

RFID Attendance System

Khushi Chunarkar¹, Shweta Maheshkar², Ashlesha Patil³

Students, Department of Computer Science Engineering^{1,2,3}

Rajiv Gandhi College of Engineering Search and Technology, Chandrapur.

arryachunarkarharrya@gmail.com, shwetamaheshkar00@gmail.com, patilashlesha875@gmail.com

Abstract: Taking traditional manual pen-paper attendance, which is very time-consuming, insecure and usually leads to human errors as well as prone to misconduct, as the valuable time and work gets wasted in organizing and structuring the attendance data in registers. Hence to overcome this major hectic problem, we have used relational database management system in real time with appropriate security measures to access, manipulate and represent the data on the basis of the unique RFID tags, which gets fast and easily scanned on the RFID reader. This system consists of hardware and software with most trending implementation of a lightweight MQTT protocol in IoT technology; designed to take an attendance on the basis of RFID technology with NodeMCU firmware. The main objective of this proposed system is to make the effective and efficient computerized attendance on institutes website in excel sheet format with a particular date and students can also see their particular subject attendance on the webpage.

Keywords: IoT, RFID, NodeMCU, MQTT protocol

I. INTRODUCTION

1.1 Problem Definition

Existing system is traditional and manual pen-paper work attendance, where lecturers have to take attendance every time of class or session in 3 ways, which are time wasting, ineffective, inefficient. They are 1.on register by calling roll number or name, wasting quality time of teaching. 2.on blank paper which gets circulated by students during lecture. 3.on attendance sheet which already having name, roll call need to be signed by students. Therefore, getting chance of proxy purposely, missing any student to make attendance. As manual conventional method of traditional pen paper attendance is cost consuming requires more papers, registers and space consuming needed to put proper location, time wasting of quality teaching leads to loss of education. This conventional attendance is insecure, inefficient and leads to human error.

1.2 IoT Concept

The Internet of Things (IoT) is a concept of revolutionary change taking place to promises transform in world of interrelated computing devices by transmitting data and automate tasks without human intervention. IoT invokes opposing emotions. So, it is nothing but connecting physical devices over the internet to make communication simple and easier.

1.3 Overview of RFID and NodeMCU

RFID (Radio Frequency Identification) technology is one of the types of Automatic Identification and Data Capture (AIDC) method. As AIDC methods automatically identify objects, collect data about them, gets that data directly into computer system, with little or no human involvement. RFID technology uses radio frequency electromagnetic fields to transfer information from an RFID tag to RFID reader using 13.56MHz electromagnetic field for identification purpose. RFID system comprises of RFID reader, RFID tags and antenna, is used to transmit and receive information through radio waves at a distance without wires. RFID reader can be grouped into three categories: low frequency, high frequency and ultra-high frequency. As per need, RFID tags maybe active or passive tags. Compare with barcode - RFID provides fast identification, no line of sight, reusable to rewrite or update, higher data storage, higher read rate, multiple reading, durable, maximum distance reading without interference. In comparison with other identification technologies - RFID technology offers quality, security, supply chain optimization, Better individual identification,

better storage flexibility, real time information and better ergonomics. Recently, UP state has made mandatory this technology for vehicle operating to use RFID tags along with E-way bill from 1 Nov, 2018. NodeMCU is an open source firmware and development board with ESP8266 helps to build IoT products. ESP8266 WIFI module is a low-cost microcontroller with WIFI capability and full TCP/IP stack to make easier IoT platform. NodeMCU have built-in support for wireless networks compared to Arduino and Raspberry Pi.

1.4 MQTT Protocol

MQTT (message queuing telemetry transport) protocol is a lightweight, small in size, publish-subscribe network protocol that transports messages between devices with low bandwidth environments. So, its perfect solution for IoT applications due to its feature. MQTT uses transport layer security (TLS/SSL) encryption with bidirectional connection support. This simple messaging protocol allows to connect, disconnect, subscribe and publish to subscribed one on request with acknowledgment. We have three options for hosting an MQTT broker. Use own locally installed broker/server, which is we have used. Second use of cloudbased server or virtual server and third one by use of shared server application.

II. LITERATURE SURVEY

Have implemented a system called RFID Based Automatic Attendance systems. This attendance system software has been developed using VB.net and database (Microsoft Access). Each student has RFID tag attached with their Student ID card. There is a serial connection amid computer and RFID reader also has been maintained for connection between RFID and the computer system. The RFID reader is placed at the lecture hall door. Whenever students enter the lecture hall RFID reader read the RFID tag and it store the all information (Entry time, Name, etc.) of students into database via serial connection and maintain the system. Here admin of this system can view all documents using the software interface by retrieving information from database without any difficulties not like traditional system.

Implemented an attendance system with the combination of RFID and Web-Based system. This system uses a RFID tag and reader for getting students" attendance and read particular student. Then this reader connects with Arduino microcontroller which passes the RFID reader response to web server by using Arduino shield, finally the attendance of students can be stored in web server by using PHP and MySQL. The admin of the system can view all students" documents by login to this particular Web based application and also can view the student"s details using LCD displays. Found a system that, RFID and Pose Invariant Face Verification for automatic attendance system. This system works under two-factor verifications. In the first step, students need to use RFID tag which is read by RFID reader. If the first step is succeeded then it moves to second step of verification, if not, student becomes under unrecognized category. The second step is Face verification, if the face match with particular RFID tag then it marks attendance into database. Missing the above both readings, the system identifies the fraud students. This two-factor automatic system reduces the misuse of identity theft for the purpose of getting attendance

"Arduino Based Smart RFID Security and Attendance System with Audio Acknowledgement" is developed by Yashi Mishra et al. SD card module with RFID tag which carry different voice codes is used in this system. The tag ID and code of the voice greeting stored in SD card module. While a student enters the class room door, his / her RFID tag is being read. If the ID of the tag matched with stored data in the SD card then particular person needs to use the voice greeting, if it is matched then the door will be opened and the attendance will store in excel sheet. Student can view the attendance detail using the LCD placed in Arduino. Here Arduino working as microcontroller to connect LCD, RFID reader, SD card module and so on. This system is also working as two-factor verification process. Moreover, this system is very simple schematics than other system because of very simple components and design. Also here we get fast response with accuracy

Had been created a prototype system called Microcontroller Based Attendance System Using RFID and GSM. This system consists three atMega16 microcontroller placed in between RFID reader, GSM modem and computer. Each microcontroller has its own purpose. The system starts whenever a teacher used his/her RFID tag to enter the class room and students will enter the class room by swapping their tag within five minutes. RFID reader reads RFID tag and sends the signal to first microcontroller which analyses the signal of RFID reader and opens class room door using IR signal which is influenced by a motor. The signal is temporarily stored in microcontroller, when teacher finishes his / her class

he /she must swap the RFID tag again to the reader and system decides automatically that the class is over. Thus, microcontroller passes the temporary stored signal to computer database as attendance. In case of absent of student, the signal passes to GSM modem and it will send the message to parents of the students who were not at the class. If any students go out before teacher use finishing RFID tag which doesn't count the status (present) of the students. This system itself added advanced and reliable security features. Thus students are not able to cheat the administration and parents.

Proposed a system that working with RFID and GSM. Here they have used microcontroller (LPC) as an intermediate amid GSM module and RFID. Whenever students enter the classroom, they need to use their tag which read by RFID reader and it send to the present signal to GSM module.

If the ID of the tag does not match with database it considered as unauthorized access. If it is okay then GSM module send message administration and parents.

Proposed a system that web based attendance using four-tier architecture by using RFID and Biometrics. In this system student's and teacher's RFID unique code will store into the database. A RFID reader and fingerprint device are placed at the door of the classroom. When students enter classroom, they need to use the RFID tag which read by reader and verifies identify by comparing with database whether the tag matches or not. Second level verification will be allowed if and only if first level is succeeded. Verification with fingerprint is the second step of the system and if the student's finger print matches with database then the attendance will be marked and stored into database, if not there is no attendance for students. The fingerprint verification only active in span of ten minutes including five minutes before the schedule and after the schedule of class starting time. If anyone late then it denies to provide attendance to particular student but students can stay at the lectures and learn. Finally, SMS will send to the student's parents about inform particular students' presence. This system is time oriented.

Developed a prototype for attendance management system with the placement of a greater number of RFID readers placed in room and there is a server application maintains via a laptop. The reader and laptop or PC connected with the help of wireless router or LAN connection. When a person enters the room, he / she needs to use the RFID tag which reads by RFID reader and passes the attendance to the server through wireless or LAN connection. Since many RFID readers are placed, more than one person can get the attendance simultaneously and get the higher efficiency than traditional method.

Also, suggested a system that working with RFID and Telegram Messenger Application. In this system students are needed to meet the teachers for tapping of RFID tags. If it is matched with tag stored in the database, then it sends to the attendance to the principal in the form of excel as well as it sends a message to the specific student's parent via Telegram messenger.

III. METHODOLOGIES

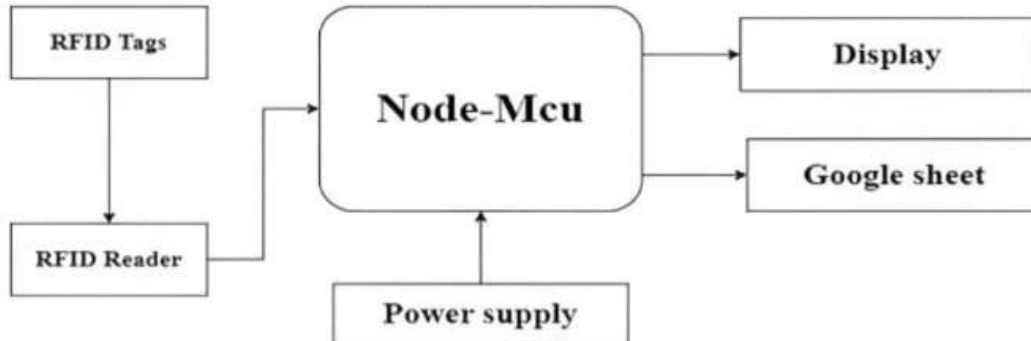
The proposed system methodology consists of four phases.

1. RFID data reading - RFID reader (RC522), RFID tag (student's ID card) and NodeMCU development board (ESP8266 WIFI module) are included in RFID data reading.
2. Data input to database - Arduino IDE sketch code programmed with ESP8266 to connect with database. Arduino code processed for data input to database by using PHP to MySQL database system of local XAMPP server.
3. Data report to web browser - CSS, JavaScript and PHP server scripting languages are used for data report to web server.
4. Hosting MQTT broker - To integrate the RFID tags in IoT, publish subscribe pattern of MQTT protocol is used. We will be using small footprint Paho MQTT as client implementation to publish and receive data from server, as it is machine to machine protocol.

IV. SYSTEM DESIGN

For hardware design, RFID module and ESP8266 module are used as the main hardware component in research project. RFID tags used for registration and later on for attendance. ESP8266 Wi-Fi module has Wi-Fi feature for data transfer

from RFID tag to the local website in web browser of web server. Internet connection require to establish NodeMCU connection via router, phone or any hotspot network in LAN area.



HARDWARE REQUIREMENTS

1. NodeMCU (ESP8266): For interfacing with RFID and connecting to the internet.
2. RFID Reader: Compatible with NodeMCU.
3. RFID Tags or Cards: Assigned to individuals for attendance tracking.
4. Breadboard and Jumper Wires: For connecting components.
5. Power Supply: To power the NodeMCU and RFID reader.

SOFTWARE REQUIREMENTS

1. Arduino IDE: For programming NodeMCU.
2. RFID Library: Install an RFID library compatible with your RFID module in the Arduino IDE.
3. ESP8266 Board Manager: Add the ESP8266 board to the Arduino IDE.
4. Google Sheets API: Set up a project in the Google Cloud Console, enable the Google Sheets API, and obtain API credentials.
5. Google Sheets: Create a spreadsheet to store attendance data
6. Google Apps Script: Write a script to handle communication between NodeMCU and Google Sheets.
7. Wi-Fi Network: Ensure NodeMCU has access to a Wi-Fi network for internet connectivity.

Configuration Steps

1. NodeMCU Programming:* Write Arduino code to read RFID data and send it to Google Sheets via Wi-Fi.
2. Google Sheets Setup:* Share the spreadsheet with the Google Cloud project's service account email obtained during API setup.
3. Google Apps Script Integration:* Write a script in Google Apps Script to handle incoming data and update the spreadsheet.
4. Internet Connection:* Ensure NodeMCU is connected to the internet through Wi-Fi.

