

The Application of Distance Education based on QR Code

Cheng Chen, Jie Yang, Xing Tang, Ning Song* and Jiacheng Lu

Military Representative Bureau in Nanjing, China.

* 18020106299@163.com

Abstract. In this paper, a novel application in distance education based on QR code is investigated. In the proposed application, each student would login in distance education platform by the unique QR code which is generated by the platform. The generated QR code would be updated each time when finishing the courses and the new one will assign to each student to replace the old one. The QR code records the information of each student, for example, name, student ID, course grade, learning progress, links to web course and so on. When scanning the QR code of each student, the education platform would get the key information of different students so that it can assign different learning courses according to grade and learning progress of each student. In this way, each student would only provide the generated QR code, which does not need to remember the account, password, learning progress and so on, the distance education platform will assign different learning courses according the information of QR code automatically. It can be applied in both the PC and mobile platform and can improve the flexibility and efficiency of distance education greatly.

Keywords: Distance education; Layered education; QR code; Application.

1. Introduction

Nowadays, with the highly development of science and technology, the education way is becoming more and more diversified, at the same time, also more and more convenient. Online learning is providing higher education institutions with an entirely new modality for educating learners free from the constraints of time and location.

QR code [1] is a popularly used two-dimensional barcode recently with the advantages of the high information density, robustness and error correction capability. Even if it is dirty, the data in QR codes can be read easily with the help of a QR code reader since it has error correcting capability. Based on the above advantages, it is widely used for many applications such as advertisements, information transfer and user authentication.

Due to the rapid development of mobile communication technology, QR code technology in mobile platform is more and more mature and convenient. Mobile platform of distance education has been accepted by the people and is more and more widely. If the technique of QR code could be applied to the distance education platform, it would improve the flexibility and efficiency of distance education greatly in both the PC and mobile platform

In this article, we propose a novel application in distance education based on QR code. The proposed application can improve the flexibility and efficiency of distance education greatly. The distance education platform would generate the unique QR code for each student each time, which is used to login in the platform. Each student would only provide the generated QR code, which does not need to remember the account, password, learning progress and so on, the distance education platform will assign different learning courses according the information of QR code automatically. It will very convenient both in the PC and mobile platform.

The remainder of the paper is organized as follows. The introduction to the QR code is presented in Section 2. The proposed application is described in Section 3. Finally, Section 4 concludes this paper.

2. Background

2.1 QR Codes

QR code which was invented by the Denso Wave [2] Incorporated in 1994 is defined as a two-dimensional barcode. The standard [1] defines forty sizes of QR code symbol versions which range from version 1 to version 40. A QR code is divided into modules and each QR code symbol version is comprised of a different number of modules. Each version has four modules more than the previous one. For example, Version 1 is made up of 21x21 modules while version 2 is made up of 25x25 modules. The QR code structure consists of function patterns and encoding regions. The encoding region consists of error correction and data codewords, version information and format information while function patterns consist of the alignment patterns, timing, separators patterns and finder patterns. The structure of a QR code version 7 is illustrated in Figure.1. Each QR code has three Finder Patterns which are located in the lower left, upper left and upper right corner. They are used to recognize the QR code and detect the position of the symbol. Alignment Patterns that only occur from version two up to forty permit QR code readers to compensate for image distortion and the higher the version is, the more Alignment Patterns exist. A quiet zone which is the blank area around QR code is necessary for reading the QR code. It should have the same reflectance value as the light modules, because the QR code readers could not distinguish between the Finder Patterns and the dark background. Timing patterns are used to determine the module coordinates and the separators which are one module wide are used to separate the finder patterns from the encoding region.

