

# Management of an Automatic System to Generate Reports on the Attendance Control of Teachers in a Educational Center

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**Abstract**— Many countries were affected by the appearance of SARS-COV-2 that was spreading rapidly, causing damage to humanity and causing a global crisis, this generated a generalized quarantine to avoid the physical approaches recommended by the health system, affecting all students in the world, since it was wanted to avoid forming foci of contagion in educational centers, for this reason, some automated systems that are marketed in the markets were applied to combat the pandemic in educational centers, but they are inefficient when registering the work attendance of teachers, causing loss of time in the registration process and causing an agglomeration of people due to the failure in the registration process, in addition to not allowing to manage the reports of the teacher's work attendance. In view of this problem, in this article the management of an automatic system was carried out to generate reports on the attendance control of the teaching staff in the educational center and control the working hours of each teacher to be visualized through a user interface, being able to control the labor discipline of each teacher since all the records will be stored in a database. Through the development of the system, it was observed that the system works effectively since an efficiency of 98.87% was obtained in its operation to control the time of entry and exit of each teacher, being an accepted value since the process is conducted safely.

**Keywords**- Database, COVID-19, User Interface, MySQL, Python, Raspberry pi.

## I. INTRODUCTION

At this current juncture it is observed that the world is still affected by a highly contagious virus generated by SARS-COV-2 [1], this virus spread progressively through all countries

causing an increase of 45.78% in the mortality rate and a high economic loss in many countries causing a global crisis [2]. Being a virus that is characterized by being of rapid spread, many governments declared as a preventive measure to establish a mandatory quarantine to reduce infections among citizens,

preventing people from having any direct contact as they normally did [3], therefore, all public activities were suspended, affecting 89% of the student population in the world due to the suspension of face-to-face classes in all educational centers, since with the advance of the pandemic the medical staff made an indispensable effort to respond to this pandemic, but it was not enough to be able to face this virus due to the lack of infrastructure to attend to all infected patients and the lack of medical equipment. [4]

Given the crisis facing the health system, the government decided to establish some biosecurity measures such as physical distancing and the use of a face mask so that people can continue to conduct their work activities or can return to face-to-face classes. The measure of physical distancing plays an important role in this pandemic because there are asymptomatic people who do not present any symptoms, but continue to spread the virus, therefore, it is necessary to respect physical distancing within an educational center because there is a greater concentration of people and it could prevent teachers and students from being infected with COVID-19 [5]. Given the need to face COVID-19, it has been observed that in recent years there has been a growth of 90.75% in the development of automation technologies unlike years before the pandemic [6], with the aim of preventing people from having any physical approach to prevent COVID-19 infections [7]. These automation technologies are intended to make manual processes where a person in charge was necessarily required, can be done through an automated system [8], therefore, by applying these automation technologies for the management of teaching staff in the middle of the pandemic would generate an important change in the educational centers.

For a correct management of the teaching staff, every educational center must know the working time of all workers, the distribution of the different shifts within the educational center and the control of the time of entry and exit of each worker [9], which are data that must be managed efficiently, but currently it is observed that for the annotation of attendance of the teaching staff, it is necessary the supervision of a person who fills out the attendance record, existing a physical contact directly and leading to a possible contagion of COVID-19 [10], being able to form a new focus of contagion with all students, since this attendance control system that is used in educational centers are not optimal, they waste time in the registration process of each teacher forming a long queue, by some error the person who supervises can place some wrong information and in addition to wasting time in the process of searching for previous attendance records [11]. Therefore, our proposed system will allow the administrator to manage the information about the attendance of each teacher within the educational center just by viewing the report of the working days that the system will send automatically when the workers have registered their work

attendance through a fingerprint reader that will recognize the identity of the teacher and through a user interface the teacher will confirm the data it shows. the system, sending and storing every recorded information to a database.

The objective of this research work is to carry out the management of an automatic system to generate reports on the attendance control of the teaching staff in the educational center and control the time of entry and exit of each teacher to be visualized through a user interface, with this it will be possible to control the labor discipline of each teacher since this system will store in the database the records of assistance in an orderly manner. For the elaboration of the proposed system, a fingerprint reader, a MySQL database, a touch monitor, a Raspberry pi 3 programmed with Python will be used. The Python programming language allows us to develop web applications in a simple way, making it a useful tool.

