

Online Attendance Management System Using RFID with Object Counter

Ankita Agrawal and Ashish Bansal

*Department of Information Technology, Shri Vaishnav Institute of Technology and
Science, Baroli, Sanwer Road, Indore, India.*

Abstract

Educational institutions' administrators in our country and the whole world are concerned about regularity of student attendance. Student overall academic performance is affected by it. The conventional method of taking attendance by calling names or signing on paper is very time consuming, and hence inefficient. Radio Frequency Identification (RFID) based attendance system is one of the solutions to address this problem. A system that can automatically capture student's attendance by flashing their student card at the RFID reader and save all the mentioned troubles was given by T.S.Lim et al. [1]. The RFID system using web-based applications such as ASP.NET and IIS server to cater the recording and reporting of the students' attendances was given by Abdul Aziz Mohammed et.al. [2]. Arulogun O. T. et al made an attempt to solve recurrent lecture attendance monitoring problem in developing countries using RFID technology [3]. Rajan Patel et al [4] presents the integration of ubiquitous computing systems into classroom for managing the students' attendance using RFID technology. H.B. Hamid et al [5] gave a system that has been built using the web-based applications such as JSP, MySQL and Apache to cater the recording and reporting of the students' attendances. NetBeans IDE 6.1 is used for developing the overall system. We have proposed the system in this paper using C#. Microsoft Visual Studio is used for the system designing. Also, the issue related to fake /false attendance through the RFID system has been addressed, we eliminate it by using a special object counter for the head count.

Keywords: Student attendance, RFID, Visual Studio Online Monitoring.

1. Introduction

Attendance Management System (AMS) is the easiest way to assist the faculty and the lecturer for this time-consuming process. The most common means of tracking student attendance in the classroom is by enforcing the students to manually sign the attendance sheet, which is normally passed around the classroom while the lecturer is conducting the lecture. For instance, lecturers with a large class may find the hassle of having the attendance sheet being passed around the class and the manual signing of attendance by students are burdensome and most likely distract them from teaching and getting full attention from the students [6]. Besides, as the attendance sheet is passed around the class, some students may accidentally or purposely sign another student's name. The first case leads to a student missing out their name, while the latter leads to a false attendance record. Another issue of having the attendance record in a hardcopy form is that a lecturer may lose the attendance sheet [7]. In terms of attendance analysis, the lecturer also has to perform manual computation to obtain the students' attendance percentage, which normally consume a lot of time.

RFID technology which stands for Radio Frequency Identification, can be a powerful tool in helping to manage student's attendance throughout the working school day and also enhance classroom security. RFID technology has been applied to solve problems where it is necessary to take automatically record the movements and locations of students in a classroom of school/university environment. RFID, which is an automatic identification technology used for retrieving from or storing data on to RFID Tags without any physical contact [8]. RFID systems have been widely used in many different application areas, such as: product tracking through manufacturing and assembly, control of inventory, parking lot access and control, container tracking, ID badges and access control, equipment tracking in hospitals, etc[9]. An RFID system primarily comprises of RFID Tags, RFID Reader, Middleware and a Backend database. RFID Tags are uniquely and universally identified by an identification sequence, governed by the rubrics of EPC global Tag Data Standard. A tag can either be passively activated by an RFID reader or it can actively transmit RF signals to the reader [10]. An automatic attendance system using fingerprint verification technique was proposed [11]. Fingerprint system can either be minutiae-based, image-based or textured-base systems [12-15]. In the minutiae-based, this system has small size but it requires large processing power for image enhancement. The image-based system uses raw pixel intensity, though this system is affected by brightness variation, image quality variation, scars and global distortions in the image. In [16], authors proposed wireless iris recognition attendance management system. However, checking more than 70 students based on their iris pattern is time consuming, and mainly expensive, and for universities this is not best choice. Having said the limitations imposed, we propose a solution in the form of an attendance tracking system based on RFID

technology. Also, the issue related to fake /false attendance through the RFID system has been addressed, we eliminate it by using a special object counter for the head count.

2. Radio Frequency Identification System (RFID)

RFID is a technology that is used to collect information automatically by radio frequency data communication between a mobile object and an RFID reader [17] to identify, categorize and track them. RFID tags can be read from several meters away and beyond the line of sight of the reader. RFID systems have been widely used in many different application areas, such as: product tracking through manufacturing and assembly, control of inventory, parking lot access and control, container tracking, equipment tracking in hospitals, etc[15]. An RFID system primarily comprises of RFID Tags, RFID Reader, Middleware, Antenna and a Backend database (see figure 1).

2.1 RFID Reader and Tag

A tag consists of a microchip that stores a unique sequence identifier that is useful in identifying objects individually. The sequence is a numeric serial, which is stored in the RFID memory. Tags are designed specific to its applications and environment.

Table 1: Features of Types of Tags.

