RFID Based Employee Attendance Monitoring System for LSPU SPCC

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Abstract

Employee attendance monitoring system is important in an organization. It involves observation of behaviors, time keeping and site security. It is important to have such a system that will be used in this kind of operation. This special project is focused on employee attendance monitoring system using RFID. An additional method of attendance monitoring is for the existing biometrics at Laguna State Polytechnic University. The project was designed using RFID reader for the scanning of RFID tags, RS 232 to TTL converter to convert the data coming from the reader. A visual basic programming software was used for the program and Microsoft Access for the database. All the readers were connected by a local area network. The existing biometrics scanner was linked into the same database of RFID. Once an employee enters the campus their time in/out will be saved to a common database. Functionality was tested and the test results showed that 100 % of the RFID tags were detected and the maximum distance was 3 inches. The results shows that the system is reliable in terms of its functionality and the sensor reading is accurate. For further studies I would suggest that, aside from the Radio Frequency Identification tags future researchers can use ZigBee technology as its transmitter and receiver in replacement of the Radio Frequency Identification System.

Keywords: TTL Converter, ZigBee Technology, RFID, monitoring system, RS 232

1.0 Introduction

Employee monitoring refers to any method of tracking what an employee does while at work. This may include the use of video cameras, keystroke logging, email filters, or even just watching or listening to the employee. As a result of increased technology, this has become a very important issue in the workplace. Employers have many options at their disposal when it comes to monitoring their employees, but the effectiveness and legality of each technique varies.
depending on the situation. (Clark Eamon, 2006).

As an employee of the Laguna State Polytechnic University the researcher was inspired by the fast changing technology to develop a new Employee Monitoring that uses Radio Frequency Identification technology. RFID Employee Monitoring System will bring a lot of benefits to any company or institution if it will be implemented. It will respond to the needs of any institution when it comes to Employee Monitoring System.

The primary objective of this study is to develop an RFID Based Employee Attendance Monitoring System for our university. Specifically, the study aims to design a circuit that will interface the RFID reader into the system; design the linkage system of the biometrics attendance and RFID monitoring system; create a program which will be used in the implementation of the system, and test the functionality of the system.

The present system used for attendance monitoring is biometrics. The campus uses fingerprint biometrics for the attendance monitoring which is installed at the entrance of the campus. Each data in the biometrics system is downloaded for the retrieval of the daily time record of each employee. For the employee monitoring there is no existing system being used; each respective dean monitors their faculty by corridor observation twice a day.

The problem with these two existing system: In biometrics, you have to remove the biometrics scanner to download the record of each employees, which is very time consuming. In the employee monitoring, it is very hard for each dean to observe them time to time. The usual routine for each dean was to observe at least twice a day and three times a week. That’s why some of the employees were abusing this routine since they can easily get out of the campus without the permission of their superior.

The proposed solution to those mentioned problems above is to add RFID as an additional option for Attendance Monitoring System. The database of the existing biometrics will be linked into the database of the proposed project. Radio-frequency identification (RFID) is a technology that uses communication via radio waves to exchange data between a reader and an electronic tag attached to an object, for the purpose of identification and tracking. In attendance monitoring, by simply adding RFID tags to each identification card they can easily
log in and log out of the campus by placing it in front of the RFID reader at the main entrance of the campus. When it comes to retrieving the time record of each employees during payroll, they don’t have to remove the RFID reader and the computer; they can easily access the database by connecting to it thru the local area network. For the employee monitoring, there must be a short range RFID reader in an area where a college can hold their classes so that it can read and monitor if all the faculty attends their classes on time.

With the application of RFID technology in the attendance monitoring system it will be a lot easier for them to download the time record of each employee anytime they want. It will be a great help because it does not require the device to be removed at the main entrance of the campus during payroll period and for the employee monitoring during the time of work. It will be very hard for any one to get out of the campus without permission. Their tags must be discharged out of the campus before they can leave the area. Since RFID uses radio waves some might think that it is prone to interference but it is tested and already in use in the market and its reader does not pick any unwanted interference.

2.0 Methodology

The main objective of the systems to be designed is to establish a complete RFID system that will monitor the attendance of each employee. A short range reader will be used and it will be placed strategically inside the campus. Structured cabling will be used in order to connect all the readers inside the campus. Each reader will be planned in accordance to the needs of the campus for a much better employee monitoring system. After the designs are made, all the needed materials and equipment will be identified and the cost will be estimated.

After the design, the system will undergo operational testing to test the functionality of the system.

Figure 1 shows the basic concept of the RFID tag-reader set-up and the existing biometrics device.

Hardware Design

The hardware component of the system is composed of the following: RFID reader module; Communications Port; and Power Supply. The RFID module will be connected to an antenna to receive the information coming from a tag. Communication Port will be the one
receiving the data coming from the RFID module and transferred it to the computer. The power supply provides the power source on both the RFID module and Communications Port.

