

Advanced QR Code Based Identity Card: A New Era for Generating Student ID Card in Developing Countries

Md. Sanaul Haque, Richard Dybowski

School of Architecture, Computing & Engineering

University of East London

University Way, London, E16 2RD

emon_sana@yahoo.com, richard.dybowski@hotmail.co.uk

Abstract—Educational institution in developing countries is a vast sector and it is expanding rapidly. With the rapid growth of technologies, educational institutions are still lagging behind. For identification of students they still lie on manual handwritten ID card and files. If proper ID card system is introduced then it would be much easier to identify a student and can track his/her progress. Therefore, in this research we implemented advanced using of QR code and student ID generation. We tried level best to make right implementation of QR code with student ID card. Automated student ID had image capturing facility and requirements of an ID and there is no need of hand written ID card. QR code is attached into ID card and student personal details can be found by scanning the QR code with smart phones (downloaded & installed QR reader software). QR code is said to be the next generation of bar code and using QR code with ID card brought positive outcomes. While using software tools, identity cards works fine and suitable for an educational institution as it is free. Thus, ID card will be a perfect use of modern technology in developing countries.

Keywords—Identity Card; QR Code; Reed- Solomon algorithm

I. INTRODUCTION

Now-a-days with rapid growth of population, people need to be identified and it is now a must for every organisation from a company to a large country to have the Identity card (ID) for the every people. Therefore, now for every educational institute an ID card for a student is compulsory. ID card is said to be the summary of any student indeed. It is highly essential for an educational institute to provide ID card to each and every student of it. ID card is generally considered to be the summary of a student's information.

The project “Advanced QR coded Student ID Card Generation” is being created to decrease the effort of human as we know before people use the hand written ID card. The ID is the pure automated solution and it will help to generate student ID card easily. It is a special type of software which will be used to make an advanced ID card with QR code instead of the bar code. It is specially made for the developing Countries like Bangladesh, Pakistan, Srilanka. Our ID card produced software that captures both student picture and QR Code of individual student.

For example, business card does have only QR code facility. But this software will add all the feature in one ID card and ID card will be act as the smart ID card. Another important point it can be found as open source that means it will be available for free. QR code can be scanned with any smart phones and it will show the information of the student including – medical details (blood group, organ details), progress of the student, current status to the school and some other personal details of him/her.

II. IDENTITY CARD & GENERATION

We can define an identity document as the document and it will help to make the proper verification of the personal identity of a person [3]. The ID is also known as ID or the portion of identification or the paper of any person. It is a small standard size card and usually called the identity card that can be easily kept in a pocket or inside wallet. A card can show data of the identification about any person including names (first name, sur name, last name), age, address, a portrait photograph to have colour of body, hair and eyes. These types identification are used commonly in place of school for the student, companies for the employees. Therefore it can be said that student ID card is the card of identification which is used for holding specific characteristic of students.

As we can compare traditional ID of any developing country then it will only contain all the details with hand written and anyone can make the fake ID card easily. When administrator make ID card with his or her hand writing then it can be filled of error and mistake. Sometimes they made the mistake of writing wrong name with spelling and so on. Here is an example of our previous ID card that students use in Bangladesh-



Fig. 1. A traditional ID card from Jahangirnagar University, Bangladesh

In this automated system the card generation process is completely done by the computer with the help of the

software. The information of the students is stored in the database and by this time the student ID card can be provided by the administration. As a result there is no tension about the wastage of time and also the data manipulating and storing is suitable for the whole process. New ID card will have live picture capturing facility which is a great advantage as most of the ID card uses the old picture. Using the live picture will allow to reduce make fake ID card with any person's picture as the administrator will take the picture of the person in front of him in a second.

III. QR CODE

A passenger was travelling from Epping (London, UK) to Stratford (London, UK). Suddenly he saw an advertisement on the newspaper of Metro and at the corner of advertisement he saw a square shaped QR code. Then we installed Semacode (rectangular code for scanning) and then scanned QR code then it goes to the link of the website of marks and spencer: www.marksandspencer.com

Another example can be given when a student is at the library of UEL (University of East London). For the library services the QR code is attached with booking PC of the library.

