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Microcontroller based Attendance Management System

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Abstract: - Many employees are reporting late on duty and therefore, Attendance Management is a tedious task and a difficult job for a person to maintain the record of it. It is also important that if we calculate the loss of work due to late reporting it will be a huge amount if a number of employees are more. Therefore Attendance Monitoring System (AMS) helps us to control labor costs, minimize compliance risk, and improve workforce productivity. It is also reduces the administrative time associated with attendance exceptions and employee inquiries. It is possible to maintain the record of overtime of employee and record of holidays also. In view of this, Attendance Management System is proposed using Radio Frequency Identification (RFID) tag and fingerprint reader. The system takes attendance electronically with the help of the RFID and finger print device, and the recorded attendance is stored in a database. The algorithm and programs are develop using python for the Raspberry Pi 2 Model B. Status of attendance can be observed on Graphical User Interface (GUI).GSM/GPRS module is implemented to send the massages to the parent's mobile periodically.

Keywords: **RFID Tag and Reader, Fingerprint Module, Raspberry pi 2 Model B & GSM.**

I. INTRODUCTION

The Raspberry Pi is a series of credit card–sized single-board computers developed in the United Kingdom by the Raspberry Pi Foundation with the intent to promote the teaching of basic computers. It also plays high definition video. This device does not include a built-in hard disk or solid-state drive, but uses an SD card for booting and long-term storage.

The prototype described in this paper has the provision of accepting inputs from a smart card reader (EM-18 RFID reader) or fingerprint module (R305). Data from RFID reader and fingerprint module (R305) are serially transmitted to Raspberry Pi Model. On identification of particular student, his attendance record is updated in the database and he/she is notified on the monitor. Also a GSM module is used here to send the attendance details as a message to the parent's phone. The literature survey related to Attendance Management System (AMS) is as under. The attendance management system is designed for student but it can also be implemented for employee.

II. RELATED WORK

Authors Tabassam Nawaz, SaimPervaiz, ArashKorrani, Azhar-Ud-Dinin(2009),suggested Fingerprint sensor was used to mark the attendance, on identification student's finger record was updated in the database and it was notified through LCD screen [1].PallaviVerma& Namit Gupta in October 2013suggested that, a Fingerprint acquisition module was used for capturing the fingerprint, GSM modem was used to send the attendance of the students to their parents in the form of SMS [2].KarthikVignesh E, Shanmuganathan S, A.Sumithra, S.Kishore and P. Karthikeyan in 2013proposed that, a Fingerprint acquisition module was used for capturing the fingerprint, The presence of each students will be updated in a database of Raspberry pi and the data will be passed to the server using Wi-Fi and GSM modem send the attendance of the students to their parents in the form of SMS[3].Chirag M. ShahȦ, Vamil B. SangoiȦ and Raj M. Visharia A inOctober 2014 suggested that , RFID reader or a biometric sensor was used to accept the input, access was granted to the user and the logs were wirelessly transmitted to the computer using a Wi-Fi module[4].RavishankarYadav,SumitaNainanin,February2014, proposed the system to monitor student's attendance by using RFID module, Notification will be sent to parents in the form of SMS using GSM modem [5]

.L.Arunkumar & A.Arun Rajain May 2015suggestedBiometrics Authentication, byDatabase creation & management using Postgre SQL, web page creation using Personal Home Page(PHP) language, fingerprint reader access, authentication and recognition using python were entirely done on raspberry pi and result was display on monitor/GUI [6].Moth

Moth Myint Thein, Chaw Myat Nwe and HlaMyoTun in JULY 2015 suggested, RFID &Finger Print Reader was used to records of the attendance and it was stored in a database. Graphical User Interface was used to show the status of the student [7].S.Divya in January 2016, suggested attendancemanagement system for students using a fingerprint sensor and Raspberry pi. GSM/GPRSmodulewas used to send the attendance details as a message to the parent's phone [8].

III. SYSTEM DESIGN

The block diagram of proposed Microcontroller based Attendance Management System (AMS)is illustrated in Fig.1.The student's bio-data (Name, date, time, RFID card id no. and finger id no.) are enrolled firstly in the database of raspberry pi. When a student enters into the class, this RFID reader reads his / her student's id no. and

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his/her finger must be press on the fingerprint module. Name, date, time of reading is shown on the computer screen. When RFID and fingerprint reader reads RFID card id no. and finger print id and if it matches with the list of ids available in the database then the person's id, GSM module is used here to send the attendance details as a message to the parent's mobile phone.

