# Automatic QR credentialing system applied to the "Ignacio Manuel Altamirano" Multiple Care Center

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**Abstract**

The present work designs and implements an automated system of credentialing using QR code, applying the agile methodology of software development called SCRUM. The QR will contain a useful information file, solving the need for students with multiple disabilities at the 48th "Ignacio Manuel Altamirano" multiple attendance center, to have a credential with meaningful information that allows them to receive better care in different situations, Highlighting situations of medical emergencies and security. Innovative software tools such as the Java programming language, Itext library for PDF management, Media Framework library for webcam management, database manager (MySQL), use of GPS and a QR code creation algorithm will be implemented, In order to obtain a credential and badge under the ISO / IEC-7810 standard on the properties of the quality of identification cards.

**Credentials, QR Code, GPS, Students**

**Citation:** ANGUIANO-BELLO, Ernestina, CARRILLO-QUIRÓZ, Anastacio, RENDON-CASTRO, Ángel Arturo and VALLADARES-VILLALOBOS, David. Automatic QR credentialing system applied to the "Ignacio Manuel Altamirano" Multiple Care **Center**. ECORFAN Journal-Democratic Republic of Congo 2017, 3-4: 6-14

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## Introduction

The credentials that the students carry are a problem if they do not have it and do not contain the necessary information that identifies them or supports the condition that they are persons with disabilities. In order to innovate the process of the credentials, the software cascade method was used, which orders the stages of the process for software development, as well as the use of the QR Code and Java programming language, Itext library for PDF management, Media Framework library for webcam management, database manager (MySQL) and use of GPS, in order to obtain a credential and automated badge with your photo and substantial student information.

## Justification

The present work will be done to contribute to the improvement of the process of generating credentials, making it easier and more useful to help the staff of the institution, parents and 80 students with disabilities that on average attend the Center of Attention Multiple No. 48 "Ignacio Manuel Altamirano" at different times, offering identification documents with emerging information technologies applied, which will allow them to have better attention in different situations, but especially in emergency situations that may arise.

It is important to implement the technological tools available to the institution, making the most of its benefits, optimizing the use of resources in order to minimize the considerable waste of office resources that currently happens in the institution.

Encourage applied research aimed at the development and implementation of free software that really benefits the society in which we live, applying new technologies in current issues that supports the line of generation and application of knowledge called "Emerging Technologies of Information and Communication" Stimulating the implementation of projects for the benefit of the community.

## Problem

At present, the multiple care center "Ignacio Manuel Altamirano" n ° 48, with key 12dml0048d, has two types of credentials, one of them is provided by the government of the warrior state, which has personal data that identify the type of disability And name, the other is generated by the same school through a complicated and inflexible process, printing the front and back in different documents and then joining them, generating a reduction of office resources, as well as having the parents place the picture of the Student in the credential, for which the cost is increased with the transfer and acquisition of the photograph.

The information contained in these documents is not sufficient to identify and provide better care to students in various situations, such as the case of an emergency of various types, such as lost or a medical emergency. Another drawback is that the credentials of the government of the warrior state usually do not arrive in time and form, so that the students must go to the corresponding government facilities causing a complicated transfer due to the disabilities of these, consequently not all Students acquire with this document.

## Hypothesis

Through the implementation of QR code you will get an automated credentialing system.

## Objectives

### General Objective

Design, develop and implement an automated system of credentialing using QR code to grant innovative identification documents with QR and GPS technology to the students of the multiple care center No. 48 Ignacio Manuel Altamirano.

### Specific objectives

- Design and develop a database to store student information.

- Investigate and implement QR code to display information electronically.

- Design and develop the system using a Java programming language.

- Investigate and implement the use of GPS to locate the place of residence and institutions of the student's credential.

- Capture and implement photography to optimize the webcam credentialing process.

## Theoretical Framework

QR code

A QR code is a two-dimensional matrix formed by a series of black squares on a white background. This matrix is read by a specific reader (QR Reader) in our mobile device and immediately takes us to an application on the Internet.

The term "QR" comes from "Quick Response" because of the immediate response they offer through their reading. Although the authors have patented their discovery, in order to encourage their acceptance and use, this Japanese company has decided not to exercise such patent rights and make public its specifications, which have become standardized documents in ISO, available to any person or organization. That its use is, nowadays, free. In addition, there are available to users multiple free applications that allow them to be read quickly and easily, and the link to the resource that links the QR code.

They are composed of three squares at the corners that allow the reader to detect the position of the QR code and a series of scattered squares that encode alignment and synchronization.

The QR code is fully adapted to the project since it is capable of storing a large amount of information in a small space such as a credential, it is important because identifying a person with different abilities is necessary to know all the data necessary for their rapid identification (Javier, Izquierdo & Cháfer, 2014)

## Types of QR codes

### QR code. Model 1 and model 2

Model 1 is the original QR code. The largest version of this code is 14 (73 x 73 modules), which is capable of storing up to 1,167 numbers. Model 2 is an upgrade in model 1, with the larger version 40 (177 x 177 modules), which is capable of storing up to 7,089 numbers. nowadays, the term QR Code generally refers to this type.

