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Smart Classroom – A Stepping Stone in Making Digital India

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Abstract: ***Recent progress in learning indicates the importance of students to be active in invents things rather than passive recipients. Smart Classrooms can make a noticeable change in how teachers can teach and learners can learn. The objective of the project presented in this paper is to propose a smart algorithm that provides a means of achieving a smart classroom environment in which most of the manual processes are automated and provides an efficient way of interconnecting multiple classes, thereby providing a unique way for information transfer. The proposed algorithm uses the Internet of Things to communicate between various classrooms and transmit/receive the required information. An embedded module installed in each classroom can collect information such as attendance detail, teacher's location, and updates the information in the server for future use. These details are then used for some critical purposes, such as sending circulars, calling a particular teacher immediately to the office, etc.***

Keywords: ***Arduino, Internet of Things, Learning environment, RFID, Smart classroom, Web Server, and Wi-Fi.***

I. INTRODUCTION

The study and practice in terms of facilitating, improving and enhancing the practices of learning by using the appropriate technology and resources [1]. It refers to hardware, software and educational theoretic. It includes several domains, including theory learning, computer-based practicing, e-learning and mobile technologies uses m-learning. A smart classroom is the most targeted and popular domain in educational technology. It is a classroom the instructor equipped with the system and audio-visual equipments, which allows the instructor to utilize the latest technology and media for teaching. These include a DVD system, smart interactive whiteboard, PowerPoint presentations and many more, all utilizing an LCD projector [2]. The smart class has an efficient unique teaching model for providing an interactive method of learning for the students in schools and colleges. A central server is created inside the school connected to the entire library and smart class digital content.

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All classrooms are connected to the central server through the internet. Instructors get required resources in digitalized form such as animated videos and interactive virtual labs tool, etc. and used as a part of their teaching in every period in the classroom [3].Some existing systems have available to improve classroom learning, using various emerging tools in computing and communication technologies, only a few have addressed collaborative teaching and learning [4]. For example, in a smart interactive Classroom, the students can share a smart whiteboard, e-textbook, etc. With the internet over a well networked-environment, the students can participate in-class learning, distributing notes, conducing exams, assess the student's projects and track the students in a classroom, to make a record for the instructor to track learner's activities, which makes to automatically generate Web-based accessible multimedia files for the instructor and learners [5].

II. BACKGROUND

Learning environment creates the teacher involves students to learn and makes to think about what they are doing. Encourage students to participate in the learning or group learning, where everyone learns from available resources [6]. Classrooms have the following general characteristics

Knowledge sharing: Instructors have knowledge about the course content, skill, and instructions, which provide information to Learners. The Instructors also build upon the knowledge, experiences, language, strategies to teach, and involves the students to learning.

Sharing ability: The Instructors encourages learners to use their own knowledge, expertise, improve their learning strategies and focus on high levels of understanding.

Mediation: Instructors act as mediators, to help learners to connect with new latest technologies to their experiences and to learning in other areas, which helps students to discover what to do and helps them to learn how to learn.

Heterogeneity: Heterogeneous groupings enrich learning in the classroom since the experiences, perspectives, and backgrounds of all learners are important for enriching and learning in the classrooms.

The knowledge sharing and sharing ability to capture the bond between the instructor and learner, the mediation characterizes instructors' new approaches to instruction and heterogeneity addresses the composition of a classroom. The Smart Classroom enhances above all.

Smart learning is a way of learning things with the assistance of electronic devices. The learner will be expertise with the look together all the time-dependent on learner's accessibility and encourages customized learning. Intelligent technological things, such as the Internet of things (IoT), big data analytics,

cloud computing and wearable technology, etc., promote smart classroom learning [7].

IoT based electronic learning Significance is we can share class notes to outside the classrooms utilizing IoT based electronic Learning and makes a virtual class where more students of various study halls in various locations can adapt effectively in learning with software tools like i.e. digitalized resources, sending messages, social network, virtualization tools and hardware i.e. interactive whiteboard, smart table, tablet and e-bag etc. It helps students to learn from anywhere and anytime.

This approach upgrades learners learning capacity, knowledge and encourages the student with satisfactory implicit and explicit the digital resources. It improves their personal information by utilizing the gadgets and things in the system. This will offer analysts to upgrade new technique and learners can learn more successfully and more effectively. A learner can be a smart learner when they collaborate with the framework of smart gadgets. Figure 1 shows the outlook of smart classroom.

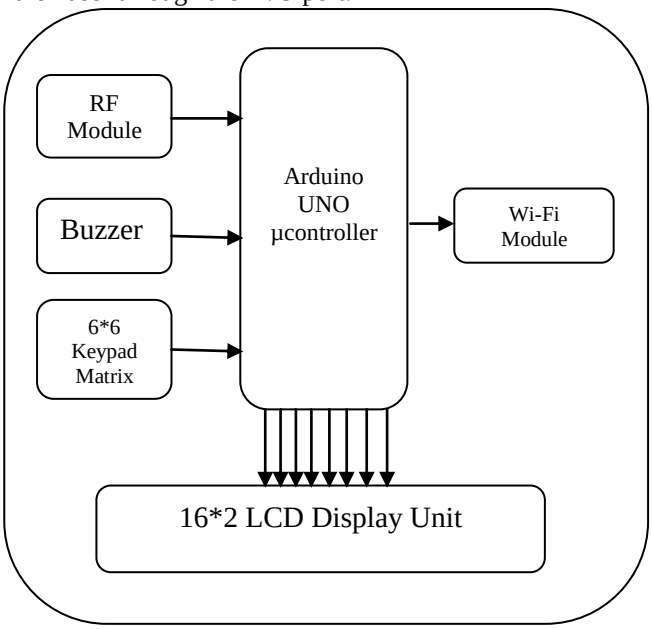
Figure 1: IoT based Smart Classroom module

II. PROBLEM DOMAIN

The basic idea of smart classes is to make studying easier and learn relevant knowledge which is out of studies for Students. In many schools and Colleges in India, attendance is taken manually and absentees are written in a sheet of paper and passed on to the office room by an office assistant [8]. This process takes most of the time in the class hours and hence students cannot utilize the entire learning time [9]. Often important notices and circulars are sent by an office assistant and read at each and every classroom separately. This process will be very annoying for the person who is taking the circular to every class. In order to automate the entire process of a classroom, the smart classroom should provide a way to organize all the work and provide an efficient way of information exchange requiring less manual help or sometimes no manual help at all.

III. OVERLOOK OF THE SYSTEM

The system is enabled with RFID and WiFi technology as shown in figure 2, that helps in monitoring the activities inside a classroom [10] and updating the information to cloud [11]. The attendance details entered in the classroom module are transferred to the college server through WiFi module [12]. A web application running on the college server is used to view the attendance details in every class. Any important circular can be sent to any classroom from the web application. Every teacher's location is also updated by the system and can be viewed in the web application [13]. The system has a power switch and a reset switch for power management. Once the system is ON it starts to receive the information from the server through the WiFi module and IOT. The input information is received from the user through the I/O port.



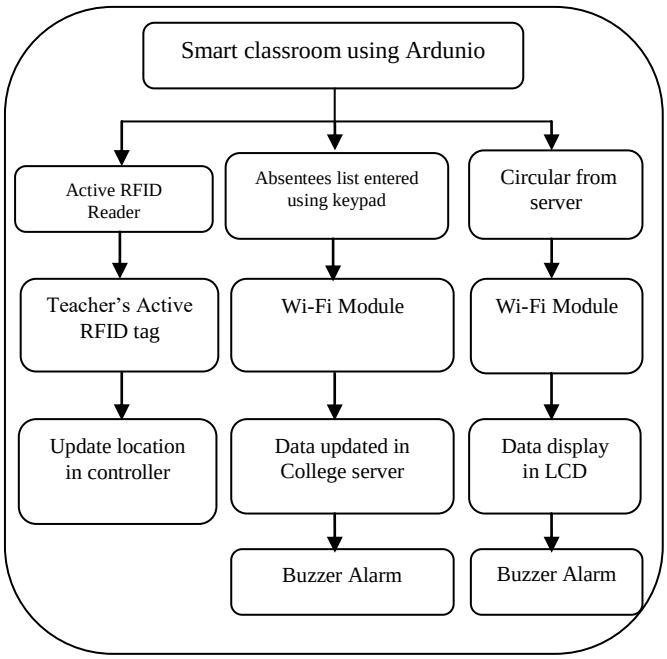


Figure 3: Flow diagram of proposed system

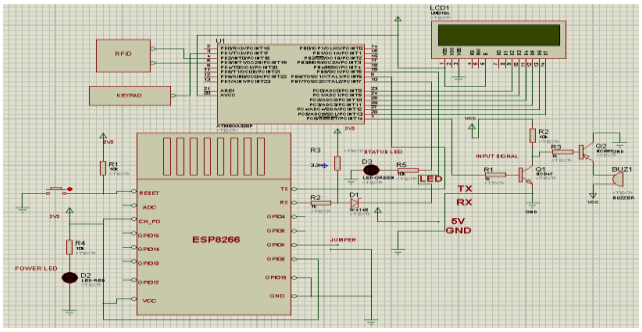


Figure 4: Circuit diagram of the proposed system

The embedded system will store the respective data into MySQL database through WiFi module [14]. The processed output will be seen in the LCD display connected to the microcontroller.