In section II, the literature of research papers was reviewed. In section III, the methodology shall indicate the block diagram of the system. Section IV shall indicate the operation of the user interface. Section V shall indicate the results obtained from the attendance control system. In section VI, the discussion will be indicated, highlighting the importance of the research work. Finally, in section VII, the conclusion and recommendation of the attendance control system will be presented.

## II. LITERATURE REVIEW

For several reasons, the supervisors in charge of registering the work attendance file of the teachers forget to do it or place some wrong data, leading to a problem with the educational center, so it is necessary to use the automated systems that allow this process to be done efficiently. For example: In [12], the authors mention that the assistance system that is used in the corporation where they work is not managed efficiently since it uses an unreliable method because it does not record the attendance of workers, being necessary to register two or more times so that the system manages to register the worker wasting time and forming agglomeration, Even worse than we are in a difficult time of COVID-19 that has claimed many lives and is transmitted by close contact, which is why the authors proposed to realize a system of administration of attendance control for employees within the corporation. The proposed methodology uses a medium monitor where the worker marks the attendance manually, a surveillance camera to confirm the identity of the worker, an Arduino UNO that controls the stored data and finally makes a log file that sends to the administrator. Obtaining as a result an efficiency of 89.99%, concluding that its proposed system solves and facilitates the assistance of workers, allowing to manage the registered data.

In [13], the authors mention that an important tool to efficiently manage the attendance record of workers without the need to have physical contact with any device or object due to

COVID-19 is facial recognition, which is a technique that allows us to detect the faces of people and with it you can record the attendance of people in a database without the need to be filling out the attendance sheets that are commonly used generating loss of time, that is why the authors proposed to make an automated assistance manager system developed with image processing for facial recognition. The proposed methodology uses a set of training data to detect faces and distinguish them from the background environment from videos and thus record people's attendance by identifying them from their variants of facial features without human intervention. Obtaining as a result an accuracy of 45% when detecting faces with the Viola Jones algorithm and a 50% accuracy for facial recognition with the Fisher Face algorithm, concluding that the method used generates a waste of time and infections of COVID-19.

In [14], the authors mention that the good management of worker assistance generates that companies improve their corporate performance, since it reflects the importance of workers in fulfilling their working hours and in addition to observing the commitment that workers have to meet the long-term goals that companies set, however, there are systems that control attendance, but they have many cost and monitoring limitations, so it does not suit companies due to the little confidence generated by these systems that are marketed in the markets, in addition to their low efficiency that cause a long queue to register attendance and even worse that outbreaks of COVID-19 infections are observed, that is why the authors proposed to make a work attendance management system for employees with cloud-based web application with NFC. The proposed methodology performs several important operations such as recording the attendance of workers through NFC technology, also performs automatic calculations about the time as the verification of leave of each worker, as well as the overtime that a worker could have, also this system generates an access to updated information and generates a report on the registration. Obtaining as a result an efficiency of 93.14%, concluding that its proposed system provides online access for all workers and allows to manage labor assistance data.

In [15], the authors mention that in their workplace they currently fill out the attendance form of each worker with a simple system that uses unreliable and irregular methods, which hinder the administration of assistance because the registered data of the workers can be lost and in addition to wasting a lot of time in the search process due to a bad order, also to generate loss of time at the time of registering attendance, therefore, this method must improve so that it can show the movement of workers in their working hours and also be able to improve the workflow within the company, since being in the middle of the COVID-19 pandemic seeks to avoid the agglomeration of people in the same place to prevent possible infections, that is why the authors proposed to develop a work assistance management

system developed in a web interface with cloud storage. The proposed methodology is developed in the Model-View-Controller framework, using Java Server Faces Framework to visualize and calculate attendance data, they also used HTML and Java Script for the implementation of the client-side web interface and as for the database they used MySQL for the storage of the files of the registered workers. Obtaining as a result an efficiency of 90.79%, concluding that the system manages the registered data correctly and stores the information in the database in an orderly manner.

