Multi-Purpose Student Smart Card Using IoT Technology

Santhoshini.P, Assistant professor, R.M.D Engineering College, Thiruvallur, India, santhoshini.ece@rmd.ac.in
Benilla Thangammal.C, Associate professor, R.M.D Engineering College, Thiruvallur, India
Ilamathi.k, Associate professor, R.M.D Engineering College, Thiruvallur, India
Amrutha.G, Associate professor, R.M.D Engineering college, Thiruvallur, India
Archana.S, UG Student, R.M.D Engineering college,Thiruvallur, India

Abstract- In recent years, RFID technology has been widely used in various sectors, such as in education, transportation, agriculture, animal husbandry, store sales and other sectors. For example, RFID utilization in education are the student's attendance monitoring, body temperature measurement and E-wallet for digital money transaction, by using Inter- net of Things (IoT) and Cloud technology, it will produce a real time student monitoring system that can be accessed by lecturer, campus administration and parents, which is very essential during pandemic situation. With this smart card monitoring system students who are absent and those who have abnormal body temperature can be immediately dis- covered and the message is directly sent to their parents' mobile number. There by ensuring smooth learning process as per the guidelines

I. INTRODUCTION

This paper aims at providing handy solution to schools and colleges during pandemic situation for a safer monitoring and storing information about students, by digital attendance, temperature measurement and e-wallet. Nowadays, due to COVID pandemic, educational institutions must monitor the students with utmost care. Direct contact can be avoided using this technology, e- wallet to pay fee instead of cash, marking attendance through RFID instead of traditional method[4]., measuring of body temperature while entering the class, and finally the information is stored and sent as message through GSM and IOT technology[16].. The traditional way of keeping track of thousands of students is less efficient and time consuming. Thus, the motivation of our system is to reduce human efforts, reduce human errors in maintaining records and to maintain ac- curate records. Also, to reduce the paper work required and to keep parents' of the student informed about their ward [15].

II. LITERATURE REVIEW

There are some existing studies to improve student monitoring using technol- ogy. N.A. Ismail. Ismail et al, had demonstrated about Managing and recording students' attendance record and sending alerts to students with high absen- teeism via short messaging system (SMS) and email. Rahni, A., Zainal et al, had explained about outlines of the development of an online student atten- dance monitoring system (named SAMSTM) based on QR codes and mobile devices. Mokhtar, M. F et al, had illustrated about Utilization of the existing technology by using smartphone that is capable of recording the attendance of staffs using their smartphone device with Bluetooth feature. Kumbha, etal, had defined the identity of a student is verified in collaboration with a fingerprint and position in real time.Makhtar, M. et al, had discussed about the geo-fence technique and its implementation for mobile attendance android-based applica- tion. Mahesh Patil et al, had described about a new paradigm of monitoring student attendance using Radio Frequency Identification (RFID) based on the Internet of Thing (IoT).

III. METHODOLOGY

In most of the universities, teachers take attendance by calling out the names and surnames of students, and marking them, while, in others, the teacher passes around a sheet of paper, asking students to sign in attendance sheet just next to their surnames. To pay school fee, no due fee, to spend in canteen and stationary shop student use direct cash inside the school campus. Body Temperature of the student is not monitored while entering the class and student starts mingling with each other. All these practices have drawbacks. In the first case, if numerous groups attend the lesson, checking all of the students by name and

surname might take about 10 minutes out of each lesson also, friends of absentees may mask down their names and surnames [7]. In the second case, using currencies handled by the public is not safe and hygienic as it might spread diseases. In the third case, If a student is found to have abnormal body temperature, if left un monitored, precautionary measure cannot be taken. In this proposed method, the automated student attendance tracking system is implemented using RF ID Technology [3]. Through this SMART CARD system we can maintain the students' records in the form of database stored in the CLOUD using IoT Modem [11]. The main motive of this paper is to avoid direct cash payments at various places in college, by using a Smart Card Compact Solution, thus becomes a new way of debiting money. Also making sure that the attendance is done smoothly and reports are generated whenever needed [14]. The Temperature monitoring helps us to identify the body temperature conditions and actions can be taken then and there [17].

