
Multilevel controlling of Informative systems by QR-codes

Zaza Davitadze

Computers sciences Department
Batumi State University
Batumi, Georgia
zazadavi@yahoo.com

Gregory Kakhiani

Computers sciences Department
Batumi State University
Batumi, Georgia gkakhiani@gmail.com

Zurab Meskhidze

Computers sciences Department
Batumi State University
Batumi, Georgia
zurab.meskhidze@gmail.com

Abstract – Any modern information system in its architecture implies the need to provide multilevel access to data. Existing mechanisms of customer interaction are oriented to users working with desktop computers and it is quite inconvenient to distribute mobile devices. The present work is presented by our protocol created by providing a security layer in the standard QR code and creation of comfortable conditions for the user. Theoretical and practical realization of this protocol is described on the basis of Application on Android Operating System, which can be used in components of smart buildings or smart cities.

Keywords – *QR-Code, Android, Application, Wearable, Multilevel control.*

I. INTRODUCTION

Development of modern information technology indicates that, providers of informational resource are interested in the guided providence of data for their customers. The guided providence of data, first of all concerns the growth of informational resources, administrative components, on the other hand, customers suggest that it causes difficulties and inconveniences with accessing the data. As a result, all these hampers the spread of services and prevents them from development.

QR coding system is superior for the systems that are based on RFID, because the reading of QR code is very dense and it is almost impossible to read unwanted code. According to this, decoding the QR code is also clear, because it only requires closeness of the device to read the code. The technology based on the QR code is also, such as the ability to save (code) large/big data. The low price and accessibility of that is remarkable [1].

As we know, QR is two-dimensional bar-code and is easily read. It was first used by Denson Wave in 1994 and was spread by the subsidiary company of “Toyota Motor Motors”. QR code can be read using the device that has tools for QR code reading, for example, a smartphone.) Codes can be made

straight onto the URL or onto some other types of codes. QR codes have some restrictions, for example the maximum amount of numbers that can be used are 7089, the maximum number of symbols are 4296 and the maximum size of binary numbers is 8 bits [2],[3].

The usage of QR codes is spreading more and more each day and it’s usually used for marketing purposes. QR codes come with every type of printed media. QR codes are going to change the library consumer service, marketing service and client support for connecting to the library’s works, for the better [4],[5].

The tendency that was described above was highlighted in the modern era of the cellular mobile devices, when humans are attached to informatic systems, but user interfaces of these devices are gradually undergoing the significant progress. Meanwhile, the mentioned systems’ unated standards are in the process of formation. The good example of that is – the appearance of advanced consumers devices (such as: hardware-software and consumer-design products) on the market. Despite of the wide range of hardware and software products, all the solutions provided by them do not justify the complaints, such as data-access standards that would have unconditionally absorbed the functions of easy use and also its universality, and most importantly these standards would have

been compatible to the most of the products, which are already existing on the market [6].

In our point of view, all these problems can be solved by using the QR system of data coding. As it is known, this system grants ability – to easily access different resources and also it can save consistent amount of data in one whole package. For now, it is formidably aprobated mechanism for the transmission of different kind of data. Moreover, QR-codes practicability and popularity make it even more attractive for using it in whole new domains and professions (where they have not been used yet), but if the data and further information will be safe[7].

We have investigated the problem and created a software, which has an ability to access different data and resources with the same QR-code. The practical value of this ideation is that – a number of people can have access to different information by the one particular QR-code, but only if these people have the appropriate permission of accessing that certain data.

For instance, let’s take the university – if a certain QR-code is going to be established in an auditorium then we can ensure that students will be provided by Wi-Fi access only during the lectures; academic personnel will have access not only to the lecture’s schedule, but also to the technics in the auditorium, and the university’s administration persons will have an additional access to the inventory in the auditoriums. This method can also be used for the digitalization of the cities – on: touristic objects, restaurants, cafes, etc. in order to gain information to the different access-leveled users, but with the one particular QR-code. Utilisation of this system might be pretty wide because of its easy use and practicability .

II. SYSTEM’S ARCHITECTURE AND METHODS

System’s architecture visualized on the Figure.1, where are:

1. Data-base – Collection of the shared resources.
2. Administrative interfaces of the data, in order to generate the keys for the management of owned and shared resources.
3. Administrative personnel.
4. Key for the access to data/resources (QR-code).
5. Customers.
6. Customers’ service interface for the data-access, in order to ensure the customers access to the resources shared to them according to their designated level of access.

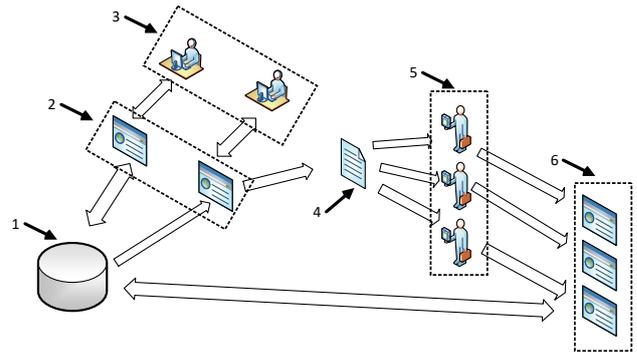


Figure 1. System’s architecture

It has to be mentioned that any organization tries to facilitate and make their work more efficient by their corporative intra-net and because of that they try to create electronic informatic systems, which are going to aid them in correctly and effectively wrapping up their working process.

Main aim of this research was the creation of the system, which would have an ability to have multi-leveled access to informative systems by just the one QR-Code, in which information is divided according to the permitted level of access for each customer and the identification of the customer is going to be able only by respective application of this program. Outside users won’t have any access to the data because of the specific encryption systems.