In [16], the authors mention that the attendance record of workers in their workplace and students in their educational institution, is a very important factor that must be taken to take the corresponding care so that the administrator does not have any problem with the assistance of the worker or the student, but currently they use an inefficient system that has problems in registering attendance and that could cause problems to the worker and the student, and to avoid these inconveniences the same workers register their attendance manually even knowing that we are in the middle of the COVID-19 pandemic where it is necessary to avoid having direct contact with other people, that is why the authors proposed to make an attendance management system based on biometric recognition with RFID technology for the San Antonio institute. The proposed methodology is developed using the Microsoft Visual Studio 2017 platform, where the user interface was created using the C# language, the SQL language was also used to coordinate to the SQL Server database to perform the storage function and be able to consult the information of the assistance of the workers. Obtaining as a result an efficiency of 91.92%, concluding that the development eliminates the inconveniences of the labor assistance that is used in said institution.

### III. METHODOLOGY

In this part of the methodology, the block diagram of the proposed system will be conducted, as shown in Figure 1, detailing each stage that makes up the system and considering important aspects so that the system takes the assistance in an abbreviated time, accurately and efficiently.



Fig. 1 System block diagram

#### A. Teacher's requirement

The teacher's requirement is based on specifying the input and output. In the input part, the attendance system must register all teachers who confirmed their attendance, manage the information of all teachers who registered and store the data including the time of entry. In the output part, the attendance system must record the teachers' departure time, generate the reports that will be sent to the administrator and store the data in the cloud.

#### B. User interface and fingerprint reader

The user interface will allow the teacher to visualize and confirm the data obtained by placing his finger on the fingerprint reader, ensuring that the worker is authentic and guaranteeing the physical presence of the teacher in the educational center, avoiding any inconvenience that could alter the work assistance.

Through a touch monitor, teachers will confirm the data displayed by the system when entering or leaving the school. With this important data, the system will provide this information to the administrator so that he can make the corresponding follow-up of each teacher and can generate the reports in detail of each worker of the educational center on a weekly or monthly basis.

#### C. Raspberry Pi

Raspberry pi is a small computer that has features that adapt precisely to our automatic attendance control system since it is a low-cost card that has various applications. For the proposed system, a Raspberry Pi 3 was used as hosts to generate the system interface for teachers through a local area network and establish stable and secure communication. Raspberry pi has its own database that allows us to easily perform a communication function, but this device has little storage, for this reason, another web server was used that will have constant communication with the Raspberry Pi, for this, we have to configure the SSH connection (Secure Shell) that will allow us to remotely access a web server, also the configuration of the FTP protocol (File Transfer Protocol) that will allow us to transfer files directly to the web server, and finally a static IP address has to be established for a more reliable and stable connection.[17]

#### D. Cloud storage

For cloud storage, it was initially thought to use the Raspberry pi database, but due to its limitation in storage capacity it was decided to use the MySQL database because it is a scalable open source server where the data of all teachers indicating the day will be stored, the time of entry and the time of departure from your school.

After previously registering all teachers in the system, their data can be searched by means of a code of each teacher that is in the MySQL database, where several documents of all teachers have also been created, such as their names, their work shifts and

their fingerprints; To connect the MySQL database with the user interface where the complete data of each worker will be displayed, Python was used as a programming language.

#### E. Administrator

The data administrator oversees managing the reports on the control of teachers' work attendance and verifying the information of each teacher belonging to the educational center, such as, for example, the working hours of each teacher, the working days of each teacher, the courses assigned to each teacher, etc., efficiently.

The data recorded daily by the system will be automatically sent to the administrator so that he can manage it through a report of working days of each teacher, in such a way that, if he observes absences by teachers in the educational center, he can take the corresponding measures.

### IV. USER INTERFACE

At the moment when teachers place their finger on the fingerprint reader, the touch monitor will show the user interface, as seen in Figure 2, where teachers when identified by their fingerprint can access their personal data so that they can confirm the registration of their attendance. In addition, this platform will provide us with the data of each teacher through a connection with the MySQL server, with this, the registration of each teacher can be sent at any time.