### QR Micro Code

You only need an orientation detection pattern for this code, which allows you to print it in a smaller space than before.

This code can be viable even if the width of its margin is 2 module-value (QR code requires a margin of 4 modulus of value at least around it). The largest version of this code is M4 (17 x 17 modules), which can store up to 35 numbers.

## IQR Code

Code that can be generated with square or rectangular modules. It can be printed as a return code, a black and white reversal code or a dot pattern code (direct part mark). The maximum version can theoretically be 61 (422 x 422 modules), which can store around 40,000 numbers

## SQRC

QR code that has a read restriction function. It can be used to store private information or to manage the internal information of a company). its appearance is not different from the regular QR code.

## Frame QR

FrameQR is a QR code with a "canvas area" that can be used flexibly. Since letters and images can be inserted within the area of the canvas, FrameQR can be used for promotion, judgment of authenticity, and other various uses. (Qrcode 2017)

## Standardization of QR codes

The process of standardization of QR codes has been the following:

October 1997: approved as AIMI (Automatic Identification Manufacturers International) standard: ISS-QR Code. Defines the codes "QR Code Model 1".

March 1998: approved as JEIDA (Japanese Electronic Industry Development Association) standard: JEIDA-55.

January 1999: approved as JIS (Japanese Industrial Standards) standard: JIS X 0510.

June 2000: Approved as International Standard for International Electrotechnical Commission (ISO / IEC): ISO / IEC 18004: 2000. Defines the codes "QR Code Model 2".

November 2004: added the "Micro QR" variant to the standard.

September 2006: update to ISO / IEC 18004: 2006. Defines the codes "QR Code 2005".

December 2011: Approved by GS1, an international standardization organization, as standard for mobile phones (Qrcode, 2017)

The standard specifies the characteristics of the symbology; Data encoding methods; Symbol formats; Dimensional characteristics; Methods of error correction; The reference algorithms for decoding; The quality requirements of the process; The application parameters eligible by the user; And a list of informative annexes (Javier Luque, 2017)

Java

It is an object-oriented programming language and a computer platform commercialized for the first time in 1995 by Sun Microsystems. Its main objective is that the applications are multiplatform, that is to say, that the application developers write the program once and run it on any device.

It has become one of the most popular programming languages in use. Currently, it belongs to Oracle Corporation. (Oracle Corporation, 2017)

## MySQL

It is the most popular open source database on the market, plus it is fast, robust and flexible. Currently, it belongs to Oracle Corporation.

It is ideal for creating databases with access from dynamic web pages, for the creation of on-line transaction systems or for any other professional solution that involves storing data, having the possibility of multiple queries (Oracle Corporation, 2017)

## NetBeans IDE

It is a development environment, a tool that allows developers to write, compile, debug and execute programs in the Java programming language, but can be used for any other programming language. NetBeans IDE is a free product with no restrictions of use. (NetBeans IDE, 2017)

## Java Media Framework

It is a library that enables audio, video, and other time-based media to be added to technology-based Java applications and applets. This optional package, which can capture, playback, stream and encode multiple media formats for developers. (Oracle Corporation, 2017)

## IText

IText Software is a specialist and global leader in programmable PDF software libraries. The iText solution was designed by the visionary Bruno Lowagie in 2000 and has seen continuous growth in its 15 years of existence.

With iText, you can create, expand, extract, split and interact with any PDF file. (IText Group NV, 2017)

## GPS

The GPS is a satellite positioning system developed by the US Department of Defense, designed to support precise navigation and positioning requirements for military purposes. At present it is an important tool for navigation applications, positioning of points on land, sea and air.

By means of this system it is possible to determine the coordinates that allow placing the Multiple Care Center within the credentials and thus provide an excellent location in the event of an incident (INEGI, 2017)

## Webcam

A Webcam is a front-facing video camera that connects to a computer normally via USB or that is built into a laptop or desktop display. It is widely used for video call programs, as well as to continuously monitor an activity and send it to a Web server for public or private viewing. The webcams usually have a built-in microphone in the unit, or an external microphone comes in the package. (PCMag Digital Group, 2017)

**Research Methodology**

**Type of Research**

The work carried out is based on applied research for our study object, which is the development of the system.

The sources used for the project were based on:

− The case investigation is carried out with focus on the multiple care center No 48.

## Theoretical Methods

The analytical-synthetic method is used because the problem to be analyzed is divided into several parts and then integrated according to the Top Down design.

## Software Development Methodology

An agile software development methodology is implemented, taking the frames of the SCRUM model.

SCRUM is an agile framework for completing complex projects. SCRUM was originally formalized for software development projects, but works well for any complex and innovative work environment.

With regard to this agile development methodology, the following roles are intended to be assigned to all those involved in the development of the system

• Product Owner = Director in charge of the "Ignacio Manuel Altamirano" school.