The AMS consists of Raspberry Pi2, Model B, EM-18 RFID Reader, Fingerprint Module R305, GSM SIM-900, and Display System. The details of each module are explained in the subsequent sections.

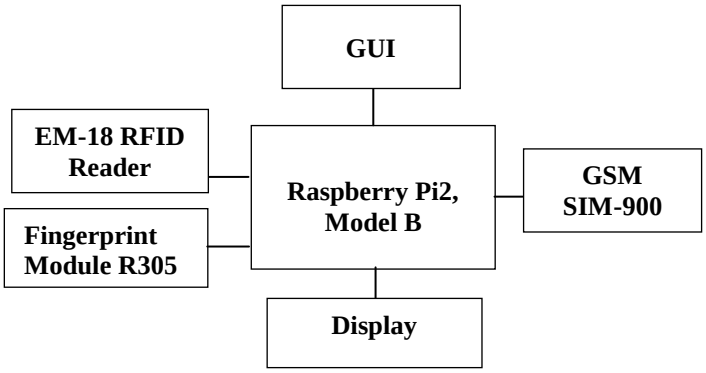

Fig.1: Attendance Management System

A. Raspberry Pi2, Model B

Technical Specifications:

- Broadcom BCM2836 Arm7 Quad Core Processor powered Single Board Computer running at 900MHz
- 1GB RAM
- 40pin extended GPIO
- 4 x USB 2 ports
- 4 pole Stereo output and Composite video port
- Full size High-Definition Multimedia Interface (HDMI)
- Camera Serial Interface (CSI) camera port for connecting the Raspberry Pi camera
- Display Serial Interface (DSI) display port for connecting the Raspberry Pi touch screen display
- Micro Secure Digital (SD) port for loading your operating system and storing data. It facilitates the increase of available memory via the insertion of a Micro SD card.
- Micro USB power source.

Raspberry Pi hardware has evolved through several versions that feature variations in memory capacity and peripheral-device support.

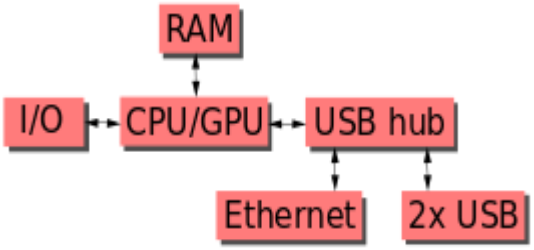

Fig.2: Block diagram of Raspberry Pi2, Model B

This block diagramRaspberry Pi2, Model Bdepicts the Ethernet and USB hub components. The Ethernet adapter is connected to an additional USB port as shown in Fig.2.

Raspberry Pi 2 model B was released in February 2015.The Raspberry Pi 2 Fig. 3. [http://www.cnx-software.com/wpcontent/uploads/2015/02/Raspberry_Pi_2_Model_B.jpg] delivers 6 times the processing capacity of previous models.

The Raspberry Pi is a Linux based operating system environment with python as the main programming language.

Fig.3: Raspberry Pi 2, Model B

B. EM-18 RFID Reader Modules

This is a low frequency (125 KHz) RFID reader with serial output with a range of 8-12cm as shown in Fig.4.[10]. It is a compact unit with built in antenna and can be directly connected to the PC using RS232 protocol.

Fig.4: EM-18 RFID Reader Modules

RFID Reader is a scanning device that uses the antenna to realize the tags that are in its vicinity. It transmits signals at certain frequencies. RFID readers are usually ON, continuously transmitting radio energy and awaiting any tags that enter their field of operation. EM 18 RFID reader is the device capable of reading and retrieving information stored inside the RFID tags

Specifications of RFID Module

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Operating Voltage: 5v
Current: <50mA
Read distance: 10cm
Operating frequency: 125 kHz

C. *RFID Tags*

RFID Tag is an IC chip that has unique hexadecimal or electronic product code (EPC) contained in it. The sequence is a numeric serial,which is stored in the RFID memory. The microchip is available inside RFID tag which is shown in below fig.5 [5].The microchip includes minute circuitry and an embedded silicon chip. Each tag can store a maximum of 2KB of information in the microchips. The tag memory can be permanent or rewritable, which can be re-programmed electronically by the reader multiple times.

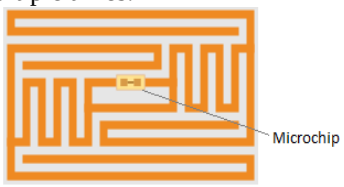


Fig.5: RFID tag

Features of different types of RFID Tags [5] are shown in the following table1.

The directional flow of the AMS is described in flow chartFig.6.

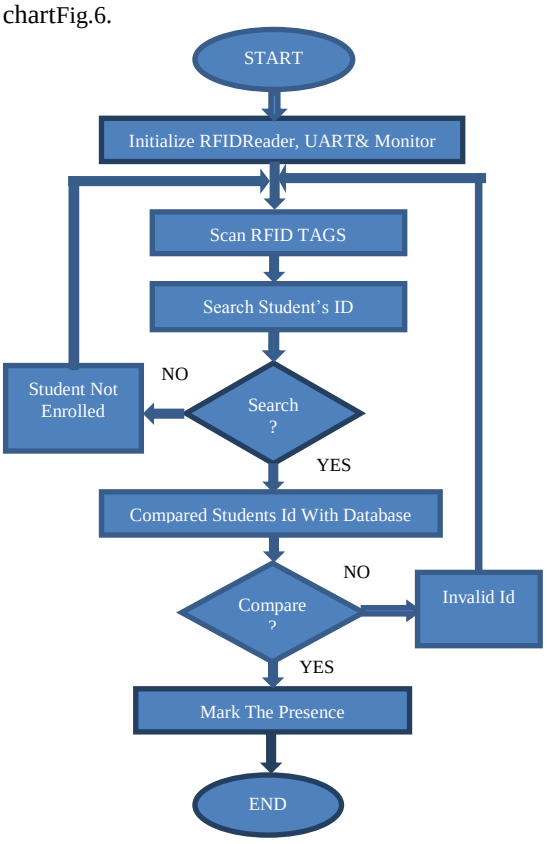


Fig.6: Directional flow of the system

The proposed system has been explained with the help of following steps**.**

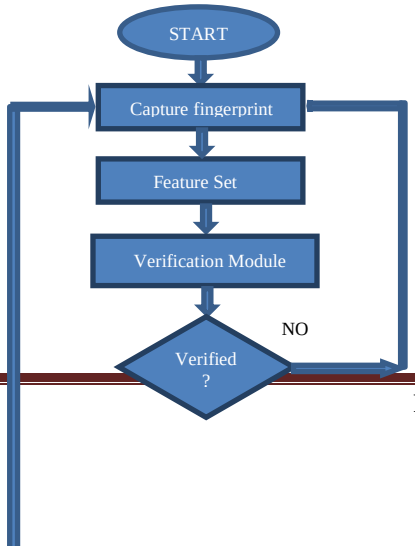
Step 1 Initialize RFID Reader
Step 2 Initialize Monitor (computer screen)
Step 3 Initialize UART (UniversalAsynchronous Receiver/Transmitter)
Step 4 Scan RFID tags
Step 5 Send scanned of RFID data to Raspberry pi model
Step 6 Using Raspberry pi modelperform the filtering operation to remove unwanted field andextract student‘s id
Step 7 Search student tags id in permanent database with scanned RFID student’s tags.
Step 7.1 Search student‘s id, if found go to step 8 else go to step 4.
Step 8 Compare detected student’s tag, id’s, date and time with class time table and if match found then go to step 9 else go to step 4.
Step 9 Check person type and mark the presence.
Step 10 Repeat step 4 to step 9 for all row of RFID data**.**

D. *Fingerprint Module R305*

The fingerprint module as shown in Fig.7 [http: //www.8051projects.info/attachments/r305-jpg.766/] is used to scan the finger and then it converts it to image and then a character file. There are 256 storage memory spaces in the module. The data that is stored in the module is then given to the controller to be read and recognized/matched in the database.