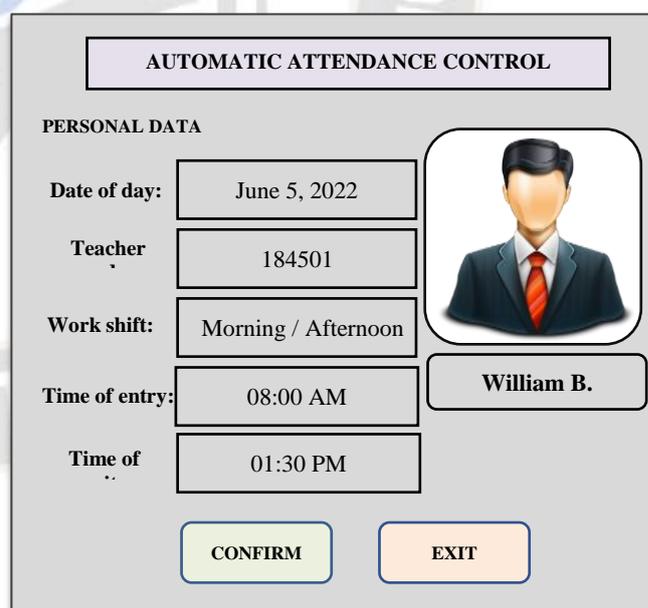


Fig. 2 The user interface

By recognizing the identity of the teacher through the fingerprint reader for greater security, the user interface will be shown where all the teacher's data will be observed and their time of work entry will be recorded at that time, with this, the teacher will interact with the server at the time of confirming the

data shown in the user interface. It should be noted that, for the development of this interface we rely on the use of the Python programming language, because it has many resources and in addition to allowing the use of several servers.

Once the teacher has finished registering his time of entry and exit in the system, this report will be sent through the Raspberry pi to the MySQL server automatically so that it is stored in the database and then the data administrator can manage the report of the work attendance of each teacher just by looking for it through his code. It should be noted that each report of the working hours of each teacher is also sent to the administrator to view that information safely, as seen in Table I.

TABLE I. REGISTERED DATA OF TEACHERS

N.	TEACHER	CODE	WORK SHIFT	DATE	IN	Out
1	W. Perez	184501	Morning	June 5, 2022	8:00 a.m.	1:30 p.m.
2	J. Quispe	184502	Morning	June 5, 2022	8:05 a.m.	1:35 p.m.
3	S. Ramos	184503	Afternoon	June 5, 2022	1:45 p.m.	6:00 p.m.
4	C. Delta	184504	Afternoon	June 5, 2022	Missing	Missing
.....	.....	.....	.....	.....	.....	.....

## V. RESULTS

With the development of the automatic attendance control system, the objective of managing the records of the working hours of each teacher in the educational center is fulfilled, making the administrator able to control the information about the time of entry and exit, replacing other manual systems that are commonly used that cause inefficiency in registering work attendance.

The administrator, when obtaining all the information of their working hours of each teacher, will be able to visualize the time of entry and exit, the shift in which they work and the date on which they attend the educational center to work, having complete information so that they can take the corresponding measures if any teacher misses the educational center.

For the development of the system, some important parts were considered such as the Raspberry Pi which is a low-cost minicomputer that is used for autonomous solutions, so that the system works efficiently by recording the work attendance of each teacher in an abbreviated time. Table II shows the characteristics of the automatic attendance control system.

TABLE II. SYSTEM CHARACTERISTICS

Labor assistance system	
Place of registration	Entrance of the educational center
Registration time	5 seconds
Database	MySQL
Electronic devices	Raspberry Pi 3 / Fingerprint Reader / Touch Monitor
Power supply	Touch monitor: 220v ac Raspberry Pi 3: 5.1v dc Fingerprint reader: 12v dc

For the development of the proposed system, the algorithm shown in Table III was used, specifying each step performed by the system according to each situation or circumstance that occurred in the attendance record, obtaining an efficiency of 98.87% in its operation to control the time of entry and exit of each teacher, being an accepted value since the process is carried out quickly and safely.

TABLE III. SYSTEM ALGORITHM

Algorithm 1 Labor assistance system
<b>while</b> do not activate the time of departure
<b>do</b>
Register the time of entry of the teacher.
Store the log in the database.
<b>end while</b>
<b>if</b> the check-out time is activated
Register the teacher's departure time.
Store the log in the database.
<b>end if</b>
Calculate working time
Store calculated data in the cloud.

