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Smart Classroom

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ABSTRACT

Smart products have influenced the market to create our lives easier at home, within the workplace, and everywhere. Technology has benefited in each aspect of our life right from education to communication. It's a fresh vision in education. The best usage of technology can bring an enormous change in education. The smart learning approach makes the learners of all age groups and walks of life with a framework and variety of smart tools that encourage higher levels of understanding. The education system of a nation like India has made students follow a stereotyped method of learning. Students are practiced to take notes on continuous lectures. This has eventually decreased the listening capability of students and also students who absent themselves to classes find it difficult to follow-up the portions. This system proposes to develop a method in which the lectures are taken as notes automatically; students just need to listen to classes. Teachers respective to all the departments will be identified using an RFID reader and notes are maintained as a database. At the end of the day, the notes are sent as mail to students who are absent from classes. Thereby by the concept of the smart classroom, we can emphasize learning the concepts which lead to innovative and interactive learning sessions ultimately enhancing the performance.

Keywords— *Smart Learning, Notes, Innovative and Interactive Learning, RFID Reader*

1. INTRODUCTION

1.1 Motivation

Countries like India's education system has made students follo w a stereotyped form of learning. Students are qualified to take notes on lectures continuously this has eventually decreased the listening capability of students. Also, students, who are absent from classes find it difficult to follow-up the portions. This system proposes to develop a method in which the lectures are taken as notes automatically and students just need to listen to classes. Notes are maintained as a database and at the end of the day, the notes will be sent as mail to students who are absent to classes. Thus, the students can now emphasize learning the concepts that motivate higher levels of understanding resulting in innovative and interactive learning sessions, ultimately, enhancing the performance of students.

1.2 Objective

The main objective of this project is to introduce a system, which can overcome the stereotype method of learning where the students are practiced to take notes on continuous lectures. And also, to develop a method such that the students who are absent to classes and find it difficult to follow-up the portions can now easily access the lecture notes of that class.

2. LITERATURE SURVEY

Dr. V.K.Maheshwari, M.A (Socio, Phil) B.Sc. M. Ed, Ph.D., "Concept of SMART CLASSROOM", Philosophical commentary on issues of today, nov 30,2016.[4]

Until now, education has concentrated mainly on teacher centric approaches in which information is transmitted directly from teachers to learners. The face of education is changing with the development and maturity of educational culture. No explanation of learner-centered learning would be complete without a discussion of constructive learning. In constructive learning, teachers are encouraged to help their students have a better understanding of given information and work out new things—or transform old things—using smart class models, where, there will be computers, projectors, internet connectivity and other multimedia devices such as home theatre, etc being employed as teaching aids.

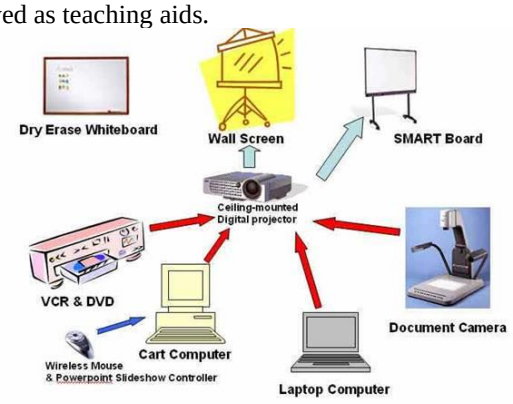

Fig. 1: The model proposed by Dr. V.k. Maheswari

We observe that the role of a teacher may be modified in such a new environment, but the students are still practiced to take notes on continuous lectures.[4]

Julie Johnston, Professor, Indiana University, FUTURE CLASSROOMS, Collective brainstorming at Indiana University's Smart Classroom Summit, OCT 2018.[2]

In the proposed system by Julie Johnston, In the class, students waiting in the hallway receive, just-in-time information about that day's lecture (e.g., group assignments, exams, etc.) in the form of a message. Here only the information about what the class is going to be is shared, also the problem that students need to take notes during the lecture still exists.

The goal of Indiana University's Future Classroom project is to build a learning environment that anticipates and automates common classroom tasks to make better use of faculty and student instructional time. They believe that many emerging technologies can positively affect the experience of students and faculty in classrooms in a variety of ways, including efficiency, learningexperience,andcomfort.The smart classroom would pro vide a technologyrich environment for the faculty and students, reduce complexity, and eliminate support needs.

To achieve these objectives, we have explored a smart solution that will enable instructors from the podium of the room to monitor them from anywhere in the class. Streamline class start-ups, including biometric access to room technology, back-the-scenes routing of course material to room screens, lighting monitoring and automatic attendance; Offer whiteboards that can be captured redirected to various displays in the room and stored for future viewing and editing; provide interactive small-group displays and the ability to easily route content to and from those displays; and deliver these features through an easy, user-friendly and responsive room/technology interface.

3. COMPONENTS USED

3.1 Power Supply

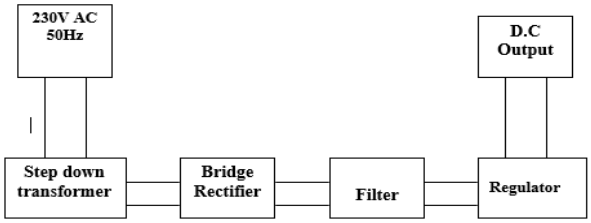

Fig. 2: 12V Power supply

Input from the controlled power supply is added to the circuit. The Output, i.e. 230V from the mains supply is fed to the rectifier by the transformer down to 12V. The signal the rectifier obtains is a pulsating d.c voltage. So, to achieve a pure d.c voltage, the rectifier's output voltage is fed into a filter to eliminate any a.c components that are present after rectification. Now, a voltage regulator is given this voltage to obtain a pure constant voltage of DC.

3.1.1 Transformer: DC voltages are usually required to operate different electronic devices and these voltages are 5V, 9V, or 12V. But such voltages cannot be directly accessed. The a.c input available at the power supply is, therefore, to be reduced to the necessary voltage level by 230V. A transformer does so. Therefore, a step-down transformer is used to lower the voltage to the appropriate level. A transformer is an electrical system that transfers energy by magnetic coupling with no moving parts from one circuit to another. A transformer consists of two or more coupled windings, or a single tapped winding, and, in most situations, a magnetic core for magnetic flux concentrations. In one winding, a shifting current produces a time-varying magnetic flux in the

3.1.2 Rectifier: The transformer output is fed into the rectifier. It is A.C. In pulsing D.C. The rectifier can be a half-wave rectifier or a full-wave rectifier. Because of its virtues including good stability and full-wave rectification a bridge rectifier is used in this project. The Bridge rectifier is a circuit that converts an ac voltage to dc voltage using all half input voltage cycles. The rectifier circuit for the Bridge is shown in the diagram. The circuit is connected by 4 diodes to form a bridge. The input voltage for ac is applied to the bridge's diagonally opposite ends. The load resistor is connected between the bridge's two other ends.

Fig. 3: Bridge rectifier

3.1.3 Filter: Within this project, the capacitive filter is used. It eliminates the ripples from the rectifier's output and smoothens D.C. The output obtained from this filter is constant until the voltage and charge of the mains are maintained constant. If one of the two is varied though, D.C. Voltage received adjustments at this stage. A regulator is then implemented at the output level.

Fig. 4: 1000µF capacitor (Used as Filter)

3.1.4 Voltage regulator: It governs the feedback applied to it, as the name itself suggests. A voltage regulator is an electric controller designed to maintain a steady voltage level automatically. For this project, the 5V and 12V power supply is required. The 7805 and 7812 voltage regulators are to be used to achieve these voltage levels. Such regulators will have local on-card supervision, reducing the issues associated with single-point control of distribution. Each type employs limiting internal current, thermal shutdown and safe protection of the environment, rendering it essentially indestructible. If the heat sinking is sufficient, they can produce more than 1 A output current. This IC is used in the prototype built for the power LCD; an RFID module named AT mega 328.

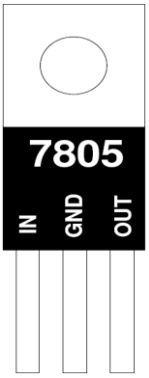

Fig. 5: Voltage regulator

3.1.5 1117 voltage regulator: The IRU1117-33 is a low-drop-out 3-terminal fixed output regulator with an output current capability of at least 800mA. This product is specifically designed to provide a well-regulated supply for applications with low voltage ICs such as VGA, sound & DVD cards. The Wi-Fi module used at the transmitter end operates at a 3.3V voltage. This module uses 1117 voltage regulator IC to supply 3.3 V. This IC generates a 3.3V output signal from the provided 5V input signal that is generated using the 7805 IC.

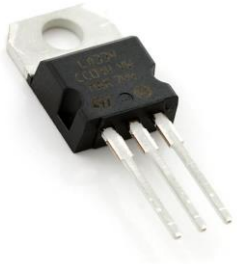

Fig. 6: 1117 voltage regulator

3.2 Arduino Microcontroller

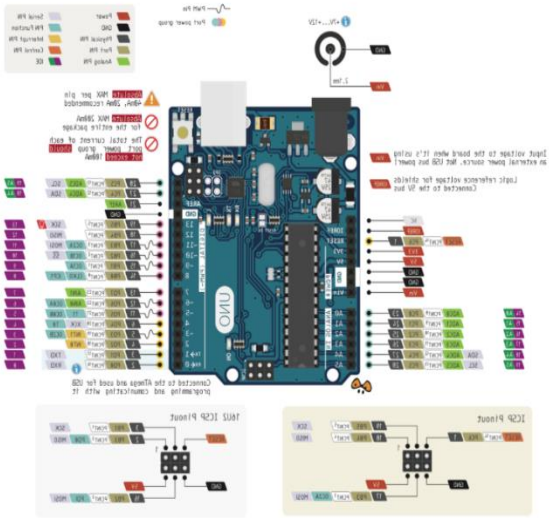

Fig. 7: Arduino Uno R3

One can think of an Arduino microcontroller board as a user-friendly, open-source input-output device. The input can range from a finger pressing a button to a light intensity adjustment, and outputs can vary from lighting up a simple LED light to sending out a Twitter post.

Arduino's different features make it stand out from the rest of the microcontrollers on the market. For example, the software is open-source, so you can so-called "look under the hood" and are free to download, change, and reuse (which is also a bonus for more experienced developers). Also, the Arduino's basic plans are open source, meaning users can build their own without having to purchase one.

Also, evergreen companies make Arduino boards and you can buy complete kits of breadboards, cable sensors, and more. Arduino is on the lower end of the cost continuum, also fully installed, and is compatible with Windows, Mac, and Unix systems. Maybe most significant for beginners is the fact that the Arduino's development environment targets people with little or no microcontroller experience yet is efficient and versatile enough for advanced users.

There's a lot of useful material out there to help even the most novice users understand the Arduino and make use of it in exciting and innovative ways. In short, it has made microcontrollers available to all, including those with limited computer experience, irrespective of age.

3.3 RFID tags

As the name suggests, the RF module operates at Radio Frequency. The frequency range in question ranges between 30 kHz & 300 GHz. The digital data in this RF system is interpreted as variations in carrier wave amplitude. This form of modulation is known as Amplitude Shift Keying (ASK).

RFID tagging is an ID scheme that uses radiofrequency identification tools for identification and tracking purposes. An RFID tagging system consists of the tag, a read/write or read-only device, and a data collection, processing, and transmission system function. RFID tags consist of at least two parts: an integrated circuit, and a signal receiving and transmitting antenna. The tag information is stored in non-volatile memory.

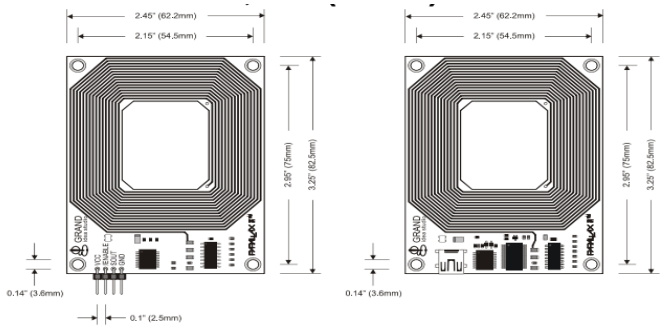

Fig. 8: RFID tags

3.4 RFID Reader

An inexpensive solution for your RFID based application is the EM-18 RFID Reader module operating at 125kHz. The Reader module comes with an antenna on-chip and can be operated with a 5V power supply. Power up the module and attach the module's transmit pin to get your microcontroller's pin. Display your card within the distance of reading, and throw the card number at the production. The module can optionally be programmed for a Weigand performance too.