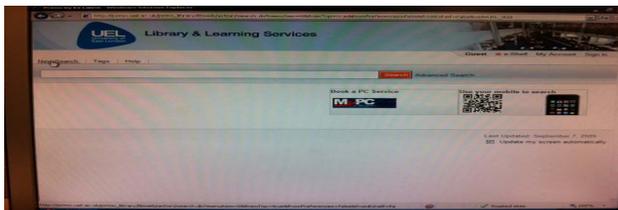


Fig. 2. QR code at the library and learning services at University of East London.

QR code (Quick Response Code) is said to be the two dimensional bar code (2D) and it is a special types of matrix barcode which was made for the auto motive factories purpose.[7] But soon after the system then become more familiar and popular and everywhere it is being used because of its large storage capacity and fast readability. The QR code is made up with the black modules on a pure white background and the black modules are kept like square pattern. For the data input the binary, kanji symbols or alphanumeric symbols can be used for the encoded information.

A. Function & Algorithm of QR Code

Normally the QR code provides the functions which have 6 major parts:

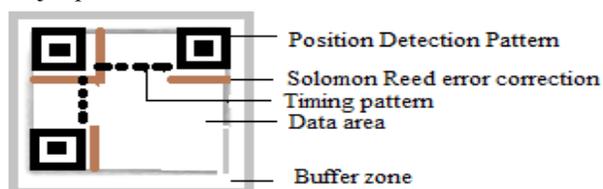


Fig. 4. Position detection pattern by finding three corners

1) Three Position Detection Pattern

At the three corner out of the four corners the three codes are located which are called position detection pattern are three position detection pattern.

2)Timing Pattern Code

In order to identify the location of each and every cell inside the QR code, the timing pattern code is greatly used. All the things are done by the decoder application.

3) Reed- Solomon Error Detection

If (x_1, x_2, \dots, x_n) is the input sequence of the values of n in a field F then the codebook will be the input sequence of n distinct values over the finite field F ; then the codebook C will be

$$C = \{(f(x_1), f(x_2), \dots, f(x_n)) | f \in F[x], \deg(f) < k\} \quad (1)$$

Here, $F[x]$ = polynomial ring The input sequence (x_1, x_2, \dots, x_n) of value $n = N$ is made as

$$(0, \alpha^0, \alpha^1, \dots, \alpha^{N-2}), \quad (2)$$

Here, α = primitive root [12].

4) Data Area

Into data area the error correction codes are inserted where the each and every cell is saved in the form of binary number.

5) Buffer Zone or Quite Zone

This zone is used for isolation of code from the information of different packaging.

6) Alignment Pattern

When code is being curved then the QR coder make the correction for the distortion. . The alignment corner is in the corner of lower right [4].

B. Adding QR Code to System

ID card is using the regular bar code for some extra information of anyone. But there is a problem here as it does not contain all the information in details. But if the bar code can be replaced by QR code than one can easily insert or make a link to more information. For example the QR code can be linked to the web address or some other web link so that anyone can get more information easily. Point to be noted that QR code is totally free. Lots of popular business companies are already started the using of QR code. So adding the QR code to the ID card will make a new era to have more information of the student.

C. Advantages of QR code

When it is online then it can read anything and all is done with the help of the camera and sensor of the cell phone. [5]With a QR reader such as QR reader or Sema Code the QR code can easily give the link of the details of the product. One can easily download the QR code reader by downloading it from online and it is totally free [7]. Camera needs not to be lined-up to read the QR code in a particular way. People may think that the scanner must have to be lined up rightly which is wrong. But point to be noted that

the users hand must be stable for a couple of minutes and then the QR code will show the link [6].