V. TECHNOLOGIES

5.1 Components:

- NodeMCU (ESP8266)
- RFID module (e.g., RC522)
- RFID cards or tags
- Jumper wires
- Breadboard
- Power supply

5.2 Connections

- Connect the RFID module to NodeMCU using jumper wires.
- Power up the NodeMCU and RFID module.

5.3 Install Libraries

- Install necessary libraries for NodeMCU and RFID module using the Arduino IDE or PlatformIO.

5.4 Write Arduino Code

- Write code to read RFID card data and connect NodeMCU to Wi-Fi.
- Use Google Sheets API to update attendance data on a Google Spreadsheet.

5.5 Google Sheets Setup

- Create a Google Spreadsheet with columns for student ID, name, and attendance status.
- Obtain API credentials from Google Cloud Console to access the spreadsheet.

5.6 Integrate Google Sheets API

- Use the obtained credentials in your NodeMCU code to authenticate and update the spreadsheet.

5.7 Test

- Test the system by swiping RFID cards to ensure attendance data is updated in the Google Spreadsheet.

VI. WORKING

New student ID card swiped over RFID reader to capture and recognize the card's unique ID by admin. The captured ID is then used to register as student's ID into the database and gets allotted. Once registered, the student can record the own attendance by swiping ID over reader. As per flowchart (Fig-3), the student's marked attendance when it's ID get matched with database of system. Initially, the system starts when student's ID gets swiped near to the RFID reader. It receives unique ID because every RFID tag of student has unique ID number. It starts to search that ID in the system database. If unique ID is found and matched with database, then it marks attendance of that session i.e. theory or practical or tutorial. So, that particular student allotted and marked the attendance is updated for that session. Likewise, all attendance of class and session are marked and saved to the database on server with downloadable excel sheet on the account of MQTT protocol. On the response of ESP8266, localhost publishes useful data to subscribed one. Localhost server which is website of institution works as MQTT client. RC522 client publishes data to ESP8266. ESP8266 MQTT broker publishes that data on subscribed computer IP. Paho client implementation will run in python coding to publish data to broker. At the last, faculty can see attendance record of student, also can able to see date wise attendance by particular session or lecture by selecting date. Student can also see their attendance by roll number to improve academic performance.

VII. CONCLUSION

Our aim is to get effective and efficient time-saving automated computerized attendance in real time with ready excel sheet to maintain attendance records in IoT trends has been done with implementing local Paho MQTT properly for communication and interfacing. The system provides more accurate identification. Identifies candidates in seconds in quick and rapid way. I conclude that this user-friendly proposed system would prove to be easy to use and implement, cost efficient, time saving, less tedious, portable. To overcome unreliable and inaccurate manual work, this proposed system gets improved with less effort and yet generates the results with high accuracy and qualitative one. Ultimately, improves academic performance with encourage as time saves. This paper has presented the proposed system with MQTT implementation successfully accompanied with booming RFID technology.

VIII. FUTURE SCOPE

Nothing is perfect in this world. We all are also no exception. Although, I have tried to present system in modern technology with small scale and smart way. Yet, there can be further enhancement by developing mobile app. According to hardware need, we can use GSM modem to send SMS for notice alert. Thingspeak can be used for data analysis. Use of unique identity with biometric technology like iris sensor or fingerprint sensor or image processing improves more authorization for RFID tag misuse. SD card modem for memory.

REFERENCES

- [1]. Sri Madhu B.M, Kavya Kanagotagi, "IoT based Automatic Attendance Management System", International Conference on Current Trends in Computer, Electrical, Electronics and Communication, ICCTCEEC 2017, pp. 83- 86.
- [2]. H. K. Nguyen, M. T. Chew, "RFID-Based Attendance Management System", IEEE 2017, doi:10.1109/RTTR.7887874.
- [3]. H. Zaman, J. Hossain, T. Anika and D. Choudhury, "RFID based attendance system", 2017 8th International Conference on Computing, Communication and Networking Technologies (ICCCNT), July 2017, doi:101109/ICCCNT.8204180.