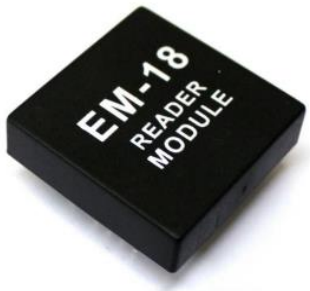

Fig. 9: EM 18 Reader Module

3.5 Wi-Fi Module

ESP8266 is a complete and self-contained Wi-Fi network system that can hold software applications or uninstalls all Wi-Fi networking functions from another application. ESP8266 when the computer is installed and the flash memory can be started directly from the external movement as the sole application of the application processor. The built-in memory cache will help increase the device performance and lower memory requirements. The highly integrated chip ESP8266, including antenna switch, power management converter, therefore with minimal external circuitry, includes the front-end board, including the entire solution designed to minimize PCB room.

Fig. 10: Wi-Fi module

3.6 Liquid Crystal Display

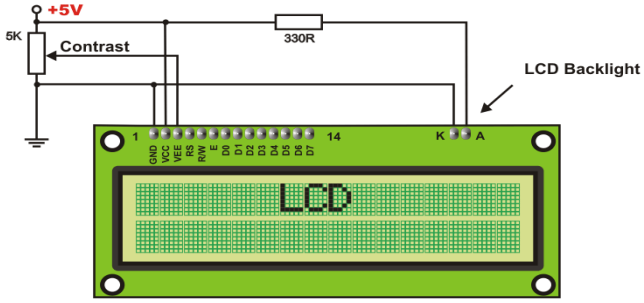

Fig. 11: Liquid Crystal Display

Liquid Crystal Display stands for LCD. For the following reasons, LCD finds widespread use of replacing LEDs (seven-segment LEDs or other multi-segment LEDs),

(a) Declining LCD costs.
(b) The ability to display numbers, characters, and maps. This compares with LEDs, which are confined to numbers and a few characters.
(c) Incorporate a refreshing controller into the LCD, thus relieving the CPU from the LCD refresh function. Conversely, the CPU must refresh the LED to keep the data displayed.
(d) Ease of Character and Graphics programming.

The LCD screen consists of two lines that each have 16 characters. Increasing character shall consist of a matrix of 5x7 dots. The display contrast depends on the voltage of the power supply and whether the messages appear in one or two lines. For this purpose, the voltage variable 0-Vdd is applied to pins marked as Vee.

3.7 Potentiometer

A potentiometer is known as a 3 terminal variable resistor in which the resistance is varied manually to monitor electric current flow. The potentiometer serves as a voltage divider which can be modified. A potentiometer is a passive component of an electronics. Potentiometers operate by varying a sliding contact's location over a uniform resistance. The entire input voltage is applied in a potentiometer over the entire length of the resistor, and the output voltage is the decrease in voltage between the fixed and sliding contact as shown below.

Fig. 12: Potentiometer

3.8 Crystal oscillator

A crystal oscillator is an electronic oscillator circuit, which uses the mechanical resonance of a piezoelectric material vibrating crystal to produce an accurate frequency electrical signal. Like in quartz wristwatches, this frequency is also used to keep track of time, to provide a stable clock signal for digital integrated circuits, and to balance frequencies for radio transmitters and receivers. The quartz crystal is the most common type of piezoelectric resonator used, so oscillator circuits using them are known as crystal oscillators, but other piezoelectric materials are used in similar circuits like polycrystalline ceramics.