**System Design**

**Attendance System.** In the attendance system, the system will only require a short range reader and it must be connected to a computer which has a database for the daily time record for each employee. Every time an employee logs in to the system the monitor at the entrance of the campus will display the time and the employee information. The database of the biometrics scanner will be linked with the RFID database.

**Monitoring System.** In the monitoring part of the system, short range readers will be placed in every class room to monitor each faculty if they attended their classes on time.

**Database Development.** The program that will be used is Visual Basic 6.0 for both attendance monitoring at the entrance of the campus and employee monitoring in each class room.

The database program that will be used is Microsoft Access, it will show all the data regarding the daily time record for attendance monitoring and employee monitoring.

**Operational Procedure**

The principle of operation of the attendance and employee monitoring system is shown through the use of a flow chart shown (Figure 2).
Operational Testing

In the operational testing the following steps were taken into consideration to ensure the functionality of the system.

**Testing of the RFID tags and Reader:**

1. The researcher used 10 I.D’s of the employee with RFID tags.
2. The researcher scanned the I.D using the RFID reader that is connected to the computer to determine if the reader will recognize the tags present on the I.D.
3. A second and third trial was done for each I.D.

**Range Testing of the Reader**

1. The researcher used 10 I.D’s of the employee with RFID tags.
2. The researcher will scan the I.D using the RFID reader by different ranges to test the maximum range of the device.

### 3.0 Results and Discussion

The present scenario for attendance monitoring system uses fingerprint biometrics which is located at the entrance of the campus as shown in Figure 3.

![Fingerprint biometrics](image)

Figure 3. Fingerprint biometrics.

Once an employee enters the campus and logged in to the system via fingerprint biometrics their time in/out is saved into a database.

With the addition of RFID based attendance monitoring system, all identification cards are embedded with an RFID tag. This RFID tags are used in logging in/out into the system. This database of this RFID system was linked into the same database of the biometrics system as shown in the Figure 4.
With a single database it is much easier for the time keeper to download all the daily time record of every employee.

The hardware circuit of this study is divided into three sections: the RFID reader, the converter and the power supply. For the power supply, in order to get the desired output voltage, the researcher uses the Multisim software to construct and test the functionality of the design before implementing it. The schematic diagram was shown in Figure 5.

The circuit design is capable of any upgrade on the system. The output voltage can be adjusted depending upon the needs of the system. This circuit was used to supply the power source of the RFID reader and the communications port. The actual power supply used is shown in Figure 6.

The second hardware section of the system is the RFID reader.

Figure 4. RFID-based attendance system.  Figure 5. Schematic diagram of power supply.  Figure 6. Power supply.
The RFID reader is the main component of the whole system. It is used for receiving all the information coming from RFID tags.

To test the functionality of the RFID reader, the researcher used AT Console software to see if an RFID tag can be detected by the RFID reader. Figure 7 shows the AT Console window. In AT console, it shows coded decimals if a tag is detected by the RFID reader.

Figure 8 shows the constructed RFID reader section of the project. This RFID reader uses Zilog microcontroller and it has a typical data rate of 5 kilobaud at 125 kHz. The power source for this reader is 5 volts dc.

Figure 9 shows the actual testing of the RFID reader using AT Console software.

**Network Design**

In network design, it shows the actual topology, structured cabling of the system and the linkage of the existing biometrics system to the proposed RFID system.

**Network Topology**

The network topology that will be used will be star topology. In a star topology, all the clients will be connected to the central hub to control the exchange of information.
coming from different end points connected to the network. The network used wired local area network connections.

Figure 10 shows the exact topology of the system. The system shows the linkage of the biometrics with the RFID system.

**Project Evaluation**

Table 1 presents the results of evaluation in terms of the functionality of RFID tags and Reader.

The data further shows that in the first trial, nine (9) out of ten (10) tags equivalent to 90 percent were detected, while both trials 2 and 3, registered 100 percent detection.

The data presented in Table 2 shows that the maximum range reading of the RFID was 3 inches.

**5.0 Conclusions**

The communications port transfers the data from the reader to the computer effectively and the best communication port well suited to this system is RS 232 to TTL converter. The system is reliable in terms of database management. It can handle all the schedule and employee information. Microsoft Access was the well suited database management systems.

![Network topology](image_url)

Figure 10. Network topology.

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software for this kind of system. The program is user friendly, the tools could be shown easily and the best programming language to be used in this kind of system was Visual Basic 6.0. The result of the operational testing showed that the RFID reader and tag testing was 100% accurately detected. In the range testing, it showed that the maximum range of reading was 3 inches.

6.0 References Cited:


