Iot Based Smart Classroom

Dr. B. Premalatha, J. Hari Krishnan

Abstract: Advanced education is aided with new technology, computers, projectors, internet, and many more. Diverse knowledge is being spread among the people. By integrating computers, software's, technology behind audience, assistant devices and audio-visual facilities, the smart classrooms are now heightened. The traditional teaching-learning approach using lecture and notes writing actually bring down the success in modern day education. The main objective of this project is to propose a system that is capable of providing a smart classroom along with automation of a classroom interconnected to achieve automation at higher level in education. The main goal of this project is to provide an efficient learning environment. The model of the smart classroom has been integrated by connecting Raspberry pi with LCD display and the smartphone that is controlled via the internet. This model will bring the automation in the attendance, to display circulars on notice board, online suggestion box and taking of lecture notes in order to manage the time and to make the classroom smart in real time.

Index Terms: Automation, IoT, Raspberry Pi, Smart Classroom

1 INTRODUCTION

When learning happens, Homo sapiens evolve into humans. Classrooms are the suitable place for learning during the civilization and the tradition has followed ever since. In the current of the modern development, the traditional way of teaching lost its efficiency in this era. An essential thing in this new era is to provide quality education. In every single aspects of the technology, digitalization plays the major role and it affects us to the core. To achieve conceptual growth in deeper, In efforts to grow academically, it must consider that discerned approach in teaching learning is essential. Innovative ideas in implementing the academic syllabus will help the students to strengthen their lessons by both academic and society level. Smart classroom is the complete digitalization system which holds the mission and vison same as the traditional classroom. The state -of- art in new concept of education is "Smart education environment' in which e-learning and online education demands. In the world of internet, it is possible to have online education now-a -days. In addition to Internet, smart class room need Use of computers, projectors and other multimedia devices such as home theater etc., in turn which changes the role of a teacher may be modified. The motivation of this project is to develop smart class room environment in which the student's learning capability can be improved. The characteristics of smart classrooms are adaptive learning and collaborative learning.

(i). Adaptive learning:

Any schoolroom can forever have students of various sorts of learning talents in it which frequently makes it tough for academics to create positive that each one of them perceive the ideas. The modern approach of reconciling learning offers students the liberty to be told at their own pace and within the approach they're most snug with.

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(ii) Collaborative learning:

The active form of learning is collaborative learning. Teaching and learning in remoteness are very limiting and delay progress. Group learning in groups boosts the room of learning and progresses critical thinking. The activities such as collaborative writing, team projects, team work of problem solving, debating etc., and it redefines Collaborative learning activities include collaborative writing, group projects, joint problem solving, debates and more. Collaborative learning redefines outmoded student-teacher relationship in the classroom.

(iii) Performance-based assessments and student centric:

Regular performance-based assessments are carried out by teachers through various activities such as by conducting quizzes and polls. Teachers can help students to think critically and they can discover and master new concepts and their learning styles can be changed. Since the students are encouraged to participate actively, learning responsibility is also improved. The learning environment is carefully planned and well-organized. Circulars, rules, procedures to follow are posted in advance through smart environment which makes the students to stay on track. The objective of this project is by proposing a SMART model of smart classroom that characterizes the parameter such as" high definition", "deep experience" and "rich interactivity".In fact, smart classes include animated visuals and presentation and this kind of visual is both eye-catchingfor young students to learn the concepts fast and more effectively. And then, it is more time consuming, by avoiding drawing or preparing diagrams on board. Smart class lectures have all this information in memory and can be presented during the time of class lectures and also more energetic by removing allergic reactions to both students and teachers. The demerit of smart classroom is high cost but the possibilities or advantages of smart classrooms are endless. The issues faced by teachers and students have been listed here as the attendance has to be taken and updated manually which has to update again as a document file and longtime attendance processing, difficulties to students when sudden changes in the schedule are made, students are bored, inattentive, or unmotivated and students are unable to what to do or do the wrong thing. These issues can be overcome by applying new innovative technology in the classroom as Smart Classroom. The proposed system will

bring some degree of modernization in the classroom to take it to the next level. In this proposed model, various new features with various innovation and new technology to enhance the future is as follows: to avoid the notes taking, to digitalize the existing attendance system to display the sudden and important announcement, to have an online suggestion box, and to provide an efficient Learning Environment. The design of this project includes, attendance monitoring system, electronic notice board and smart registration.