V. FUNCTIONING OF THE PROPOSED WORK

The device is based on an embedded system which has modules like WiFi Modem, RF module and LCD panel. The WiFi modem is connected to the Microcontroller to transmit and receive attendance details and circular details to and from the college server. The data regarding any circulars are received by the microcontroller through the WiFi module, and then it activates a buzzer to indicate that a message has arrived and it is displayed in an LCD display. The RF modem available in the classroom node reads the details of the Teacher presents in the class and updates it to the microcontroller. If a request is raised from the server to know a location of a particular teacher, the appropriate Microcontroller is triggered and the classroom where the teacher is present is displayed in the server.

The proposed system has 3 major functionalities: Teacher location tracking, Attendance management and Wireless Circular management. Figure 3 shows the flow diagram of the system for location tracking, attendance and circular management. Figure 4 shows the corresponding circuit design of smart classroom.

Teacher Location Tracking

The teacher's ID card is embedded with an active RFID tag. The RF Module present in each classroom monitors the presence of the teacher in that Particular class. If a particular RFID tag remains for more than some time in a Particular classroom, then their presence is determined in that particular class. The collected information from smart classroom is stored in the server. A request is sent from the college server to the microcontroller to find the location of a particular teacher. The microcontroller replies with the current Location of the teacher which is displayed in the server page.

Attendance Management

The teacher takes the attendance and enters the list of absentees using a keypad connected to the module. This system can use IoT technology for taking attendance more effectively and more efficiently and requires less time to collect attendance than standard roll call system. Each and every classroom contains RFID reader which reads each student ID card for updating their attendance which makes taking attendance simpler and makes attendance management efficiently. These details are automatically transferred to the college server, just by a single click with the help of Wi-Fi module. Any changes in the attendance can be made in the server by an authenticated person and the final list is stored in the database for future use.

Wireless Circular Management

Any important circular or information to be passed on to all the classes is typed in the server by an authenticated person. The information is passed on to modules in smart classrooms through a Wi-Fi modem and the received circular is displayed in a digital projector unit which is connected with classroom node. If information needs to be sent to a particular classroom or teacher, appropriate IP address can be used.

VI. RESULTS

In this paper an integrated smart classroom which automates the classroom activities such as Teacher location tracking, Attendance management and Wireless Circular management. Figures 5 shows the complete interface diagram of hardware, and figure 6 shows the tracking of teacher and students using RFID tag, the location of teacher and students attendance details is updated in server and the circular is sent to the particular class from server. This design exploits the hardware and provides an innovative solution in reducing man power and computerizing the overall classroom experience.

Figure 5: Complete interface diagram of hardware.

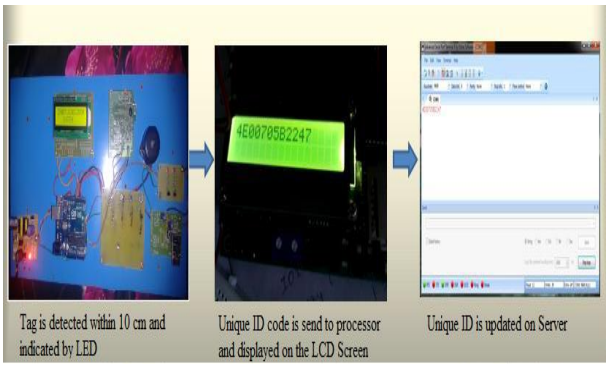


Figure 6: RFID card detect ->Unique ID display in LCD screen -> Comm. to Server

VII. CONCLUSION AND FUTURE SCOPE

The system proposed in this paper is of great advantage to the schools and colleges.

With the more sufficient investment in technology the system can be enhanced. Several researches are being conducted by various scientists to have this system implemented in real time with much more additional features in teaching and learning. Researchers are being done to utilize cloud technology and use a cloud based server to process and store the results. It is planned to embed many environment monitoring sensors like LM35 temperature sensor, MQ2 smoke level sensor to monitor the classroom environment. In case of any fire accident, the information is passed instantly to all the classrooms and asked to vacate the building immediately.It is also planned to include a potential face detection algorithm, which in turn reads the facial expressions of all the students. If much number of students feels drowsy, the teacher will be notified so that they can plan their classes accordingly.

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