Fig.7: R305 module

A fingerprint sensor device along with a monitor is placed at the entrance of each classroom. The fingerprint sensor is used to capture the fingerprints of students while monitor notifies the student that his/her attendance has been marked. The Flow chart of the system [1] is as shown in Fig.8.



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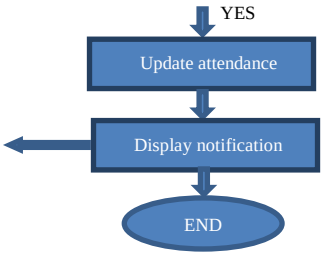

Fig.8: Flow chart of the system.

The proposed system has been explained with the help of following steps.

- Step 1: Capture the student's fingerprint sample and create a feature set. A set of unique features created to match fingerprint is called feature set.
- Step 2: Retrieve the stored templates from the repository (database).
- Step 3: Perform a one-to-n comparison between the fingerprint feature set and the fingerprint templates stored in database, make a decision of match or non-match.
- Step 4: If match is found retrieve student's information (Registration number, Department, Subjects) from the database.
- Step 5: Obtain the scheduled lecture from the database and mark attendance if student is within the specified time i.e. within 30 minutes of the lecture's starting time. If verification is not done or there is some error in enrollment of fingerprint, system goes back to its initial state without marking the attendance as shown in Fig.8.

E. GSM Module SIM-900A

GSM Module SIM-900A is as shown in fig.9.[D:\alldatasheets\sim900a\SIM900A_GSM_modem.jpg].It has a variable baud rate with range from 9600 to 115200. Baud rate can be configurable using AT commands. It operates on 12V regulated power supply. It has a SIM card slot to insert SIM and a receiving antenna to receive network signals.GSM Modem-RS232 is built with Dual Band GSM engine- SIM900A, works on frequencies 900/ 1800 MHz.

Fig.9: GSM module.

For AT commands:

- Use capital letters for AT commands.
- Send CR (Carriage return) and LF (Line feed) after the AT command.
- Place the serial communication jumpers in the right position.
- Use an external power supply and place the power jumpers in the right position.

IV. RESULT

The Microcontroller base attendance system is design developed and tested using EM-18 RFID and R305 Finger Print Module. The GUI design and the result are shown in fig.10 to 14.

Fig.10: Microcontroller base attendance system Model

The following dialog box in Fig.11. shows, the admin/teacher mode for entering in this system. Admin/Teacher needs to create own username and password to log in this system.

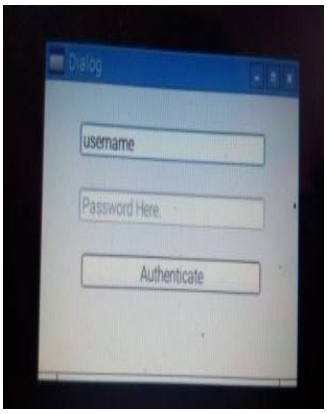

Fig.11: Login Screen for admin and teacher

Admin may register to every student with RFID card ID and finger ID. At this position, the user needs to press finger on fingerprint module. These registered ID number save in database shown in fig.12

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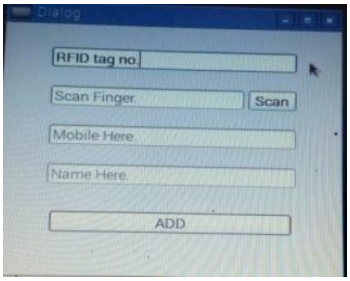

Fig.12: Student Card &Finger ID database

For attendance, student RFID card ID firstly read from RFID reader. According to their RFID card ID that have stored in database, system will show student details. Then student must press his/her finger on fingerprint reader. If these RFID card ID and finger ID are valid, student will get roll call for that day as shown in Fig.13.

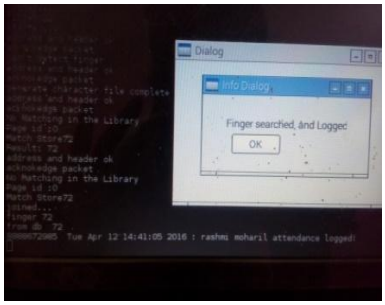

Fig.13: Student Roll Call

This system takes the attendance of the student and sends this attendance to their parent's mobile through GSM. Fig.14. shows the SMS received by the parents.