PIN CONFIGURATIONS

IR SENSOR : The three pins of the IR sensor the ground, power supply and digital pin is connected to 9th pin of Arduino Mega 2560

TEMPERATURE SENSOR : The three pins of temperature sensor are the ground, power supply, and analog pin. The analog pin connection has been given to A0 pin of Arduino Mega 2560.

PUSH SWITCHES : The five switches are connected to 22nd, 24th, 26th, 28th, 30th pins of the Arduino Mega 2560 Mega 2560.

16x2 LCD : The 16x2 LCD with six pins, In which 2 pins are the control pins and the remaining 4 pins are the data pins. Connections are made to 2nd, 3th, 4th, 5th, 6th, 7th pins of Arduino Mega 2560.

GSM MODULE : It consists of three pins, ground, TX (transmit) and RX (receive) pins. TX and RX pin of GSM are connected to the TX0, RX0 pins of Arduino Mega 2560 (alternative connections) [6].

RFID : It is given to the common ground terminal and need no power supply from distributor. It has separate power supply [12]. RF READER: EM-18 has three pins, the ground, the power supply, the transmitter with TX0 and RX1 [5].

IOT MODEM: It has 5v power supply, ground, RX2 and TX2 [10].

BUZZER : 10TH PIN of the buzzer is connected ground to ground.

POWER DISTRIBUTOR : Initially 230V supply is given to the power distributor, which is converted to 12V dc supply. A regulator helps to convert into 5V dc (we distribute 5v dc). The filter (if any AC supply comes in, it converts it as dc). The maximum voltage that the Arduino can withstand is 12V. The GSM Module alone requires 12V.

DEVICES AND CONNECTIONS

A.THINGSPEAK Server: A login id is created in the thingspeak website. The data of the student's attendance is stored in the excel sheet having several fields. It displays the time of attendance marked, Name of the

student and the number of entries. The data can be downloaded at any place from the web, when the login id and password are known. From the import/export data column the information is viewed. This data pattern can be altered for various purposes. The ESP8266 IOT module gets connected the cloud server connections. The internet connection is made with configured username and password in the program. The IOT module transfers information from the input connections and the Arduino Mega 2560 to the cloud (ThingSpeak).it is illustrated in figure 1,2,3.

Fig. 1. Thingspeak website

A. MESSAGING Service : The attendance intimation is sent as SMS to the registered mobile number configured in the program [13]. The aim of paper is to send the attendance information of the student to the parent's mobile number through SMS. The SIM800C GSM module, with three pins are configured to the Arduino Mega 2560 through transmitter and receiver pins. The RX pin of GSM module is connected to the TX0 pin of Arduino Mega 2560 and TX pin of GSM module is connected to the RX0 pin of the Arduino Mega 2560.The power and Ground connections are given through power adapter and ground pin to ground pin of Arduino Mega 2560 [9].

B.TEMPERATURE SENSING: The proposed method of the versatile stu- dent smart card is made innovative with temperature sensing to help students to continue their education in the offline mode. The temperature is sensed us- ing the sensor LM-35, it is a precision integrated circuit device whose output is directly proportional to the Centigrade temperature. The threshold level is between -55°C and 150°C. It has three pins, supply, ground and the analog pin. The analog pin is connected to the A0 of Arduino Mega 2560. The temperature is sensed when the IR sensor identifies a person approaching towards it. The IR sensor used here is passive one, it has three pins, ground and supply connected to the power distributor and the digital pin connected to 9th pin of Arduino Mega 2560.
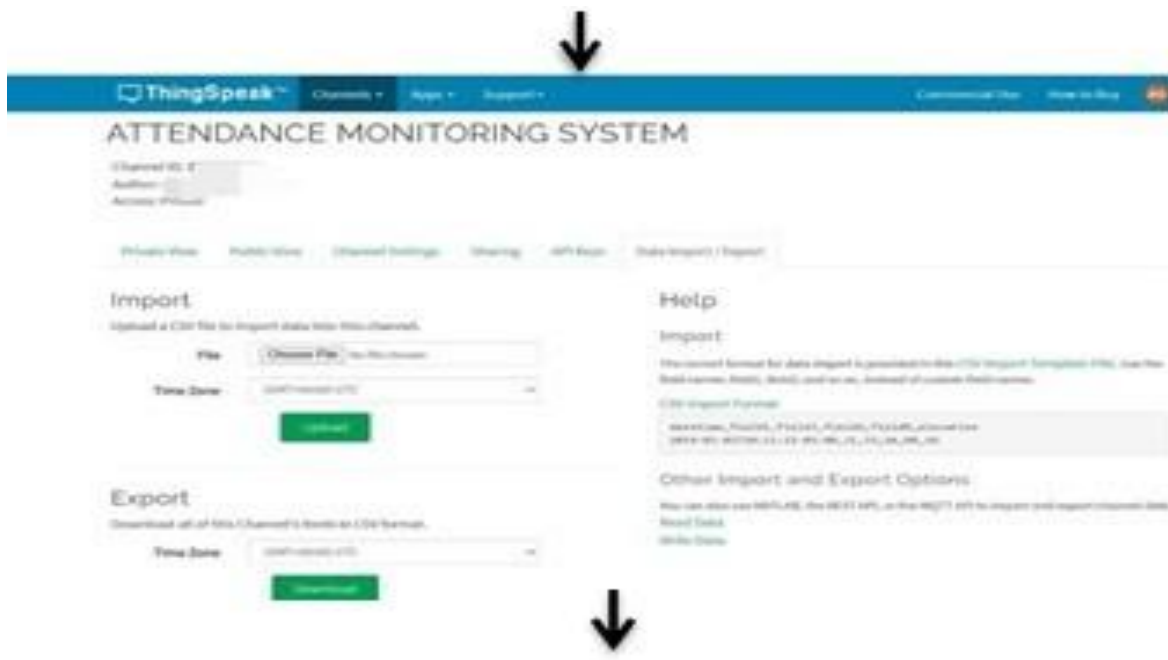
Fig. 2. Attendance monitoring system

Fig. 3. Attendance in excel format.

C. THE SMART ID CARD : The smart Id card is the RFID tag, a wireless communication technology. The tag contains unique code to which the data is stored. The unique code varies for each individual card holder. The EM-18 RFID reader, detects the tag and processes the information when the tag is scanned within the given range [1]. The scanned range is between 5cm and 10cm.The RFID reader has the RX pin, that reads the unique code and RFID tag has to transmit the unique code [2].

Fig. 4. Smart ID card

SWITCHING OPTIONS : The switches employed in the project provide various options such as:

Examination hall

Library

E-wallet

Fee dues

A detailed note on the switches is as follows:

Fig. 5. Menu options

Examination hall:

By pressing the first option, the student can view the details of the examina- tion hall. Further on pressing the first option, contents such as the examination hall number, the timing for the examination (whether it is fore-noon or after noon) is displayed. This makes the student socially distant and adhering to the rules and guidelines of the pandemic situation, thus by reducing the crowd near announcement walls and notice boards. Also, it makes the student to view the details at the time of attendance itself. Please try to avoid rasterized images for line-art diagrams and schemas. Whenever possible, use vector graphics instead (see Fig. 12).

Library:

By pressing the first option, the menu gets displayed. To view the library option, the second switch is pressed. It shows the number of books issued to the student and the names of the books.