B. Disadvantages of QR codes

User must have camera phone and right kind of software installed into mobile phone. Problem is only the work can be done using the smart phone that can take and read image of QR code [6]. Many people have mobile phone with cameras but the cameras are unable to read and phone does not support QR reading software [5]. Smart phones are comparatively expensive than that of the other phones available in the market. Young people are aware of technology and they are using it but it is a real problem for people above 40 and they are not interested to spend money in the technology and also they do not know how to use them properly [7].

C. Uses of QR code

1) Use as Current Mainstream

Today QR Codes is using for the e-info or e-marketing. The Companies are using the code just next to their product for the viewers. If someone is interested then he or she just scan the QR code and then code get linked with a webpage and the viewers can easily have a look of the details of the company's product. QR code can give lots of information of any product and its configuration within very early shortest time. In the below we can see how a company is using the QR code [8].



Fig. 4. An advertisement on train using QR code

2) Applications in the Field of E-ticketing

Any time we can go and show the QR code and then the result of the scan will be come out quickly. The airline of Japan is using the QR code scanner at the gate where ticket is required. Also Heathrow express train (UK) is using the e-ticketing in London.

3) System for Loyalty points

The famous Coca Cola is now using the technique of QR code to give free drinks to the Japanese customers to redeem collected points of loyalty. Here they have a CMODE vending machine with the QR coding system.

4) Intelligent Advertising

URL of any web pages can be linked with the QR code and in this way the organisation can use the QR code for their advanced advertising. In the billboard they can add in a corner side the QR code and then the people can scan it at any time.

D. Difference between QR code and bar code

A Bar Code can be defined as the generic that is used for the information of visual display and it will be as the series of bars or lines. QR Code or quick response was made for the method of gathering more information into a specific area for the use of inventory controls and shipping purposes. The basic ability of these types of codes is to gather vertical information where horizontal allows getting Japanese characters and it is necessary for the Denso to have higher solution. QR Codes can contain the amount of alphanumeric characters of 4000 and this will be good for new marketing opportunities. Bar codes are cheaper (price of 1 bar code is less than half pence) but the QR code is totally free. One can make one's own QR Code using the QR Code generator or JSERVELET Programme. Therefore, the main difference of bar code and QR code is the storing capacity where QR code contains more information than that of bar code. Also QR code is cheaper than bar code.

E. Choosing QR code instead of bar code or RFID:

Like bar code there is also another code which is also used widely and it is RFID. RFID can be used for tracking of large amount of items for the physical distance travelling. The department of defense of USA and popular Wal-Mart use RFID. But it is more expensive than even barcode and also it is not useful for small business purposes.



Fig. 6 Clear images of RFID & Bar Code

As we can see that the bar code and RFID is expensive and they are not good for small business purposes. Therefore the choosing of the QR code is the best idea to get all the facilities including the free of expense and the modern facilities.

F. Relevant research work:

1) For the medical emergency in order to get the critical information of any person [8] - <https://www.myinfo911.com/>



Fig. 7. In USA medical card is using QR Code for emergency purpose

It is used in U.S.A. Using the smart phone application the QR code can be scanned and then the information of the people will show automatically. For this they are asking

\$9.95 for each of the ID card which will be expensive for the ordinary people from the developing countries.

2) The Japanese proposed future national ID card using QR bar code [9]. In this proposed (2009) system the Japanese ID will contain IC chip with extra QR code.

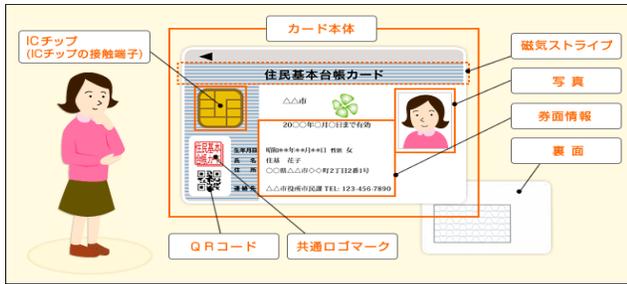


Fig. 8. Japanese proposed ID card with chip

3) For making any business card [10]: <http://www.tec-it.com/online-demos/Business-Cards/Free-Business-Cards.aspx>



Fig. 9. Personal Business Card with attached QR Code contains link of individual Website

Lots of online based companies are producing business card by adding the QR code. We will use it to some developing countries (Bangladesh) to be implemented in each and every organisation for free to identify anyone with more information.

IV. DESIGN

A student ID card generally deals with the fields: Students Name, Class Roll Number, Registration, Number, Session, Name of the department, Hall name. To demonstrate the administrative requirements we need to meet the administration the following parameters: Basic student information, The feature, Add / remove department name and hall name, Take student snap from a real time video streaming, Checking the printable form, Editing total amount of information, Going to printing process, Find student information using unique ID number

A. Use Case Diagram

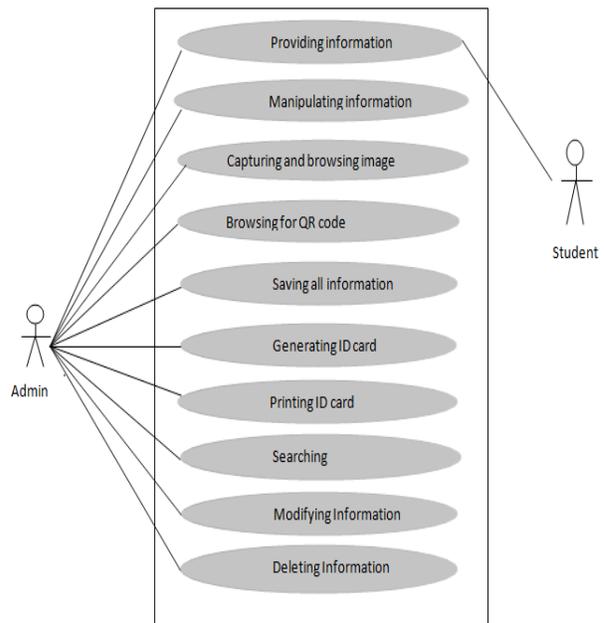


Fig. 10. The Use Case Diagram of QR coded Automated Student Identity Card Generation

B. Class Diagram

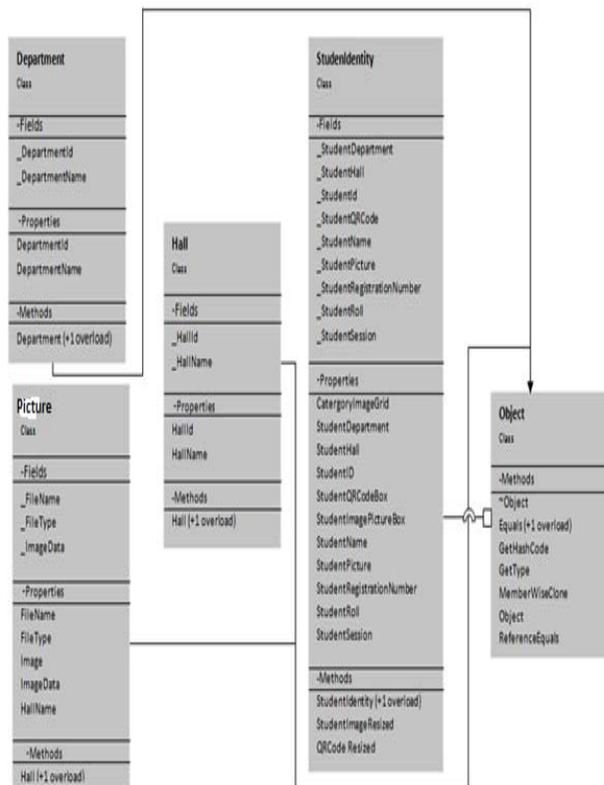


Fig. 11. The Class Diagram of student Identity Card Generation.

C. Using Microsoft visual studio 2008 & SQL server management studio express:

To make the whole system we need to use the software and for coding we take the Microsoft visual studio and for connection of database we took the SQL server management studio express. Visual studio supports different types of programming languages that can allow the debugger and code editor for supporting the programming language including C, C++, VB.NET, Basic .NET. We can configure and managing within Microsoft SQL Server. SQL server can add the graphical tools and script editors and they can easily work with object and features.

