient and Reliable.

VIII. CONCLUSION

The recent interest in the use of visual tags in everyday life is a natural consequence of the technological advances found in modern mobile Phones. Although our proposed system has the potential to make the question paper easily available to students using the qr code also it is handy for the students to give the answers to the questions which is time saving for teacher as well as student and also checking is 99% error free.

REFERENCES

[1] Yeu Liu,Hu Yang,Ningjun *Liu, recognition of QR code with mobile phones*,2008 Chinese and Decision Conference ,university of jinan,jinan 250022,china.

[2] QR Code Security Peter Kieseberg, Manuel Leithner, Martin Mulazzani, Lindsay Munroe, Sebastian Schrittwieser, Mayank Sinha, Edgar Weippl SBA Research Favoritenstrasse 16 AT-1040 Vienna, Austria.

[3] The jaltcall journal issn 1832-4215 Vol. 5, No. 2 Pages 15–28 ©2009 jalt call sig "*Utilizing the quick response (QR) code within a Japanese EFL environment*"

[4] Law, C. & So, S. (2010). *QR codes in education. Journal of Educational Technology Development and Exchange, 85-100.*

Published By:
Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP)