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An Internet of Things (IOT) based Class Monitoring System: Suchak

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Abstract: ***For effective teaching, it is imperative that classes are held regularly as per schedule, and all the students attend the same. All university and colleges have prescribed attendance rules to ensure that the minimum number of lectures is being attended by the students. Maintaining the records of lecture held, counseling/informing the students who are short of attendance and finally taking consequential action manually is a timely and tedious task. In this paper, an Internet of Things (IOT) based Class Monitoring System is introduced. Each Professor is assigned a unique ID, and the system uses RFID tag to identify the Faculty. All the captured information is sent to the cloud and analyzed for further appropriate action.***

Keywords: ATMEGA 328P, Class Monitoring System, Internet of things (IOT), Suchak

I. INTRODUCTION

Kevin Ashton gave the term "Internet of Things" (IoT) which represents a system wherein physical devices can communicate with each other and can send and receive data. The data is stored on the cloud, processed, analysed and appropriate action is taken accordingly. In IoT, all the computing devices, physical objects, people etc. are given separate IDs so that data can be transmitted amongst them without the human or machine intervention. According to Gartner, by the year 2021, 25 billion devices will fall under the gambit of IoT. The applications of Internet of Things (IoT) covers varied fields enumerated below:

1. **Smart Health Care**: Smart Health Care systems make use of internet of things wherein health parameters like blood pressure, heart rate, asthma are monitored with the help of wearable devices. The information collected is sent on the cloud which can be analyzed by the concerned medical practitioner.
2. **Smart Transportation**: The vehicles moving on the roads have been automated using internet of things. From controlling the traffic light to collecting toll and managing road safety, IOT has paved the way for smart transportation.
3. **Smart Environment Monitoring**: Monitoring of pollution levels and forecasting the weather conditions is of utmost importance for human beings as it helps in improving the quality of life and ensures taking preventive measures against natural calamities. Internet of things helps in developing a smart environment monitoring system thereby monitoring the pollution levels and forecasting the weather conditions.
4. **Smart Manufacturing**: In an enterprise maintaining the demand supply gap is of utmost importance as it involves many stakeholders. There are many aspects that are unpredictable and beyond one's control. IOT facilitates development of smart supply chain management system wherein procurement of raw materials, developing it into a product, inventory management, transportation of goods, consumer behavior is monitored and analyzed.
5. **Smart Energy management**: Internet of Things (IOT) helps development of smart appliances for homes as well as offices which helps in efficient consumption of energy.

With Internet of Things being one of the key areas of interest for researchers, the usage and applications of IOT are increasing day by day.

Another significant area where Internet of Things is finding its usage is the Class attendance monitoring System. Class learning plays a major role in Universities, Colleges and Schools. For better understanding of concepts and stronger grasping of the subject, it is essential that the students attend the classroom lectures regularly. Class room teaching is different from reading from books as the Faculty teaching in the class shares their real life experiences along with providing practical exposure to problems. Also learning in group helps in better retention and understanding of the concepts. Interactive teaching helps in instant clearing of doubts and also helps the facilitator/ instructor to judge the level of understanding of the students. Thus attending the classes by the students has far more significance than just getting a credit for the attendance.

In view of the criticality of the attendance of the students in classes, all universities and colleges have prescribed attendance rules for the students. Also, there are recommendations for holding minimum number of lectures. A record of the lectures attended by the students is kept by the universities and colleges and suitable consequential action is taken in case of short attendance. In extreme cases, students are detained and stopped from giving exams.

In a large university, maintaining the records of the students manually is a timely and tedious task.

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The novel technology of Internet of Things (IOT) can be aptly used for developing a smart class monitoring System.

II. SYSTEM DESIGN AND ARCHITECTURE

This device will monitor the real time attendance status of all teachers who are present or not present in their classes and also track the working status of running classes as well. All data will be recorded automatically on the IoT cloud and we can access it further and simultaneously all information will be displayed on the LCD screen of the device. The information including teachers' name and IDs will also be displayed. We can use an Android application for checking the current location of a particular teacher.

The main aim is to transfer all information to students regarding their class schedules and location of teacher. Through this device, they get all the information which a student needs in the campus area without any kind of struggle. This device can not only be used for students, but it will also maintain teachers' attendance record as well. SUCHAK will inform you about where your class is going on and it will maintain the attendance of teachers and notify the late arrival timings of all teachers for their particular classes to higher Authorities of the Organization.

"SUCHAK" is an IOT based device. "SUCHAK" as the name indicates, is an informer which gives information about the class schedules and teachers' current location. It will monitor the real time status of all classes and track the working status of teachers as well. All data will be recorded digitally on cloud and we can access it further. All teachers have their own RFID tags, which contains their information in it. The RFID tags contain all the information about a particular teacher like name, ID and subject. It will display the information on the LCD screen of device. It is possible to reduce the human effort and time by using this device. RFID reader reads the RFID card of a teacher who enters in the class and displays all the information on the LCD screen. The information of the previous teacher remains on the screen until another teacher puts his/her card. As the next teacher comes in the class and puts his/her card on the device, it will replace the information of previous teacher by the new information.

The designing of this module contains: ATMega 328P dip type microcontroller, which extracts all the information from RFID tags and displays it on the LCD screen. An ESP8266 Wi-Fi module is interfaced with the micro-controller. It will send all the information from micro-controller to the IoT Cloud for digital storage.

III. COMMUNICATION

The HC-05 module and ATMEGA 328P microcontroller are interlinked via Pin 4 (transmitting pin) and Pin 14 respectively. Similarly, fifth Pin of HC-05 is linked with the fifteenth pin of the microcontroller which is used for receiving data from the controller.

Pin number 16 of microcontroller is linked to the RFID module via the transmitting pin. The ground pin of RFID module and pin number 20 and 21 of microcontroller is linked to the VSS pin of LCD. Also, VDD pin of LCD is linked to VCC of RFID module. The RS pin of LCD is linked to PD2 of controller. In the LCD the enable pin is linked with the microcontroller via pin PD3. The data pins D4, D5, D6 and D7 are linked to the digital pins of microcontroller's PD4, PD5, PD6, PD7 respectively.

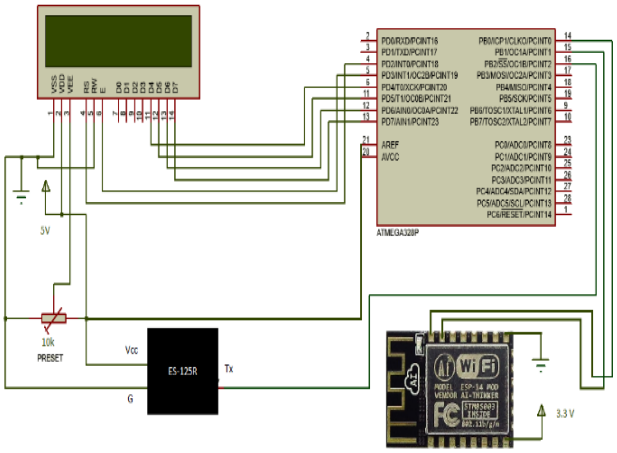

Figure 1: Circuit diagram

BLOCK DIAGRAM

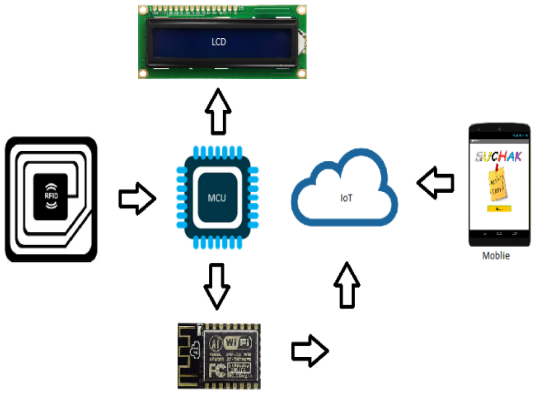

Figure 2: Block diagram

IV. PROTOTYPE MODEL & LABELING

Figure 3: Prototype model

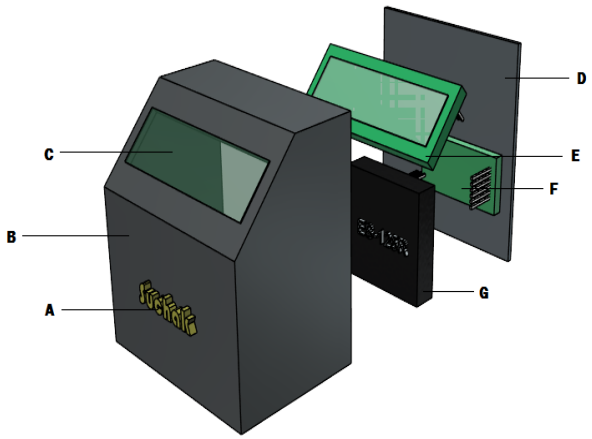

Figure 4: 3 D View

The various parts of 3D view are enumerated below:

(A) Device Logo
(B) Main Body
(C) Transparent Glass
(D) Main Body Cover
(E) 16*2 TFT LCD
(F) ESP 8266 Wi-Fi Module
(G) ES-125R RFID Reader

V. ANDROID APPLICATION

VI. IOT DATA VISUALS

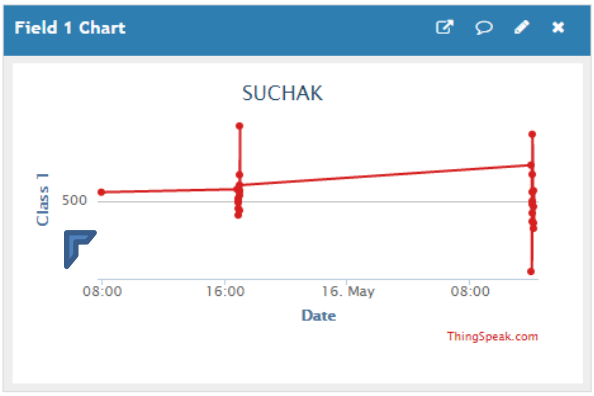

Figure 5: Analysis of Class 1

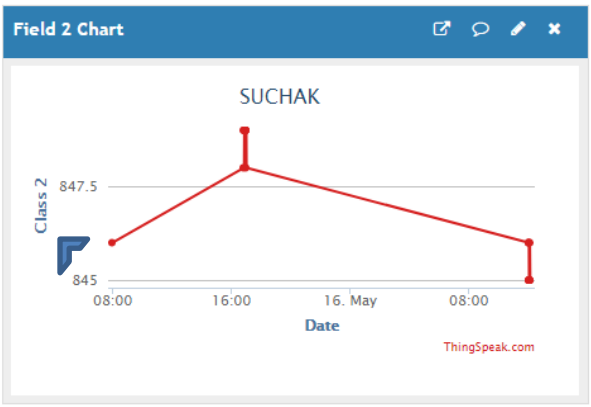

Figure 6: Analysis of Class2

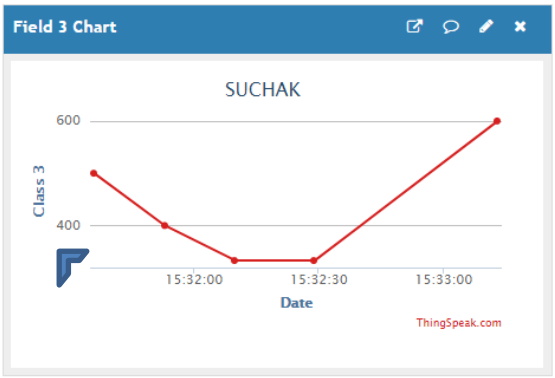

Figure 7: Analysis of Class3

The IOT Data visuals shown in the above figures gives the analysis on daily basis of the number of students present in a particular class and also gives us the timing of the entry and exit of a particular Faculty from the Class.