D. Semacode/QRReader and Code Reader:

Semacode or QRReader are Softwares in order to scan QR code. They can be compatible with the smart phones specially iPhone. But Sema code is comparatively faster than QR Reader. The software can be found for free. Once we install it into the phone then we can scan the QR code anytime. The code Reader is to scan barcode when we will compare QR code ID card with barcode ID card.

V. IMPLEMENTATION

For implementation of the system we need to do three important steps system construction, support plan and software user interface. In the System Construction it is required to validate new system for acceptance of the whole system. The system is also need to be tested carefully.

A. Installation

Microsoft Windows XP, Vista, 7 and all XP versions are easily compatible for installing of the software. For supporting plan, three parts are included back-end implementation, front-end implementation and last of all is the combination of the front and back-end implementation. The back-end implementation is for storing the data as the user does not know the number of tables in the database. In the front-end implementation of the system the front-end user can read the data and also they can modify or enter data without any concept of database.

B. Software User Interface

In the software user interface we can show the user interfaces of the whole project.

C. Starting up Screen

Here we can see that into the data entry part we can add the name, roll, registration number, session, department and hall of the student. There is an capture option for taking picture and in below there are the other buttons available-save, browse for QR code , print and close. By clicking the browse for QR code we can get the QR code. All the information can be stored by clicking save and can be printed by the print option.

D. Capturing the picture of student



Fig. 12. Capturing image of the student

Once we click the capture option then we can take the live picture of the student and then it can be saved into the box of the image

E. Browsing file QR code & Generating ID



Fig. 13. Screen shots of capturing student's image

We can browse for QR code to get the picture of it. All the data was taken here and then we can see the format of the ID card including the picture, QR code and other details of the student.

F. Save to Database

After providing all information, capturing image and generate the ID demo the following interface appeared and once procedure had been completed then ID card was ready to print.

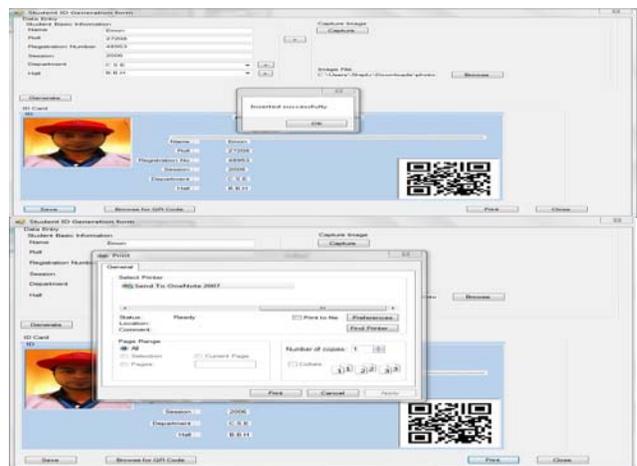


Fig. 14. Capturing student's image & printing order

G. Scan QR code of student

QR code was made from the www.smartytags.com. By opening account we made QR code for individual student and it was linked to the website:

www.qrcodesample.webs.com. The link website is our educational sample website where administrator will have student's secured data access using login details. The website will only show the general information of a student on homepage currently and student's data can be shown using SQL server. But in future, in order to access data from anywhere, there will be some work by using Windows Azure when it is available in Bangladesh. Moreover, we can make our own QR Code using JSERVELET programme. Now if someone scans the above QR code then it will give the following seen output on the iPhone



Fig. 15. Print screen shows web link for QR Code (Left) & our QR Code (Right)

Here we can see all the details of student by using the phone. Therefore, the implementation of the advanced QR code automated student ID card has been done successfully.

VI. EVALUATION

Data will be then collected and will be analysed to get the best result from the requirements of the users of the system. Then we can compare our ID card with other market available ID card and comparing all the facilities as well, see Table I. Therefore it can be said that QR code is much better than anything to make the ID card perfect.