Fig. 13: Crystal oscillator

4. SOFTWARE USED

4.1 Arduino Software

The Arduino Integrated Development Environment (IDE) is a Java-written cross-platform framework that derives from the IDE for the language of programming processing and the Wiring projects. It is intended to incorporate programming which is unfamiliar with software development for artists and other newcomers. It includes a code editor with features such as highlighting syntax, brace matching, and automatic indentation, and can compile and upload programs to the board with a single click. A "sketch" is a program or code written for Arduino.

Arduino programs are written in either C or C++. The Arduino IDE comes with a software library from the original Wiring project called "Wiring," which makes many common input/outputs operations much simpler. The users just need to specify two functions to render an executable executive cyclic program.

4.2 Java

Java is a general-purpose programming language that is class-based, object-oriented, and built to have as few dependencies as possible on implementation. This is intended to let application developers write once, run anywhere, ensuring that compiled Java code will run on all Java-supporting platforms without recompiling. Usually, Java programs are compiled to bytecodes that can run on any virtual Java machine, regardless of the underlying computer architecture.

Java was originally designed at Sun Microsystems by James Gosling, and published in 1995 as a core component of the Java platform of Sun Microsystems. Java compilers, virtual machines, and class libraries were originally published under proprietary licenses by Sun as original and reference implementation. Java can be used to build full applications that can run on a single device, or be spread over a network to servers and clients.

5. DESIGN AND IMPLEMENTATION

This proposed system consists of two sections as shown in the block diagram.

1. Transmitter section
2. Receiver section.

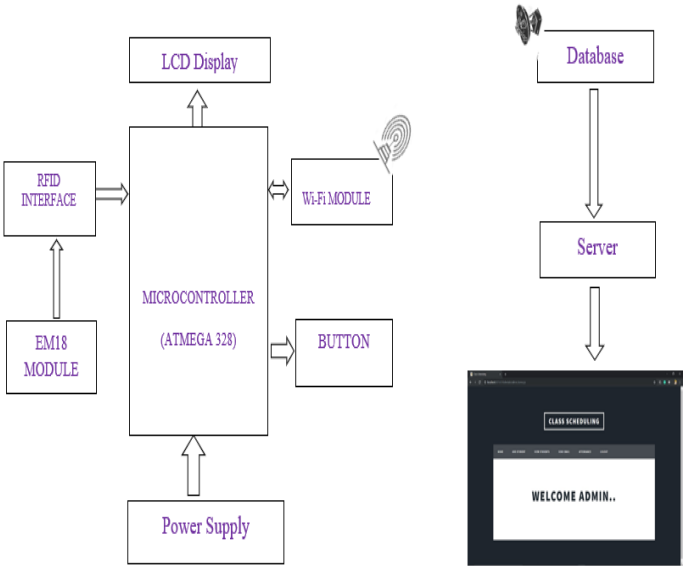

Fig. 14: Block diagram of the proposed system

Various blocks are integrated with the transmitter section each of which is discussed below. The power supply section is used to power up the entire setup. The kit is turned on using the button provided. The EM-18 RFID Reader module, an inexpensive solution for your RFID based application, is where the student is required to show your card within the reading distance and the card number is thrown at the output, which is also displayed on the LCD. Using the interface module, the data captured using the reader module is sent to the microcontroller. The status of all the processes is displayed on the LCD screen. The Wi-Fi module used in the transmitter section is used to transmit the data to the server end.

The receiver section consists of a cloud where the data sent by the Wi-Fi module at the transmission section is stored. Then set up the server page, login into the manager app to access the application page.

5.1 Working

Working on the project starts from connecting the wi-fi module to a hotspot and then set up the Tomcat server. Admin then has to open the browser and then open the link- localhost:2019 and then get the server page displayed on the monitor. Admin no need to enter credentials after opening the manager app. Open the application page to perform the required operation. Admin can now update the data if required using the add student feature.

Faculty once enters the class need to turn on the hardware setup at the door using the button. Once the kit is turned on students can simply register themselves to class by placing an RFID card across the RFID reader module. Once the message student registered appears on the LCD, he can enter the classroom. Thereby all the students can register themselves to the class and enter the lecture hall. Faculty can switch off the kit whenever he wishes to, which is when the attendance is closed.