E-Wallet:

In pandemic situations, the exchange of cash spreads disease, therefore digital transactions are very safe. The digital transaction of money is implemented for educational institutions. The third switch displays the wallet option, a prede- termined amount is loaded into the card by the administrator. By pressing the third switch, the options such as 1.PAY and 5.BACK are displayed. When pay button is pressed, a preset amount gets deducted and the balance is displayed on the screen

Fees due:

The fourth switch is selected for fee dues. This option helps to find the amount of dues for a student to be paid in school or college. The fee dues category is displayed separately. When the key is pressed it shows the options such as: 1.DETAILS and 5.BACK by pressing the 1st switch, all the details regarding the dues is displayed like, it displays the Exam fee and the Tuition fee. To select BACK, the 2nd switch is pressed.
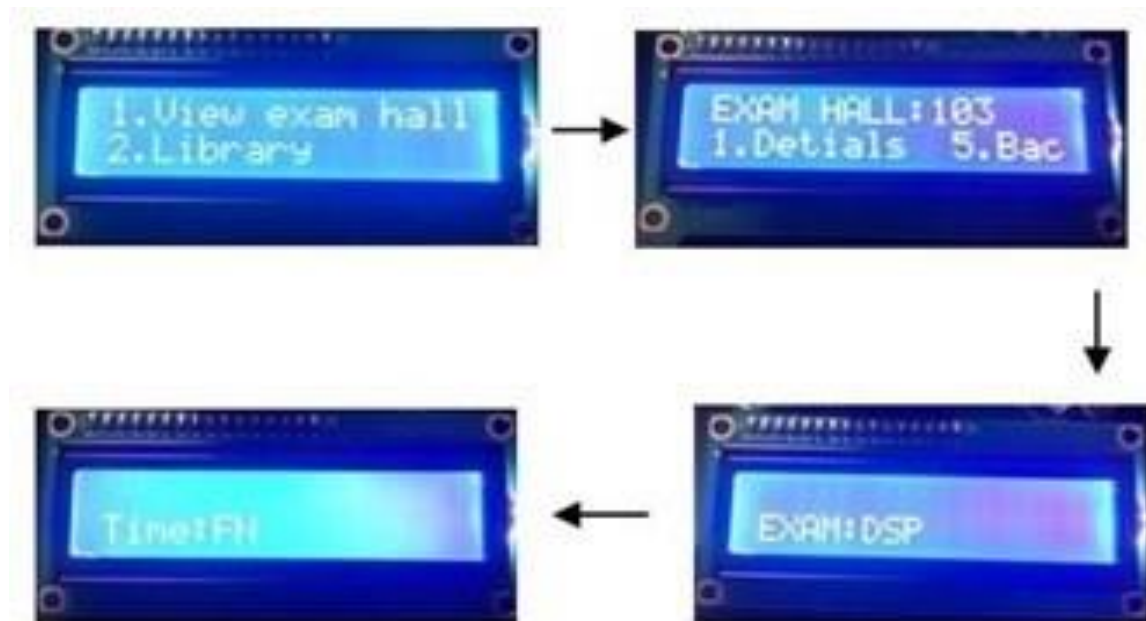

Fig. 6. Examination Hall

Fig. 7. library

Fig. 8. E-Wallet

ALGORITHMS

The algorithm for the project is illustrated in figure 10.

FLOWCHART

The Flow chart for the project is illustrated in figure 11.

EXPERIMENTAL RESULTS

The components of the multipurpose smart card system are interfaced to the Arduino Mega 2560. The inputs are the IR sensor, Temperature sensor, RFID tag. The IR sensor detects the person approaching towards the setup, further the temperature sensor measures the body temperature. The measured temperature is compared with the threshold temperature value (37°C) provided in the program. If it exceeds the acceptable limit the buzzer alerts the user. The RFID reader, reads the unique 12 digit code of RFID tag, sends the information to Arduino Mega2560 microcontroller. The unique code varies for every RFID tag [8].If attendance is made, RFID reader sends the information signal to the cloud server, which is connected to ESP8266, where the program is configured to con- nect the modem with Thing Speak. When internet is provided with hotspot, the username and password are configured in the program. Whenever attendance is marked, data is continuously sent to the cloud server.