TABLE I. COMPARING QR ID CARD & OTHER ID

Subject	Traditional ID card	Normal ID card	QR ID card
Type of ID card	Handwritten	Bar code ID card	QR ID card
Cost	Free	Not free	Free
Scan speed of barcode from smart phone	Do not have any facility	2.5 seconds	3 seconds
Price of each code	no code	.05 pence	0 pence
Swapping speed to open security gate	Not valid	3 seconds.	1.5 seconds.
Information in each code	Do not have any	Hundreds of characters only	5000 characters
Picture taking option	No	yes	Yes

VII. CONCLUSION

By viewing all of the above analysis and result it can be said that the product is a GUI based system with highly efficiency. After completing the project we can make the surety of overcoming the problems of the existing system. Advanced QR coded Student ID card generation is being made computerised to increase efficiency and reducing of error of human being. All records and data are stored in Microsoft SQL Server management studio express database and from which respective data can be deleted and retrieved easily. Editing is made also flexible as the authority only need to give the required information and then print ID card with the image of student with real time video streaming and added QR code is introduced that contains details information of student which can be scanned in a single second using the smart phone. Computerisation of Advanced QR Coded Student Identity Card Generation will not only reduce the human stress but also improve human stress and advanced system with the modern QR code and all the things can be got free. Getting the modern technologies free is a great advantage for developing countries as they can introduce the system to their many different and different educational institutions. At present in Bangladesh some institutions have started using our system and get benefitted greatly.

ACKNOWLEDGEMENTS

We would like to give special thanks to Aminul Karim for helping us with programming code materials. We would also like to offer my blessings to the people who supported us a lot during the time of our entire research work.

REFERENCES

- [1] Paul J. Deitel Harvey M. Deitel.2010. C# 2010 for programmers. [electronic book] Prentice Hall. Available from: <http://torrentz.me/86feaa41c25de726f33992c2009f92ae4b437807> [Accessed October 7 2011]
- [2] Richard Dybowski. 2012. The ClassLectures. IT project. September-October. London: School Of technology and Management
- [3] Dictionary Reference.2013.ID card. 2012. [online] Available from: <http://dictionary.reference.com/browse/ID+card>[Accessed August 14 2012]
- [4] Marksprague Wordpress.2012.Understanding QR code [online] Available from: <http://marksprague.wordpress.com/understanding-qr-codes/>[Accessed August 24 2012]
- [5] Robabdul.2012.QR code advantages and disadvantages. 2012. [online] Available from: <http://robabdul.com/QR-Code-advantages-and-disadvantages.asp>[Accessed August 21 2012]
- [6] Beqrious.2012.The advantages and disadvantages of today's QR code. [online] Available from: <http://www.beqrious.com/show/the-advantages-and-disadvantages-of-today-s-qr-code-technology/>[Accessed August 21 2012]
- [7] Qrme.2014.QR code applications. [online] Available from: <http://www.qrme.co.uk/qr-code-news/> [Accessed January 15 2014]
- [8] Medical details card. [online image] Available from: <http://www.myinfo911.com/> [Accessed September 12 2011]

- [9] Japanese proposed ID card.2012. [online image] Available from: <<http://www.2d-code.co.uk/japanese-id-card-qr-code/>> [Accessed on September 21 2011]
- [10] Business card with QR code.2011. [online image] Available from: <http://www.tec-it.com/online-demos/BusinessCards/Free_Business_Cards.aspx> [Accessed October 2 2011]
- [11] QR Code features | QR Code.com][Accessed October 2 2013]
- [12] Reed Solomon. Available from: <http://math.berkeley.edu/~mhaiman/math55/reed-solomon.pdf> [Accessed Oct 2 13]
- [13] QRCode. 2013. Structure of QR Code. Available from: <http://www.tecgraf.puc-rio.br/~mgattass/fcg/trb09/IsmaelAndadePimentel/Compgraf trab2/QRCode.pdf> [Accessed June 2 2013]