• ScrumMaster (the Facilitator)

• Managers

• Scrum Team = Students of the Engineering Degree in Computer Systems.

Times of iterations of variant character that conform to the development of the project, will be implemented:

− Stand-up meeting: Meeting where the general state of the project will be reviewed.

− Sprint: It is the time in which the work of the activity in turn is carried out.

− Sprint Review: Review activity status and product demonstrations.

Steps to Implement

The following steps are required:

− Requirements analysis: Analysis of customer needs.

− Design of the system: Development of the structure of the system.

− Development: Phase where program and build the system.

− Testing: The correct functioning of the system is checked.

− Implementation: Stage where the system is implemented in CAM No. 48.

## Results

Then the results of the system, which comprise the functional software, are manifested.

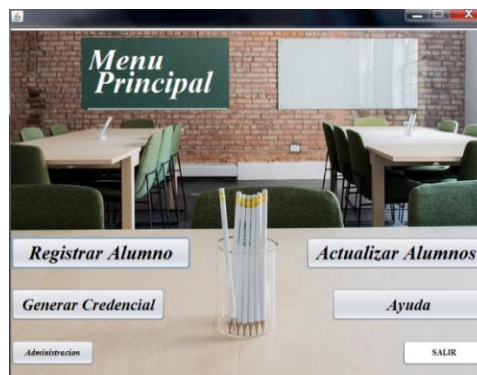The appearance of the system has an easy-to-understand menu of options as shown in figure 1.



**Figure 1** System main menu

The register student option allows the capture of the information of a new student in the database, the required fields are shown in figure 2.

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**Figure 2** Student registration interface

To take the photograph is linked to a module through the "Capture Photo" button that makes use of a webcam connected to the computer, in this module the image is displayed (see figure 3) for later capture as a file and saved in the database.
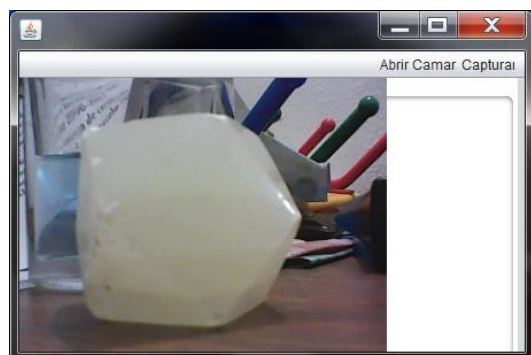


**Figure 3** Image capture interface

When you save the new student's record, a QR is automatically created that contains your information and the links that are redirected to Google Maps. In the Update students section of the system, it allows the editing of student information (see figure 4), as well as updating the photo and the QR.



**Figure 4** Student Update Interface

In the credential generation section, two file types are created for printing, the first contains the credential and badge in the same document, while the second is sectioned into four sheets for special printing on PVC cards with a laser printer using a configuration previous.



**Figure 5** Credential Generation Interface

As a result two documents are generated which are the credential and the badge, as you can see in figure 6.

Article

a)



b)

**Figure 6** a) Credential; B) Gafete

When QR codes containing these documents are scanned and without an internet connection, a complete student information file (see Figure 7) is shown, as well as two links that redirect to the Google Maps application which show the Route from the location where the code is scanned to the address of the student's home and school (see figure 8).



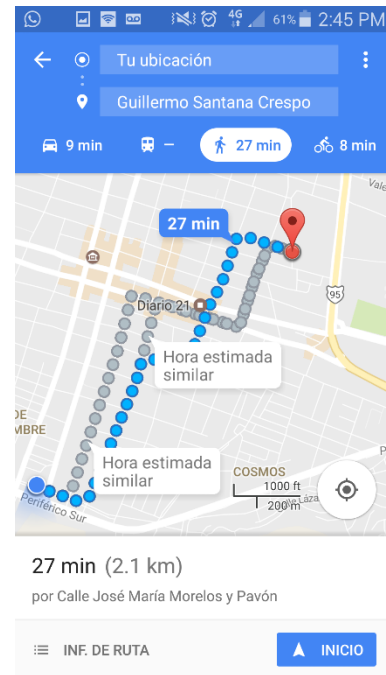**Figure 7** Recorded scan QR scan



**Figure 8** Route shown in Google Maps

In addition to the sections shown, there is a help section containing videos showing the execution of various processes, also has an administration section that allows adding, modifying and deleting users with access to the system.

The images contained in the interfaces backgrounds are owned by Pixabay under the public domain CC0 1.0 Universal, which can be found at the following link: https: //pixabay.com/es/service/terms/#usage .

## Conclusions

So far, a fully functional version of the system has been implemented and corresponding training has been carried out to enable CAM 48 staff to create identification documents for their students for the 2017-2018 school year, which represents a number of benefits for The institution, parents and especially students with various disabilities, promoting the participation of academic bodies in the generation of projects that benefit society and encourage the participation of students of the Technological Institute of Iguala to strengthen their Knowledge and skills.

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