The data in QR code is encoded into the binary numbers of “1” and “0” based on Reed-Solomon codes. The bit stream which is generated by message data encoded is divided into a sequence of codewords that are 8 bits length. There are four different error correction levels (L = 7%, M = 15%, Q = 25%, H= 30%). The error correction [3]-[6] is used for recovering the QR code in the event that parts of the symbol are dirty or destroyed. So, the QR code [7] can also be recognized when embed other information in it. The recovery capacity of QR code will be improved by using the higher error correction levels, but it will increase the amount of data to be encoded. It means that a larger QR code version may be required when using a higher error correction level to encode the same message. In order to balance the light and dark modules and provide a good contrast for reading a QR code after encoding the codewords, a data mask is applied to the encoding region. It can minimize the occurrence of undesirable patterns that may confuse a QR code reader. There are eight data mask patterns in total, which are responsible for an optimal distribution of black and white pixels.

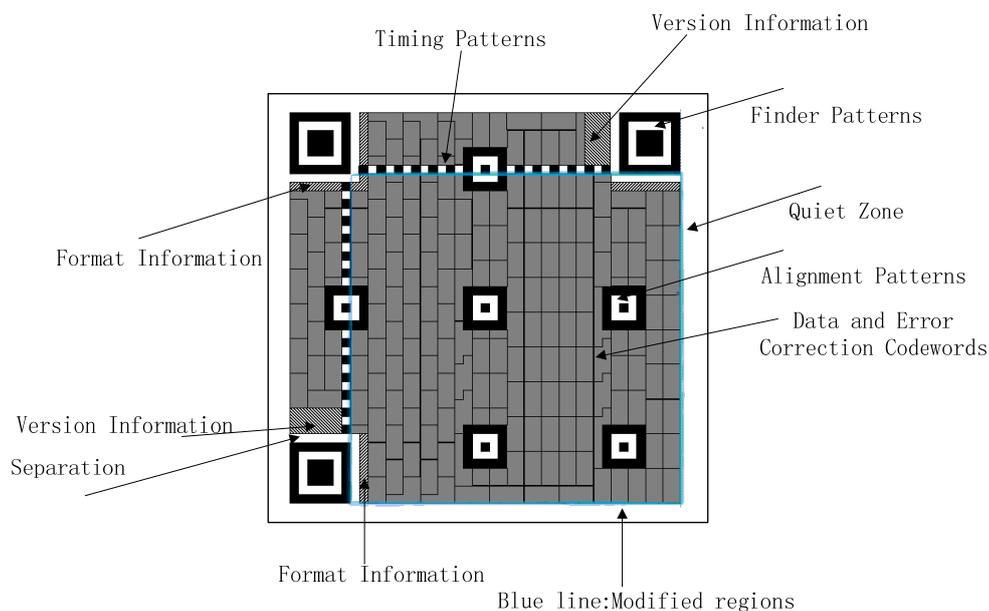


Figure 1. QR code version 7 structure

3. Implementation

In this section, a model about distance education based on QR code called layered education is proposed, which can improve the flexibility and efficiency of distance education greatly.

The structure of the model of layered education as shown in Figure. 2 and the specific steps are as follows. In the model of layered education, different students would go to different courses to learn according to the QR code which is unique and generated for each student by distance education platform. The generated QR code would record the information of each student, for example, name, student ID, course grade, learning progress, links to web course and so on. When scanning the QR code of each student, the education platform would get the key information of different students so that it can assign different learning courses according to grade and learning progress of each student.

In Step 1, each student need to login distance education platform by providing the unique QR code. Then, the platform would authenticate identity information of each student and record the information of courses based on the platform database. In Step 2, whether the information of QR code is correct or not would be confirmed. If not, the student needs to provide another QR code to login in. The students would link to a custom web course platform to learn something when the information is checked correctly in Step 3. In Step 4, each student would start to learn the custom courses based on his information of courses recorded last time. When finish the courses, the platform would record the new information of each student and then generate a new QR code for each student. The new QR code which includes the key information of each student would replace the old one and be assigned to each student in Step 5. When each student needs to log into the platform next time, the new generated QR code would be used. In this way, it can improve the flexibility and efficiency of distance education greatly based on the model of layered education.