Features	Type of Tag		
	Passive	Active	Semi-Active
Read Range	Short (up to 10 m)	Long (up to 100 m)	Long (up to 100 m)
Lifespan	Up to 20 years	Between 5-10 years	Up to 10 years
Battery	No	Yes	Yes
Cost	Cheap	Very Expensive	Expensive
Availability	Only in field of Reader	Continuous	Only in field of Reader
Storage	128 bytes read/write	128 Kbytes read/write	128 Kbytes read/write

RFID tags are of three types which are passive, semi-passive and active tag. Tags that are initiated by the reader are known as Passive tags, whilst those that do not require external initiation are called Active tags. A Semi-Passive tag exists, which has the features of both Active and Passive tags. The Each tag type has its distinct characteristics, which are discussed in table 1.

The RFID reader sends a pulse of radio energy to the tag and listens for the tag's response. The tag detects this energy and sends back a response that contains the tag's serial number and possibly other information as well. It transmits this information to the Middleware for further processing [18]. The reader attempts to interrogate the tags

at varying frequencies. The reader also contains built in anti-collision processes, which allows the reader to read multiple tags simultaneously [19].

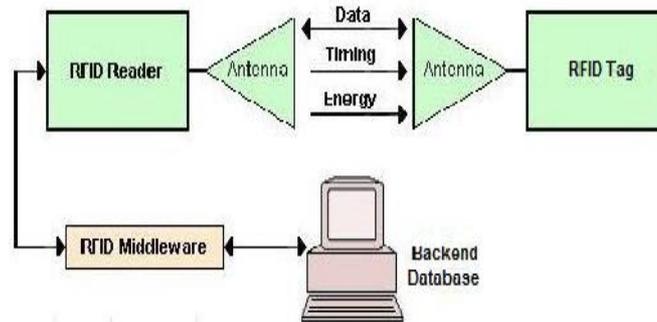


Fig. 1: Components of an RFID system.

2.2 Middleware

The middleware is an interface required to manage the flow of data from the reader and to transmit it efficiently to the backend database management systems [20]. Data from tags must go through software (middleware) that can filter, convert, correct and relay it to the appropriate systems. The middleware can reside on a reader or a server.

2.3 Antenna

The antenna is medium through which the tag and reader communicate with each other. It antenna can activate a tag and transfer data by emitting wireless impulses implementation of RFID in student management will provide additional capabilities like high efficiency and overall ease in management of the system. The objectives of the research should be clearly organized to successfully develop the system.

2.4 Backend Database

A database is defined as an organized collection of data and tailored to our system, our database primarily deals with the storage of relevant information recorded by the reader and communicated by the middleware.

3. Proposed System

Development of the system will be based on problems be addressed and which can meet the needs of the organization. The proposed system provides solution to problem through coordinated hardware and software design handshaking data communications between RFID tag and RFID reader. This system is based on active RFID tag. All RFID readers are mounted in the central of each class room and connected with the class room computer which is connected with the existing campus LAN infrastructure. Software running on main server receives events, which having tag id, date, time, and class room location etc. These information pass through middleware (middleware can

placed in reader itself also, which decrease the LAN traffic) which provides the filtering operation. The system operation is described as below:

- Step1. Track all RFID tags in class room and object counter count the number of persons in class room.
- Step2. If tracked RFID tags count is equal to object counter count then send RFID tag data to middleware through LAN.
- Step3. Using middleware perform the filtering operation to remove unwanted field and extract class room id, course id and student id.
- Step4. Search student tags id in permanent database with tracked RFID student's tags.
 - Step4.1. Search class room id, if found go to step 4.2. else go to step3.
 - Step4.2. Search course id, if found go to step 4.3. else go to step3.
 - Step4.3. Search student id, if found go to step5. else go to step3.
- Step5. Compare detected student's tag id's date and time with class time table and if match found than go to step6 else go to step 3.
- Step6. Check person type and mark the presence.
- Step.7 Repeat step 3 to step 6 for all tracked RFID tags.

4. Advantages of System

This system is fast, fully automated, flexible, reliable, accurate, does not required physical site of contact, reducing paper based work, saving the time of attendance call, authentic attendance, no proxy attendance, cannot forged data, students would have a reason to go to class, easy way to let parents know if a child is skipping class. With this system, percentage of student attendance will increase because there will be no proxy attendance. Student's Attendance weight-age is also calculated in order to confirm their eligibility to sit in exam. As below figure shows, compared with the time consumption in data entry for different technologies, RFID technology saves considerable amount of time and greatly improves the operation efficiency.

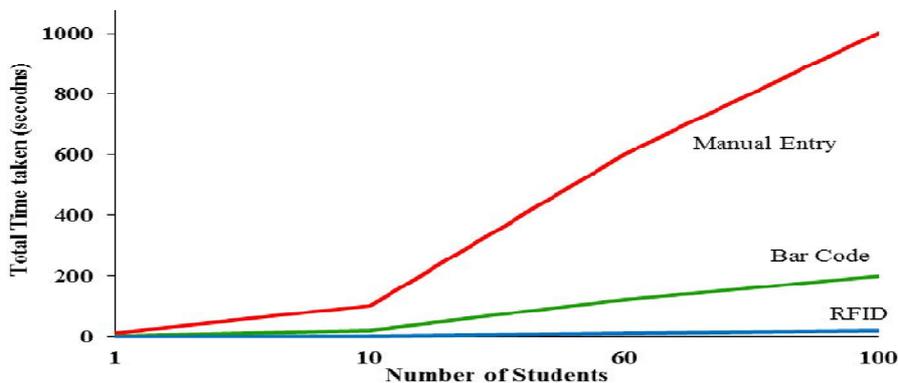


Fig. 2: A line graph showing the comparison of total time taken to record the attendance of students.