VII. APPLICATIONS AND FUTURE ENHANCEMENT

This device can be used in colleges for informing students about their class schedules and attendance of teachers. Also it can be used in offices for attendance records. This device can be used in buildings for maintaining records of the people. Many future enhancements can be added into this device. At present it informs about class schedules and is used for maintaining teachers' attendance record. In future it can give alert massages to a particular person about class status. This device can also inform about the absence of a Faculty in the class to a Higher official i.e. if the class begins at 8:30 am;

the teacher has to report in the class within 10 minutes and if a particular teacher is not present in the class then the device will generate an alert massage to the higher authorities that the class has been started from last 10 minutes but the teacher is not present in the class.

VIII. CONCLUSION

The main moto behind this project is to save time of students and teachers. Once all the information is fed in this device, it will display the information on the LCD screen thereby reducing human efforts. We can access this device from anywhere in the campus area. In general, it is best suited for colleges to maintain Faculty attendance record and eliminate paper work. As the entire information will be stored on cloud it can be used any time with the help of an application which we are using for receiving information from the microcontroller.

SUCHAK is small in size, and thus can be fixed at the entrances of all the classes. As a teacher enters in the class, he/ she will put his/her RFID tag on it. SUCHAK will receive all information of the teacher who puts the card on it. The information including: ID numbers of RFID tags and Name of teacher will be displayed on 16*2 LCD screen. The information remains on the LCD screen until another teacher puts another card on the device.

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Dr. Abhiruchi Passi did her **B.E** in Electronics and Communication Engineering and **M.Tech** in Electronics and Communication Engineering in **2001** and **2006** respectively. She also did her Masters Diploma in Business Administration from Symbiosis, Pune in **2005**. She completed her **PhD** in **2016** from Shri Jagadish Prasad Jhabarmal Tibrewala University. She has over **16 years** of teaching experience and presently she is Associate Professor and Head in the Electronics and Communication Engineering Department of Manav Rachna International Institute of Research and Studies, Faridabad, India. She has more than **26 papers published** in various National and International Journals and Conferences. Her areas of interest are RF power solutions (Microstrip Filters), Wireless and Data Communication and Internet of Things. She is a member of Institution of Engineers, Life member of ISTE and Member of IAENG.

Mr Devdutt completed his B.E in Electronics and Communication Engineering in 2015-2019 from Manav Rachna International Institute of Research and Studies. He is a chip level and card level certified Engineer in SMD Electronics by HI Tech Institute of Advance Technologies (P) Ltd. He is an Intel Higher Education Challenge 2017 winner, Robotic National Champion at IIT Guwahati, Aster Piece Living Talent Dubai 2017 under top 15 teams in the world, Robotics Gold Medalist at IIT Guwahati in 2018, IESA Makeathon 2018 winner, IESA Makeathon South campus golden ticket winner 2018 , Microsoft Imagine Cup National finalist 2018, E- Summit'19 Makeathon 2019 winner at IIT Roorkee, World Arduino Day 2019 winner, Faridabad Industrial Association 2019 winner, Awarded by Renesas GR Lychee Design Contest for India's top 15 innovation idea. Developer circle Chandigarh octal Hackathon by Facebook 2019 winner. He has been honoured by Manav Rachna International Institute of Research and Studies with golden batch for best Innovator. He has 3 filed patents and 3 papers published to his credit. His area of interest includes Robotics and Embedded Systems. His all the achievements and awards are dedicated to his Parents and Mentors. Currently, he is a core member of an USA based IoT solution startup Company.