From cloud server the information is gathered in real-time. One more option is messaging service, through SIM800C GSM modem. The state of student (present or absent or any abnormalities identified) is sent as a SMS to the parents' mobile and campus administration. MAX232 is used to interface GSM with Arduino, the RS232 level is made to match with TTL logic of Arduino. Hence it makes the conversion. The GSM sends its information as AT commands through the program. Further, the features are chosen using the switches, to select among the various options. Power supply is given from the Power distributor. Each component is supplied with required power supply. The output devices (LCD) contribute to display the features and the results (selected options). 16X8 LCD displays the switching options such as attendance, temperature, name of the student, roll number and other details. The Buzzer alerts after each read of the tag as an indication. The overall setup provides the information reading and monitoring activity in real time through IOT [11].

Fig. 9. Fees Due .

| Step 1: | Start |
Step 2:	Read IR sensor and temperature sensor
Step 3:	convert ADC value to degree Celsius
Step 4:	Display and allow attendance if the Temperature is below threshold
Step 5:	Read RFID card through RFID reader
Step 6:	Display the student details in LCD Display
Step 7:	Press the keypad for making attendance or Other features like library, exam hall, E-wallet etc.
Step 8:	If attendance has been marked, it will be updated to the cloud server.
Step 9:	Attendance SMS will be sent from the GSM modem to the parents' mobile number.
Step 10:	Stop