5. Conclusion

The study has identified and explained the key benefits of RFID technology. The Student Attendance System using Radio Frequency Identification technology with object counter will significantly improve the current manual process of student attendance recording and tracking system, especially in a university environment. The system promotes a fully-automated approach in capturing the student attendance and monitoring the student in the university campus. The attendance taken is secure and accurate. The system is user-friendly with easily accessible switches and communication ports. Attendance can be stored and retrieved easily. It can easily integrate with other campus activity such as RFID book library, automatic payment system in canteen etc. This system does not required additional cost; it is one time investment and having long life.

References

- [1] T.S. Lim, S.C. Sim and M.M. Mansor “RFID Based Attendance System,” in Proceedings of the IEEE Symposium on Industrial Electronics and Applications, October 2009.
- [2] Abdul Aziz Mohammed and Jyothi Kameswari, “Web-Server based Student Attendance System using RFID Technology”, International Journal of Engineering Trends and Technology (IJETT)–Volume 4 Issue 5, May 2013
- [3] Arulogun O. T., Olatunbosun, A., Fakolujo O. A., and Olaniyi, O. M., “RFID-Based Students Attendance Management System” International Journal of Scientific & Engineering Research Volume 4, Issue 2, February 2013
- [4] Rajan Patel, Nimisha Patel, Mona Gajjar, “Online Students’ Attendance Monitoring System in Classroom Using Radio Frequency Identification Technology: A Proposed System Framework” , International Journal of Emerging Technology and Advanced Engineering Volume 2, Issue 2, February 2012
- [5] Hanisah Binti Hamid, “RFID Based Systematic Student’s Attendance Management System” , November 2010
- [6] Gatsheni, B.N., R.B. Kuriakose, and F. Aghdasi. “Automating student class attendance register using radio frequency identification” in South Africa, in Mechatronics, ICM2007 4th IEEE International Conference on 2007.
- [7] Mahyidin, M.F. “Student Attendance Using RFID System” 2008; Available from: <http://umpir.ump.edu.my>.
- [8] L. Sandip, “RFID Sourcebook”, IBM Press, USA, (2005) ISBN: 0-13-185137-3.
- [9] K. Domdouzis, B. Kumar, and C. Anumba, “Radio-Frequency Identification (RFID) applications: A brief introduction”, Advanced Engineering Informatics, Vol. 21, 2007, pp 350-355.

- [10] US. Department of Homeland Security, "Additional Guidance and Security Controls are needed over Systems using RFID and DHS", Department of Homeland Security (Office of Inspector General), (2006), OIG-06-53.
- [11] Chitresh, S and Amit K (2010),"An efficient Automatic Attendance Using Fingerprint Verification Technique ",International Journal on Computer Science and Engineering (IJCSE),Vol. 2 No. 2,pp 264-269.
- [12] X. Jang,W.Y. Yau, "Fingerprint Minutiae Matching Based on the Local and Global Structures", IEEE 15th International Conference on Pattern Recognition, Vol. 2, pages 1024-1045, 2000.
- [13] H. B. Kekre, T. K. Sarode, V. M. Rawool, "Fingerprint Identification using Discrete Sine Transform(DST)", International Conference on Advanced Computing & Communication Technology (ICACCT-2008) Asia Pacific Institute of Information Technology, Panipat, India, 2008.
- [14] J. Anil, R. Arun, P. Salil, "Fingerprint Matching Using Minutiae and Texture Features", International conference on Image Processing (ICIP), pages 282-285, 2001.
- [15] M. Oloyede, O. A. Adeyinka, S. A. Kayode, "Fingerprint Biometric Authentication for Enhancing Staff Attendance System", International Journal of Applied Information Systems Vol 5, No.3, pages 19-24, 2013.
- [16] S. Kardy and M. Smaili, "Wireless attendance management system based on iris recognition", Scientific Research and Essays, Vol. 5(12), 18 June 2010, pp. 1428-1435.
- [17] Sae Sol Choi, Mun Kee Choi, Won Jay Song, Sang H. Son, "Ubiquitous RFID Healthcare Systems Analysis on PhysioNet Grid Portal Services Using Petri Nets", IEEE ICICS, pp.1255, 2005.
- [18] Nurbek Saparkhojayev and Selim Guvercin. "Attendance control system based on RFID technology", in 2012 IEEE IJCSI International Journal of Computer Science Issues.
- [19] Krane, J. (2003). "Benetton clothing to carry tiny tracking transmitters", Associated Press.
- [20] Stockman, H. (1948). "Communication by Means of Reflected Power", Proceedings of the Institute of Radio Engineers. October. pp 1196-1204.