All the entries are updated in the database the moment kit is turned off. Faculty can now monitor the attendance through the Attendance feature provided. Admin can trigger a mail to the students attaching the lecture notes of that class provided to him through the send email feature provided on the application page. Thereby, after the end of class, the absent students can receive the lecture notes of the class held on that day.

5.2 Flowchart

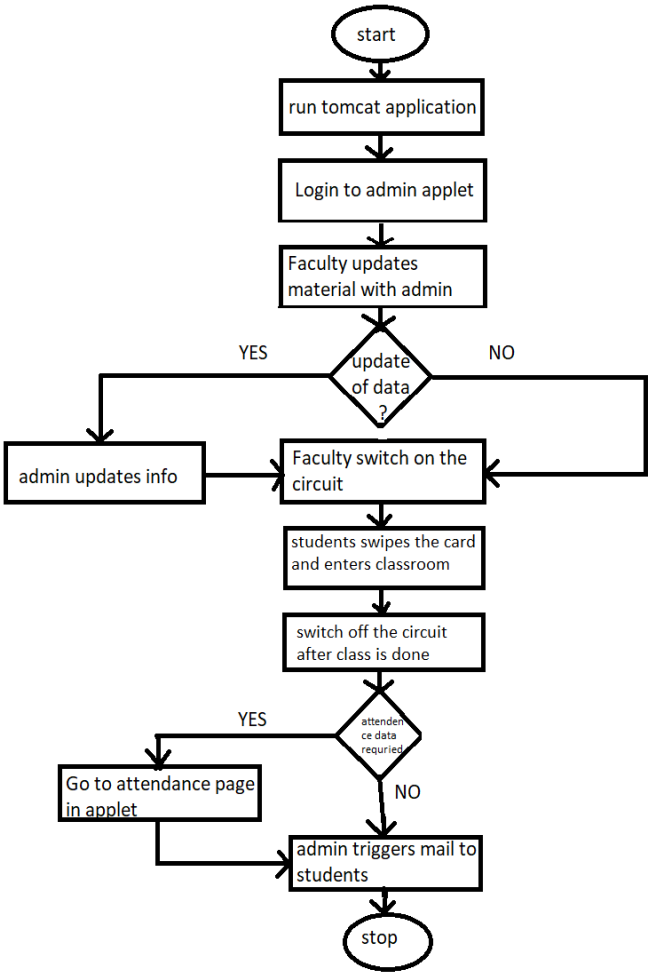

Fig. 15: Flow chart

5.3 Advantages

Smart learning without any mental stress.

- More practical knowledge is gained.
- The listening capability of students is increased.
- The difficulty of understanding concepts for slow learners is reduced.
- No need of taking the attendance physically in classrooms.
- At the end of the day, notes will be sent as mail to students who are absent from
- classes.
- Ease of accessibility.

6. CONCLUSION

In state-of-the-art digital conference rooms equipped with a smart classroom system, an exact and convenient manner and information can be communicated more clearly via the real-time on-screen transmission and additional description of materials. When used in a multimedia room, the smart classroom system helps learners improve their understanding of and familiarity with lessons by allowing them to use a wealth of multimedia materials. As an optimal learning environment is created by the use of diverse multimedia equipment, the smart classroom system promotes learners' concentration and engagement in class.

Smart classes thus help in improving the conceptual understanding of the subjects by increasing learners' creativity and cooperativeness and help them to further concentrate on learning and are also helpful in automating the academic procedures in the institution.