Fig.14: SMS received in parents mobile

V. CONCLUSION

The existing conventional attendance system of taking attendance by calling names or signing on paper is very time consuming and insecure, hence inefficient. Therefore, microcontroller based attendance monitoring system is proposed. The system is tested for a class of 50 students and it is observed that the accuracy is 98%. The system can be extended to more number of students and more number of classes provided its database is generated. The system not only to maintain the attendance but also it can inform the status of attendance to concern by messages. The AMS is also capable of to maintain the records of loss of work due to late reporting. The AMS helps to control labor costs, minimize compliance risk, and improve workforce productivity. It can be concluded from the above discussion that a reliable, secure, fast and an efficient system has been proposed by replacing a manual and unreliable system byusing Raspberry Pi Model with Radio Frequency Identification (RFID) or a fingerprint.GSM module is used here to send the attendance details as a message to the person's phone. The benefit of this system is that it will save time and reduce the amount of work of the administration.

In future the work can be extended with the Web camera that can automatically calculate and maintain the attendance for students in an institution using an image processing.

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REFERENCES

[1] Tabassam Nawaz, SaimPervaiz, ArashKorrani, Azhar-Ud-Dinijcsns"Development of Academic Attendance Monitoring System Using Fingerprint Identification", International Journal of Computer Science and Network Security, Vol. 9, No. 5, pp. 164-168, May 2009.

[2] Pallavi Verma & Namit Gupta, "Fingerprint Based Student Attendance System Using GSM" International Journal of Science and Research (IJSR) ISSN (Online): 2319-7064 Volume 2, pp. 128-131, Issue 10, October 2013

[3] KarthikVignesh, Shanmuganathan, A. Sumithra S. Kishore and P. Karthikeyan, "**A** Foolproof Biometric Attendance Management System", International Journal of Information and Computation Technology, ISSN 0974-2239, Volume 3, Number 5 (2013), pp. 433-438

[4] Chirag M. Shaha, Vamil B. Sangoia and Raj M. Visharia, "Smart Security Solutions based on Internet of Things (IoT)", (3402) International Journal of Current Engineering and Technology, Vol.4, No.5, pp. 3401-3404, Oct 2014.

[5] RavishankarYadav, SumitaNainan, "Design of RFID Based Student Attendance System with Notification to Parents Using GSM", International Journal of Engineering Research & Technology (IJERT), IJERT, ISSN: 2278-0181, Vol. 3 Issue 2, pp. 1406-1410, February 2014.

ISSN: 2277-3754
ISO 9001:2008 Certified
International Journal of Engineering and Innovative Technology (IJEIT)
Volume 5, Issue 10, April 2016

[6] L. Arunkum & A. Arun RAJA, Sri Ramakrishna Engineering College."Biometrics Authentication Using Raspberry Pi", International Journal For Trends in Engg.&Technology., ISSN: 2349-9303, Volume 5, pp. 212-216, ISSUE: 2 MAY 2015,

[7]Moth MothMyint Thein, Chaw Myat New and HlaMyoTun, "Students' Attendance Management System Based On RFID And Fingerprint Reader", International Journal of Scientific & Technology Research, Volume 4, Issue 07, pp. 30-38, July 2015.

[8] S. Divya. Tunnelling, "Authenticated Data from Raspberry PI and Message Intimation via GSM", International Journal of Emerging Technologies in Engineering Research (IJETER) Volume 4, Issue 1, pp.92-95, January 2016.

[9] Datasheet of Raspberry Pi 2, Model B

[10] Datasheet ofEM-18 RFID Reader

[11] Datasheet of Fingerprint Module R305

[12] Datasheet of SIM900A

Author Profile

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Currently working as a professor in Electronics Engineering Department, Babasaheb Naik College of Engineering, and Pusad, India. He has completed his doctorate in Electronics Engineering. He is a member of many professional bodies like ISTE, AMIE and IETE. He has total teaching Experience 31 years at UG level and 07 years at PG level. He has published more than 23 research papers at national and international journals and conferences. He is also a reviewer of many international journals. His field of interest is signal processing and artificial neural networks.

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