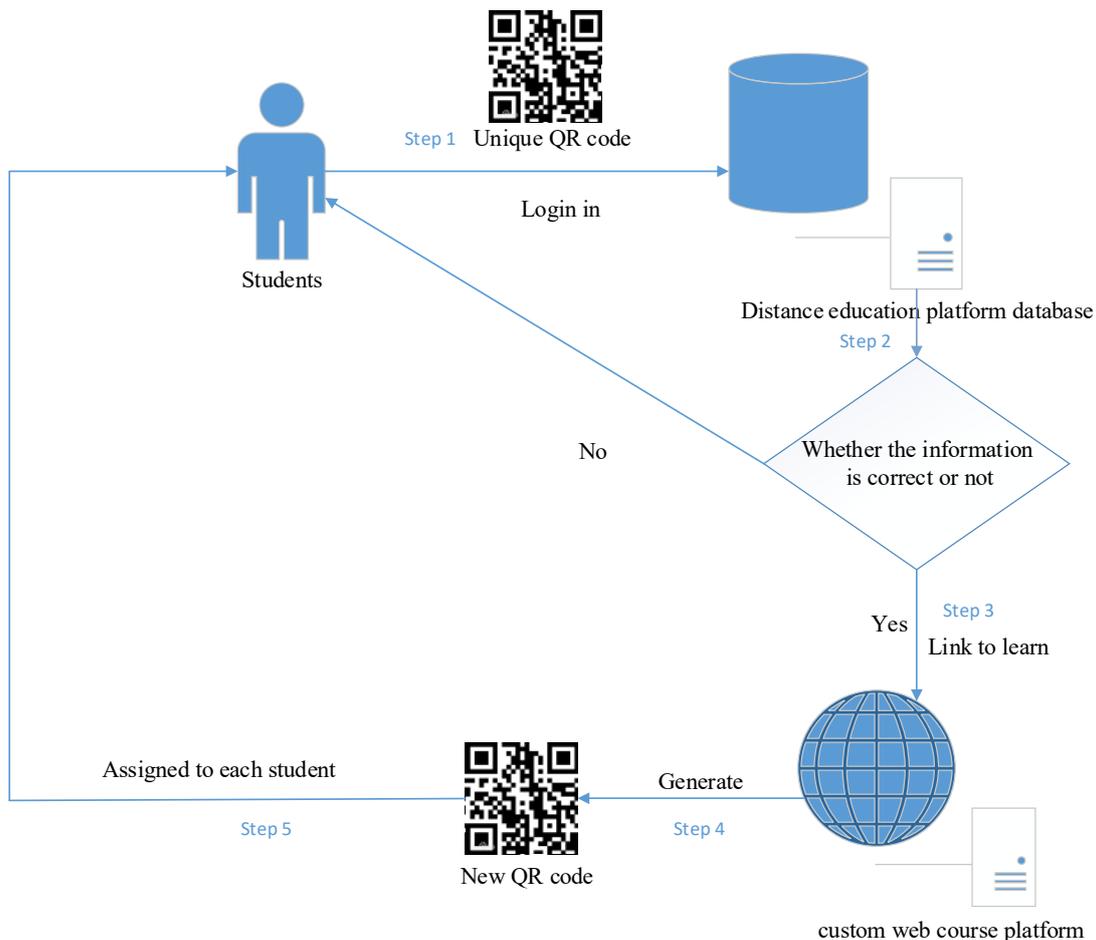


Figure 2. The Model of layered education

4. Conclusion

This paper presents a novel application in distance education based on QR code. In the proposed application, each student would only provide the generated QR code to login in distance education platform. When scanning the QR code of each student, the education platform would get the key information of different students so that it can assign different learning courses according to grade and learning progress of each student. When finishing the courses, the platform would record the new information of each student and then generate a new QR code for each student to replace the old one. Based on this, each student only needs to restore the generated QR code when login in the distance education each time, the platform will assign different learning courses according the information of QR code automatically. In this way, it can be applied in both the PC and mobile platform and would improve the flexibility and efficiency of distance education greatly.

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