Fig. 10. ALGORITHM.
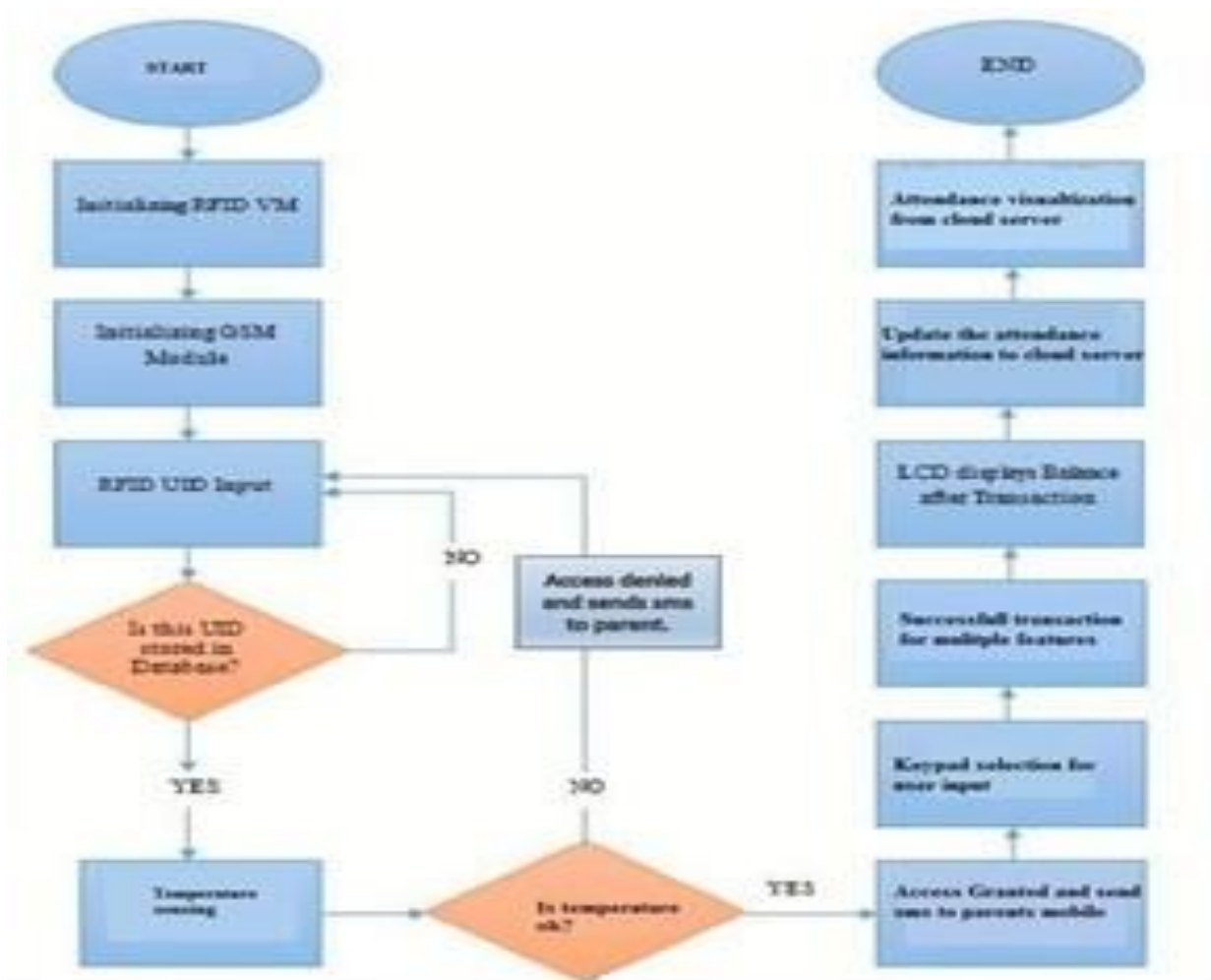
Fig. 11. FLOWCHART
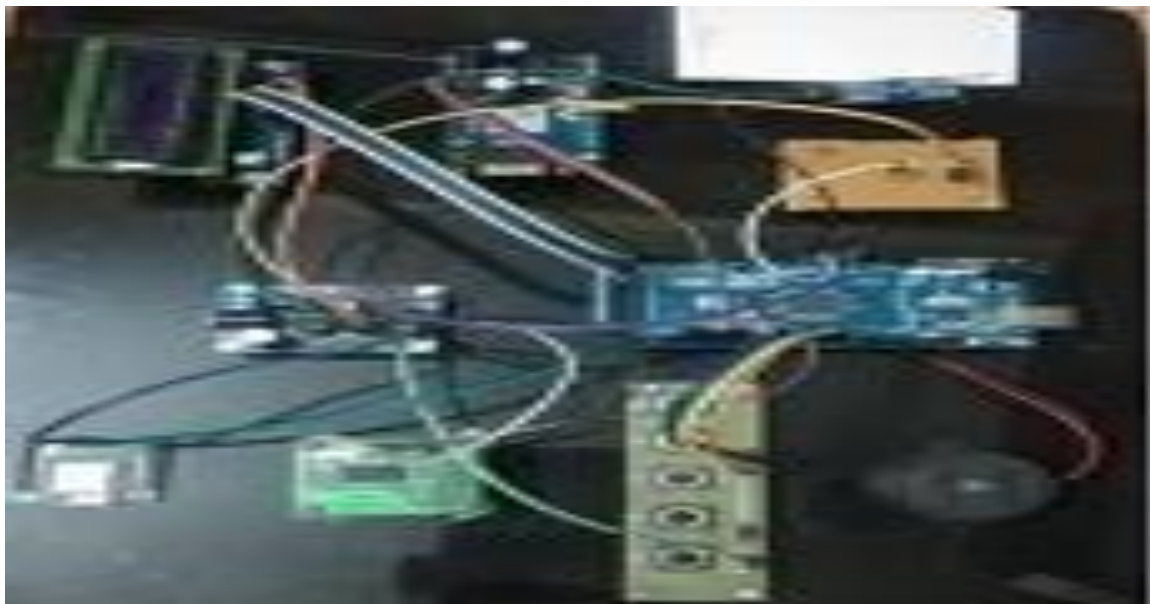
Fig. 12. EXPERIMENTAL SETUP.

IV. CONCLUSION

This work mainly presents to prevent fake attendance and make a real atten- dance entry, and also it concentrates if the student's body temperature is below the threshold. The proposed method requires a combination of RFID, IoT Mo- dem (for Cloud storage) and GSM module (for SMS). Implementation has shown promising efficiency and feasibility for attendance taking along with body tem- perature measurements which is very important aspect to be considered during the pandemic situations. It is a very promising approach for E-wallet payments. It makes sure that the tracking of attendance becomes smoother and Reports are generated whenever needed. It also helps the student to identify his/her pres- ence in their examination halls, laboratory systems and equipment. Thus, usage of GSM module helps the parent to track their child's attendance and making them easily discoverable.

