



Design of an Intelligent System for Automatic Verification of Presence and Authorization in an Examination Room: CERFILTEX Case

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Abstract: Checking attendance has become a common practice in all education systems. In response to this situation, there are many verification methods but the emphasis is on automating the process. The research and training center for light and textile industry (CERFILTEX), in the Republic of Mali, still applies the traditional manual method for the identification and preparation of the attendance list in the examination rooms. This manual process of verifying eligible students and counting the number of participants' papers results in a significant delay. In addition to this, some dishonest people may take exams in place of others. To address these concerns, an intelligent and efficient system is designed and developed in this work. After registering all participants by storing their data with their unique badge code and/or fingerprint, the system automatically records exam attendance and verifies eligibility by applying RFID and/or fingerprint technologies in searching for a match in the created database. To reinforce security, the photo of the person registered in the database is displayed on the screen to allow the supervisor to reassure himself that it is indeed the person carrying this card. This process eliminates any fraud and saves processing time for verifications and registrations. 20 students tested the system and the success rate was 100% while reducing the average execution time to 3 and 6 seconds per student instead of 25 seconds with the manual method.

Keywords: Microcontroller, RFID, fingerprint.

I. INTRODUCTION

Nowadays taking attendance of students in an examination room in an automatic manner not only helps to keep a record of attendance but also facilitates the task of the exam organizers to classify students according to promotions and exams taken [1, 2, 3]. And this strategy is not implemented at the Research and Training Center for Light and Textile Industry, due to the various challenges posed by the current method of taking attendance. And the traditional method involves the use of paper sheets to ensure the presence of students [4].

This manual process is time-consuming and it is difficult to determine the number of students who have reached the minimum percentage and are therefore eligible for the exam [5]. It is therefore necessary to have a system that would eliminate all these inconveniences [5].

To better understand this ambiguity, a question crosses our minds: Concretely, are there effective means allowing a rapid control processing as well as an ease in the task of recording and verifying the presence of students in an examination room? To provide a solution to the problems posed, an intelligent system (RFID cards, readers of the latter or fingerprint readers, i.e. the two technologies combined) is proposed.

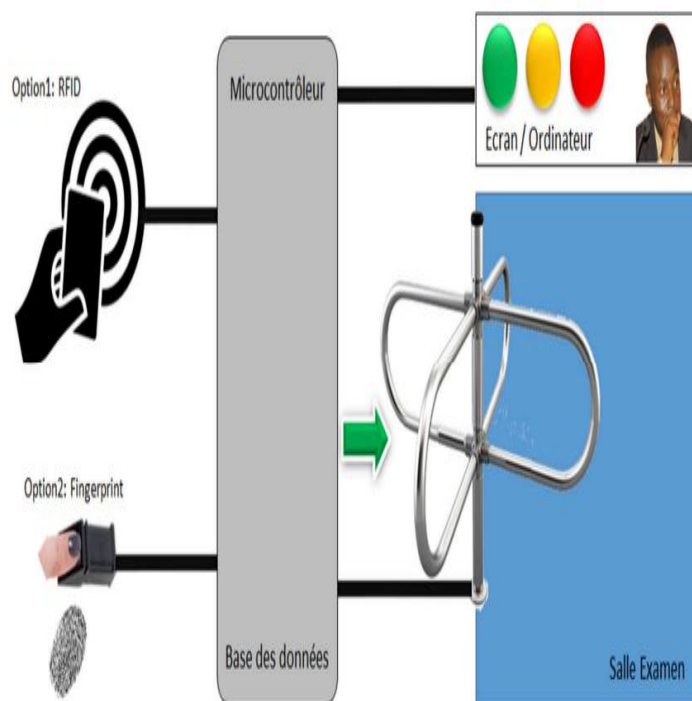


Figure. 1. Proposed system: automation of access to the examination room.

This system is designed assuming that each student has a card with RFID transponder for the application of RFID technology. And the system monitors the access



authorization to the examination room and automatic attendance recording.