Another aim is the creation of multi-software and multi-hardware model of platform for facilitating the management of any business-model. The novelty of the research is a result of the given statical QR-Code’s encryption for reading the data, finding the respective level and accessing the respective information for the system,- finding out the wanted level is possible only by the customer who has the permission or the appropriate access-level and in order to find out whether customer has the appropriate access or not,- he or she has to utilize the application thanks to which QR-Codes are read and further details are identified.

As a solution, we created the informative system, database, customers’ database, QR-Code generator and QR-Code reader for Androids. Each of these components are created specifically for organizational/business models and the necessary safety measures are taken for data, for program codes and for informative systems.

QR-Codes generator – Creates code, which is encrypted with BASE64 and by the symmetric encryption algorithms. We used the easy algorithm of symbol alternation as an encryption algorithm for our product (Fig.2)

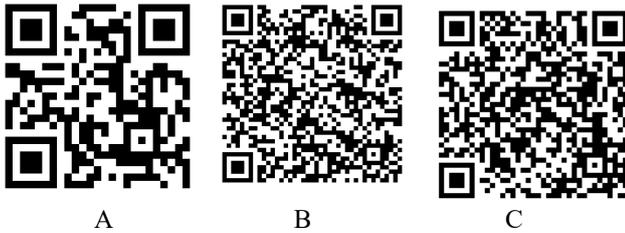


Figure 2. The examples of QR-Codes A) Standard Coding B) A number of links in a standard coding C) A number of links, which are coded together with BASE64 and encrypted.

The mentioned script generates QR-Codes with the informative system’s link-<http://westgeorgia/qrcode/>, also, the info about the link’s access-level is integrated within a code. Informative system is protected from any kind of security breaches, because a link, which forwards us to the wanted data, exists only in the QR-Code and it is nowhere else to be found. Respectively, outside-users can’t see the system’s web-address and thus, can’t launch cyber-attack. Accordingly, databases are connected only to informative system.

III. SYSTEM’S BACKEND

Content management system created by an informational system - any copyright or standard (available on the market) using CMS. While the data is processed using HTML / CSS / JAVASCRIPT / BOOTSTAP technologies. point out that in our case the information system was drawn using DJANGO, the Django-based information system was very simple and the organization would have needed a web developer who would have had experience in this technology, since our goal is to automate and simplify, Mito conducted studies have shown that this technology can also be easy to merge WordPress-, since it does not require any special knowledge of web programming, any profession person information management becomes easy.

The database system database created for Django was created by the database management system - SQLite because the interconnection is relatively simple compared to another DBMS and easily accessed by means of the same QR code.

The information system created on WordPress uses the MySQL database management system, since it has the simplest interconnection (since Content Management System is written in PHP - programming language).

QR-Code generator’s script is written on programming language - PYTHON, because the easiest and fastest way of QR-Code’s creation, integration of a link in it and the utilization of encrypted algorithm is possible on this particular language. Program code (Fig.3) is formed just by a couple of lines.

```
def _on_texture(self, instance):
    self._detect_qrcode_frame(
        instance=None, camera=instance, texture=instance.texture)

def _detect_qrcode_frame(self, instance, camera, texture):
    image_data = texture.pixels
    size = texture.size
    fmt = texture.colorfmt.upper()
    pil_image = PIL.Image.frombytes(mode=fmt, size=size, data=image_data)
    symbols = []
    for code_type in self.code_types:
        codes = zbarlight.scan_codes(code_type, pil_image) or []
        for code in codes:
            symbol = ZBarCam.Symbol(type=code_type, data=code)
            symbols.append(symbol)
    self.symbols = symbols

1 import pyqrcode
2 import qrcode
3 import base64
4
5 encoded_data = base64.b64encode(b'http://westgeorgia.ge/qrcode/')
6 #decode_data = base64.b64decode(encoded_data)
7 qrcode = pyqrcode.create(encoded_data)
8 #img=qrcode.make_image()
9 #img.save("image.jpg")
10 qrcode.svg('image-student.svg',scale=4)
11 qrcode.show()
12 print('QR Code Generated')
```

Figure 3. Parts of program codes.

QR-Code reader is ANDROID application, which is used for the management of the informative system and for access to data from ANDROID platforms. The code was designed using the ANDROID STUDIOS, but it should be mentioned hereby that first reader was created using the programming language - PYTHON, because the formation of algorithm turned out to be easier, despite a fact that for generating such an applet, the operative system LINUX is used,- it’s special version LINUX BUILDZER, where the written algorithm is generated as an ANDROID application. Moreover, parallely our applet (and generally, the whole system) was built using ANDROID STUDIOS because standard applet’s distribution this way is far easier and it sort of guarantees fine multi-platform.

The QR CODE GENERATOR was designed and generated by 3 codes, which were placed on the 3 different types of rooms in the university, one of which was located on the usual laboratory, the other was placed at the Department of Computer Science, and the third was placed on the library in the university. In accordance with the information system, information about all three types of rooms was provided with the right to access.

QR CODE READER - created a 3-level application in the same way we wrote a student, lecturer and administration representative in mobile phones (which have an ANDROID operating system). There are three different applications that read the common QR code and the information system is looking for different information. For security purposes, this application is installed personally, which means that it is not

available for general search engines and stores (regard to PLAY STORE and APP STORE).

Apart from the university, it is planned to introduce this approach in different organizations, including tourist facilities, restaurants, public places, banking systems, etc.

QR CODE READER is not only for the ANDROID operating system but also for the iOS and MICROSOFT MOBILE operating system, after which the system will become multiplatform and will be available for any smartphone users.

IV. SUMMARY

This article describes the technology of the multifunctional coding, QR coding, which is used to differentiate the user's ability of accessing the resources. For example, with the help of different decoders, the user gains the access to different resources of the IT department or IoT system.

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