7. RESULTS

7.1Hardware Results

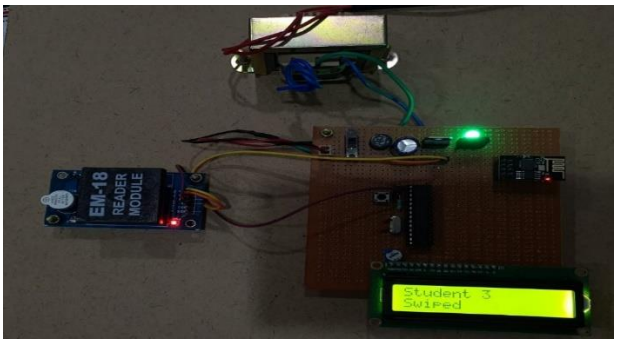

Fig. 15: Student swiped RFID card

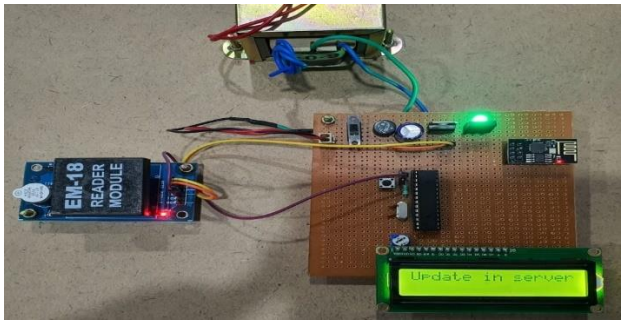

Fig. 16: Updating in server

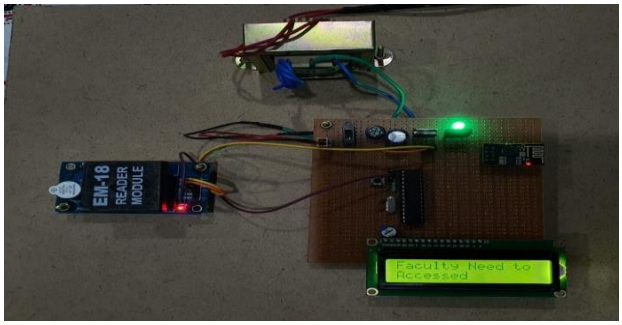

Fig. 17: Faculty accessing the data

7.2 Software results

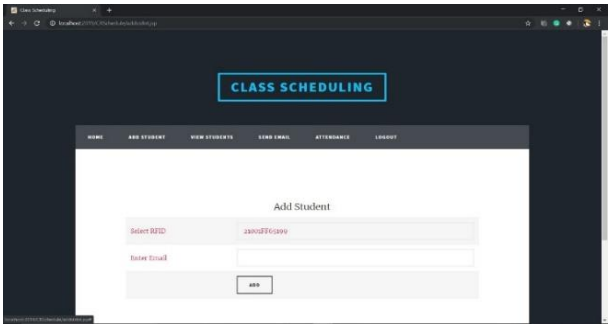

Fig. 18: Updating Students list

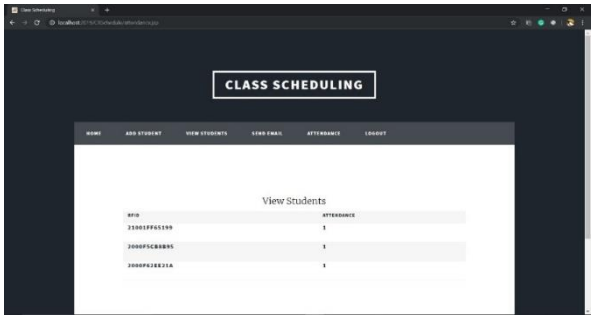

Fig. 19: Displaying Absentees list

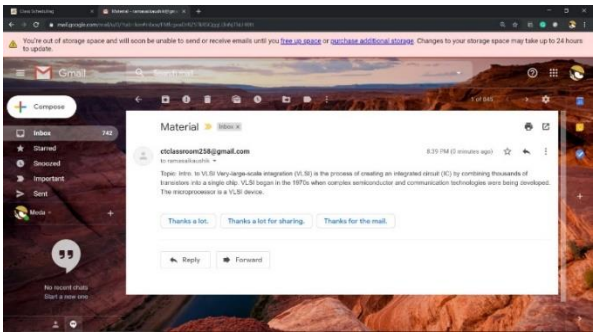

Fig. 20: Notes sent to their email id

8. FUTURE SCOPE

Our proposed system can be extended to As of now, the mail is triggered only to the absentees, we can enhance it in such a way that the material can be sent to all the students of the class. All the other services like library access and other student monitoring formalities can be embedded into one application. Scheduling of classes depending upon the faculty availability and other factors can be achieved. As of now, the mail is triggered only to the absentees, we can enhance it in such a way that the material can be sent to all the

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