RFID based Student Attendance System

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ABSTRACT

Attendance plays a vital role in evaluating a student. The traditional method of taking attendance manually is very time consuming and often leads to human error. This paper elaborates the implementation of Radio Frequency Identification based Student Attendance Management System using Open Source Software in a multi-user environment. The system uses python as backend for reading tags. A JAVA based desktop application is used to authenticate lecturers, run the python code and record tags in an XML file. Finally, the XML file is uploaded in the server for processing and interpreting student's attendance. User can view attendance by accessing the web portal.

Keywords

RFID, RFID tags, RFID reader, Lecturer, Student, Attendance.

1. INTRODUCTION

RFID based Student Attendance Management system uses emerging technology that eliminates the problem faced in manual attendance entry and will prove to be more reliable and accurate. Radio Frequency Identification is a technology that uses radio waves to transfer data from an RFID tag, through a reader for the purpose of uniquely identifying a person. An RFID system consists of a tag and a reader. The RFID reader consists of an antenna and transceiver. The reader is usually on and continuously senses its range of operation. Whenever a tag enters its field of operation, the RFID reader transmits electromagnetic waves using antenna to communicate with the tag's antenna. The tag's antenna receives data from the reader, activates tag and reflects back the incident electromagnetic waves with RFID tag information. The transceiver in the reader receives data and passes them on to the controllers.

The system uses Php, MySQL, Java, Python, XML and Apache to cater the recording, storing and extracting student's attendance. Java is used for developing desktop application for taking attendance, python to retrieve data read by RFID reader and XML to store read tagIDs temporarily in the client PC. The XML file is then sent to the server using SSH for further processing. PHP is used for developing the web portal for accessing attendance. RFID based Student Attendance Management System was built using Open Source Software which reduces the overall cost of development process.

2. RELATED WORKS

Samuel King Opoku[1] have underwent a project based on biometric system. Under this system, time and attendance software is paired with a time clock which uses biometric technology for authenticating employees. The employees can use their fingerprints for clocking in and clocking out. Similar technology was implemented by Simao, P. Fonseca, J. Santos, V[2] with the help of two technologies namely Embedded system and Biometrics.

Arulogun O. T. , Olatunbosun, A. , Fakolujo O. A. , and Olaniyi, O. M[3] have developed an RFID based Attendance System that are commonly used nowadays to keep track of attendance for community organizations such as educational institutions, business organizations etc. Similar project was undertaken by Nurbek Saparkhojayev and Selim Guvercin[4].

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3. SYSTEM ARCHITECTURE

3.1 Client side architecture

The RFID reader is connected to client computer. The reader is usually on and continuously senses its field of operation. Whenever a tag enters its vicinity, it sends an electromagnetic wave to the tag. The tag reflects back the wave along with its unique identification number. The java application for taking attendance is executed using shell script. A lecturer needs to authenticate himself by logging into the system. If the response is positive, the lecturer is redirected to the 'take attendance' panel where he needs to enter the subject name for which he wants to take attendance. The subject name is validated using database and a python code is executed for reading tags, checking redundancy and creating an XML file containing tagIDs. The XML file is sent to the server for further processing. At the end the XML file is deleted from the client PC.

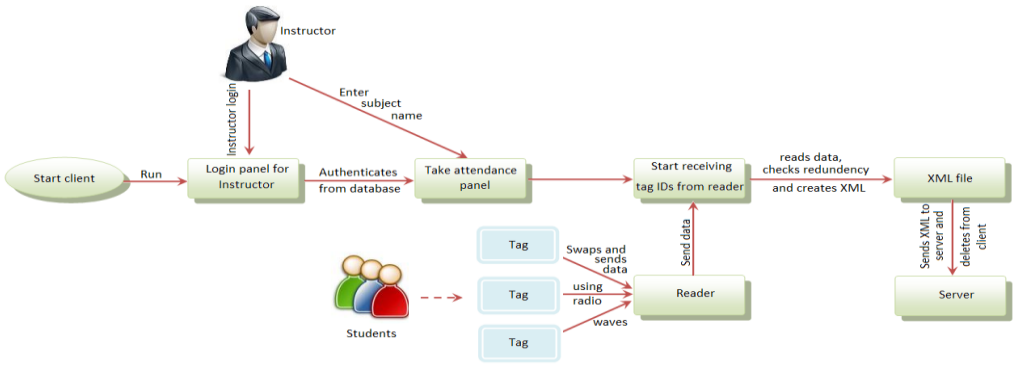

Fig 1: Block Diagram Showing Client Side Architecture

3.2 Server side architecture

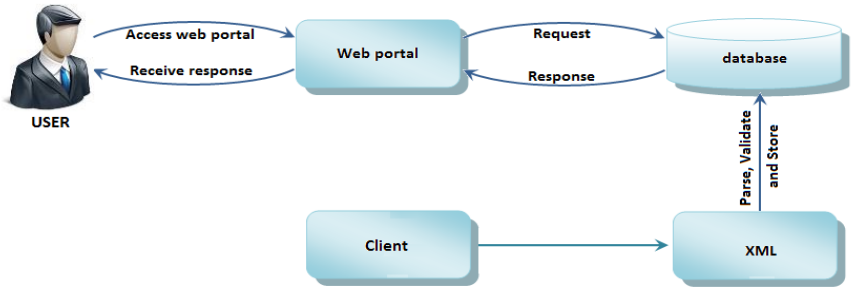

Fig 2: Block diagram showing server side architecture

The server fetches the XML file from client and parses the XML file to retrieve subject name and corresponding tagIDs. The tagIDs obtained are validated and attendance is stored in the database. The user can access the web portal for viewing attendance. The web portal in turn queries the server database and retrieves student attendance. Finally the web portal respond users with the attendance.

3.3 State Transition Diagram

The primary role of an administrator is to allocate tagIDs to student and monitor the entire system. Whenever a student wants a unique tag, he need to go to the administrator. The administrator selects a random tag and reads the tagID. He logs into the system and assigns that tagID against a particular student.

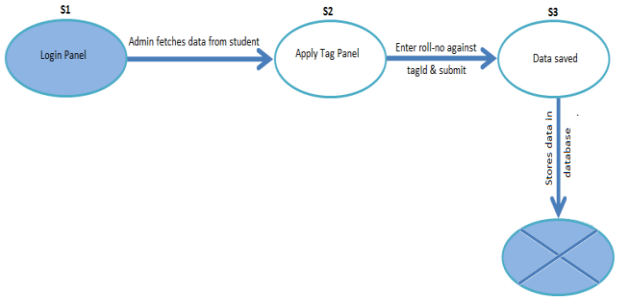

Fig 3 : State transition diagram for administrator

A student can register for a session and view his attendance. Once he is enrolled, he can view his attendance for a particular subject.

A lecturer can take attendance by logging into the system and activating the RFID reader. He can also view attendance of all students enrolled for a particular subject.

4. IMPLEMENTATION DETAILS

4.1 Creating Database

The database is designed with the help of 'Lamp' server. The tables generated are in normalized form, hence there is no data redundancy.

4.2 Creating client side GUI for taking attendance

The GUI is created using Java. A lecturer needs to authenticate himself by entering his username and password. The password entered is converted to md5 hash and is authenticated by querying the database. If the response is positive, it is redirected to 'take attendance panel' where the lecturer needs to enter the subject name for which he wants to take attendance. The subject name is also validated using database. If it matches, the java runs a python code for taking attendance for that particular subject.

4.3 Reading the RFID Reader using serial port

The java file executes python code for taking attendance. The python code creates a List for storing data in an orderly manner. The subject name is appended at the beginning of the List. Then the code reads tagID using serial port. The read tagIDs are inserted at the end of the List. This process of taking attendance continues for fifteen minutes.

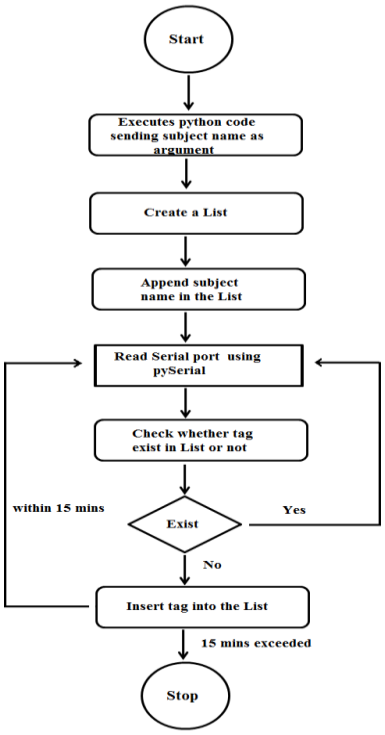

Fig 4 Flowchart for reading RFID reader using serial port

4.4 Creating XML file for storing tagIDs temporarily

An XML file is created using python. The root node is chosen as 'root' and the subject name is inserted in the tree. Finally the tagIDs in the List are stored in the XML file.

4.5 Sending the XML file to server

The XML file created in the client was sent to the server for further processing. The client was connected to the server using SSH and file was transferred successfully.

4.6 Parsing the XML file and storing in database

The XML file received by the server was parsed using Php. The total number of classes for that particular subject was incremented by one and the tagIDs found in the XML file for that particular subject were marked present.

4.7 Creating server side GUI for storing and retrieving information from server

The web portal for viewing attendance was created using HTML, CSS, Javascript and Php. The student can access the web portal for viewing attendance by entering his roll number and subject name. The attendance will be calculated by querying the database and calculating the percentage based on total number of classes held for that subject and the number of classes attended by the student.

5. CONCLUSION

The objective to build an Open Source based RFID Attendance Management system which increases performance and efficiency was successfully achieved. The system offers data manipulation and retrieval via an interface, making it a user friendly attendance system. The system built is flexible, cost effective due to use of open source software and can be extended by adding more modules.

6. FUTURE SCOPE

Further improvement can be undertaken on this project for better enhancement:

A webcam can be integrated into the system to monitor the person who swaps the card, thus avoiding the problem of a person scanning in for another person.

The attendance system can be enhanced to biometric technology which is a full proof technique that captures a person's unique biological or physical features and prevents unauthorized activities.

7. REFERENCES

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