II. MATERIAL AND METHOD

The system is based on two main parts:

- ☐ A "web application" part to process information, make it available and accessible;
- ☐ A hardware part consisting of the Arduino card, RFID module, fingerprint module and a WIFI module to transmit the information of each student to the system.
 - ☐ An Arduino MEGA card
 - ☐ An RFID module (reader and labels)
 - ☐ A fingerprint reader
 - ☐ RFID tags / cards in the form of badges
 - ☐ A WIFI module (Shield)
 - ☐ System administration,
 - ☐ **3 LEDs (Light Emitting Diodes), green, yellow and red**
 - ☐ **A servomoto**

III. RESULTATS

The student scans the RFID card/badge or places the finger on the fingerprint reader and depending on the decision of the microcontroller/database, either the room door or the turnstile device lets the student in if he is in order, or the door does not let him pass by lighting the yellow or red lamp as the case may be, (Figure 1 and 2). The student's eligibility verification block for the exam is a quick indicator to the exam invigilator: a green LED lights up if the student is in order, a yellow LED lights up if the student is registered but is not in order (school fees) and finally a red LED lights up if the student is not registered in the database. In addition to this, upon entering, the student's photo is displayed to allow the invigilator to reassure himself that the exam is not being done by another person.

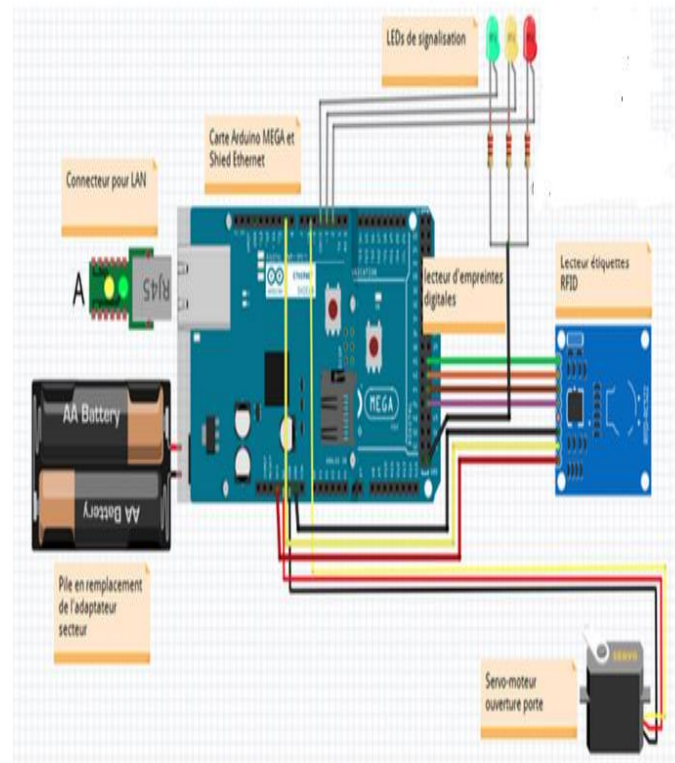


Figure 2. Functional model of the system.

The system is based on two main parts: a "web application" part to process information and make it available and accessible to those who need it (including exam organizers, different faculties); a hardware part consisting of the Arduino card, RFID module, fingerprint module and a WIFI module to transmit each student's information to the system. Implementation with Hybrid RFID-Fingerprint technology, the flowchart of which is illustrated in Figure 3.

IV. DISCUSSIONS

Compared to manual attendance in an examination room, it appears that the proposed system is far more efficient due to the response time and speed of obtaining reports. Approximately, it takes an average of 6 to 10 seconds to allow a student to access the examination room and register his/her attendance, while for a manual system, it takes an average of 25 seconds.

The system checks eligibility, authorizes and automatically records attendance for examinations. The prototype is able to capture new fingerprints, new badge codes to be stored in the database.

V. CONCLUSION

This study makes an important contribution to the process of digitalization of higher education institutions in Mali, more



precisely the research and training center for light and textile industry (CERFILTEX). The proposed system allows a fluidity of the process of verifying the presence of students in an examination room. The system made it possible to know with accuracy the list of all students in the examination room and the promotion of each one. This system is intended to contain data related to the different flows of presence and participation in the examination. The goal remains and remains that of creating a tool to help verify presence and automatic authorization of access to the examination room.

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