The operation of this proposed system in different educational centers will allow the administrator to follow up on each teacher to determine if they comply with their work schedules, being a system that contributes to this current situation of pandemic in which we live.

The implementation of this assistance system is completely safe since there will be no physical contact between the teacher and the administrator who oversees verifying the attendance in the educational center. With this, COVID-19 infections are avoided in the educational center since there will be no agglomeration of people due to the high efficiency of the system in quickly registering each teacher.

The development of this assistance system is very viable for any educational center or company that wants to implement it as an attendance control measure in a certain place since it is not

expensive unlike many simple systems that exist in the market and that also present inefficiency in their operation to register the labor assistance of each teacher.

## VI. DISCUSSION

Different attendance control systems have been developed that seek to manage the assistance of workers and replace the manual and inefficient process that is used in various places to control workers that are also expensive and have limitations in their operation, therefore, this system differs from other jobs that have been carried out previously, for example, the work done by [12], where the authors proposed to realize a system of administration of attendance control for employees within the corporation. From where they obtained a result of 89.99% efficiency, but this system does not use a database that allows it to store all the registered information, limiting the administrator to keep track of the work attendance of each worker. Table IV shows the comparison of this common system (a) with our automatic system (b).

TABLE IV. COMPARISON OF ATTENDANCE CONTROL SYSTEMS

	a	b
How to register	Manual	Automatic
Registration time	2 minutes	5 seconds
Information Management	No	Yes
Storage	Excel file	Database
Efficiency	89.99%	98.87%

We also have the work developed by [13], where the authors proposed to realize an automated assistance manager system developed with image processing for facial recognition. From where they obtained as a result an accuracy of 45% when detecting faces and 50% for facial recognition, but this developed system has a difficulty when trying to detect faces of people with face masks, complicating its operation.

We also have the work developed by [14], where the authors proposed to make a labor assistance management system for employees with cloud-based web application with NFC. From where they obtained a result of 93.14% efficiency, but this developed system has limitation when trying to track the working hours of those workers who work outside the office, being able to consider it as non-attendance because it is not registering the worker.

We also have the work developed by [15], where the authors proposed to make a work assistance management system developed in a web interface with cloud storage. From where they obtained a result of 90.79% efficiency, but this developed

system is limited when trying to calculate the working time of each worker, being able to manipulate that information.

We also have the work developed by [16], where the authors proposed to make an attendance management system based on biometric recognition with RFID technology for the San Antonio Institute. From where they obtained a result of 91.92% efficiency, but this developed system did not consider the interferences that can exist when using this type of technology.

## VII. CONCLUSION AND RECOMMENDATION

It is concluded that the automatic system facilitates the search of each record that has been stored previously by simply specifying the code that each teacher has, this favors the administrator since he will not have to look for the records in physical documents as do the other simple systems generating loss of time.

It is concluded that the automatic system to generate reports on attendance control, contributes to the control of the working hours of the teaching staff in the educational center, with this, the inconveniences that exist at the time that teachers register their time of entry that for some reason the inefficient system does not register it generating a problem are resolved.

It is concluded that the automatic system to generate reports on attendance control works efficiently and shows the teacher's data instantly, it only takes 5 seconds to process the data for storage in the MySQL database, thus helping to maintain order and avoid the agglomeration of teachers now that we are in the middle of the COVID-19 pandemic.

It is concluded that the data administrator will be able to constantly obtain the complete information of the work assistance of each teacher without any problem, since this system will provide all that information effectively that has an efficiency of 98.87%.

It is concluded that the automatic system to generate reports on attendance control does not need the staff in charge of supervising the entry and exit of the educational center to have any physical contact with the teacher, thus avoiding infections of COVID-19 between teachers and students who are in their charge.

As a future work, a mobile application will be added to the automatic system so that through mobile devices those workers who work outside the educational center can be controlled.

It is recommended to record the personal data of teachers along with their fingerprint before starting the system so that later the system will quickly identify you and record your working hours within the educational center.

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