REFERENCES

1. H. K. Nguyen, M. T. Chew, "RFID-Based Attendance Management System", 2nd Workshop on Recent Trends in Telecommunications Research (RTTR)-2017.

2. Van-Dung Hoang ,Van-Dat Dang , Tien-Thanh Nguyen, DiemPhuc Tran, "A solu- tion based on Combination of RFID tags and facial recognition for monitoring sys- tems", 5th NAFOSTED Conference on Information and Computer Science (NICS)– 2018

3. Mahesh Sutar, Mahesh Patil, Sachin Waghmare, "Smart Attendance System Using RFID In IOT", International Journal of Advanced Research in Computer Engineer- ing Technology (IJARCET) Volume 5, Issue 4-April 2016

4. Norakmar Arbain, Noor Firdaus Nordin, Naimah Mat Isa, Shuria Saaidin, "LAS: Web-based Laboratory Attendance System by integrating RFID-ARDUINO Tech- nology", 2nd International Conference on Electrical, Electronics and System Engi- neering (ICEESE), 2014

5. Md. Sajid Akbar, Pronob Sarker, Ahmad Tamim Mansoor, Abu Musa Al Ashray, Jia Uddin, "Face Recognition and RFID Verified Attendance System", 2018 Inter- national Conference on Computing,Electronics Communications Engineering (iC- CECE), 2018

6. Baban, M. H. M. (2014). Attendance checking system using quick response code for students at the University of Sulaimaniyah. Journal of Mathematics and Computer Science (JMCS).

7. Bjorklund, M., Wenestam, C.-G. (1999). Academic cheating: frequency, meth- ods, and causes. In European Conference on Educational Research. Lahti, Finland: Education-line.

8. Chew, C. B., Sing, M. M., Chiang, K., Tan, W., Sheng, W., Husin, H., Malim, N. (2015). Sensors-enabled Smart Attendance Systems Using NFC and RFID Technolo- gies. International Journal of New Computer Architectures and their Applications (IJNCAA), 5(1), 19- 28.

9. Cˇisar, S. M., Pinter, R., Vojni´c, V., Tumbas, V., Cˇisar, P. (2016). Smartphone

10. application for tracking students' class attendance. In Intelligent Systems and In- formatics (SISY), 2016 IEEE 14th International Symposium on (pp. 227–232).

A. Singh, S. Meshram, T. Gujar, P.R. Wankhede. Baggage tracing and handling system using RFID and IoT for airports. International Conference on Computing, Analytics and Security Trends (CAST), (Pune, India, 2016).

11. T. Sharma, S.L. Aarthy. An automatic attendance monitoring system using RFID and IOT using Cloud. 2016 Online International Conference on Green Engineering and Technologies (IC-GET), (Coimbatore, India, 2016)

12. M. Kassim, H. Mazlan, N. Zaini, M.K. Salleh. Web-based student attendance sys- tem using RFID technology. IEEE Control and System Graduate Research Collo- quium, 7 MATEC Web of Conferences 164, 01020 (2018)

13. H.M. Nguyen, S.H. Kim, D.T. Le, S. Heo, J. Im, D. Kim. Optimizations for RFID- based IoT applications on the Cloud. 5th International Conference on the Internet of Things, (Seoul, South Korea, 2015).

14. Shoewu, O. O. M. Olaniyi, and Lawson (2011), Embedded Computer-Based Lec- ture Attendance Management System, African Journal of Computing and ICT (Journal of IEEE Nigeria Computer Section), 4(3):27 – 36.

15. "Android tutorials" [Online]. https://developer.android.com/training/index.html

16. Apoorv, Raghav, and Puja Mathur. "Smart attendance management using Blue- tooth Low Energy and Android." Region 10 Conference (TENCON), 2016 IEEE. IEEE, 2016.

17. Rao, Seema, and K. J. Satoa. "An attendance monitoring system using biometrics authentication." International Journal of Advanced Research in Computer Science and Software Engineering 3.4 (2013).