2 LITERATURE SURVEY

To improve the quality in education to students in terms of conceptual understanding, elaborating concepts, reading skill improvement, smart classes plays a vital role in worldwide education scenario. Computing system-based education system is used in modern learning which leads to smart classroom. The literature survey regarding this work is as follows: Anatoly Plakhteyev and Artem Perepelitsyn [2] described the cloud computing to provide communication with the global network of all nodes. In the field of IoT, Cloud computing, edge computing also plays a major role. Data processing with help of sensor devices and individual devices related to physical world can be used in smart world. A lot of network interfaces and protocols IoT make it difficult to develop and debug applications, require the tools for rapid prototyping of network fragments and project-oriented methods for training developers. Using the above obtained analysis and the results, a methodology was formulated to achieve the objective of the project. Dhara and Rangani.G [3] used the Arduino board to transfer the data and display it on a LCD board. In various places such as railway station and educational institutions are very abundant in the modem world and are being used at many different places such as railway station, educational institutions schools and corporate offices. However, there is no any innovation even invented. Notice board management in manual is very monotonous process. Updating hard printing documents in manual frequently is also a common problem. Also, the maintenance of hard copy documents is a difficult task. Normal notice board management is a time-consuming task as well as human labor dependent.. In this paper, we proposed a new electronic based notice board using an Internet of Things (IOT) technology. This proposed work makes the process of conveying the information or message to others is an easy task. This system is purely an advanced one and just by login to webpage the message can be conveyed to others. Milon Islam and Kamrul Hasan [5] have developed an idea to store the attendance of the students in the Microsoft excel. Physically mark the attendance by the teacher is time-consuming process and may unintentionally marked as absent. Sometimes the hard copy of attendance may be lost. In this project.by creating mobile app to mark the attendance a at any place, the task become more smart. Song Shuqiang,Zhong Xiaoliu,Li Haixia,Du Jing [6] conceptualizes “smart classroom” in order to map up the “iSMART” system model. A construction project on smart class room have been done at the Wudaokou School of Finance of Tsinghua University, the construction thoughts and integration scheme are introduced and the function of smart classroom operation have been discussed. combined the design philosophies of syncAs the core part of the teaching environment classrooms have been moving from the multimedia period to the internet period, and will eventually move to the smart technology period. It not only possesses network sensor module and central management module, but also can optimize the demonstration of the teaching content, record the whole process of teaching activities, seamlessly and integrate cloud resources and services. The smartness of “smart classroom” is not limited to the organization of the technological devices and modules. More importantly, it should be implemented to support the teaching activities more intelligently. Yelin Kim, Tolga Soyata [7] proposed a system which is capable of making real time suggestions to an in-class presenter to improve the quality and memorability of their presentation. Non-verbal behavior such as hand gestures, facial expressions and body languages are used to do real-time adjustments during the presentation. Based on these requirements, we provide a feasibility study of the system. Most advanced components are used in our system to realize the concept of smart classroom. The main challenge in this work is to integrate all the technologies and dynamic variation of algorithm for real time execution and usage of variables in algorithm. LCDZhong Xiao-Liu, LI Hai-Xia, Xu Jun-Hua, Song Shu-Qiang [8] , discussed about the design attitudes of interactive teaching-learning environments in both synchronous and asynchronous, online and offline mode. This can be used to create a long-distance real-time educational support system based on intelligent perception (i-percieve), intelligent manageability (i-manage), intelligent interactive feedback (i-feedback), smart displays (i-view) and other core technologies. In addition to creating physical and virtual learning spaces, this system supports remote display synchronization, session recording, live streaming, webcast, interaction and sharing capabilities. This research supports educational model reform by diversifying instructional techniques and improving teaching outcomes.

3. SYSTEM MODEL

This section explains about the construction and working of the smart class room system model and the design considerations. The block diagram of proposed system model consists of the following parts: Raspberry Pi 3 model B mounted with LCD display and a software application named BARMAX_13 is developed for the smart attendance. Figure 1 and 2 represent the block diagram for smart notice board and smart attendance.

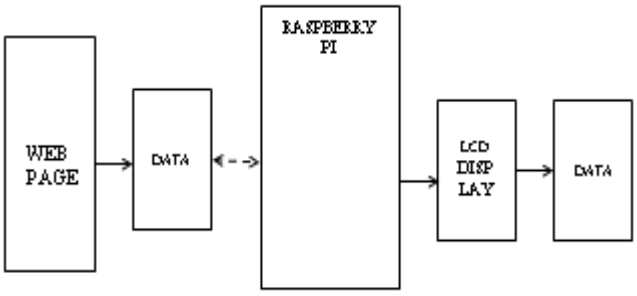


Fig 1: *Block Diagram for Smart Notice Board*

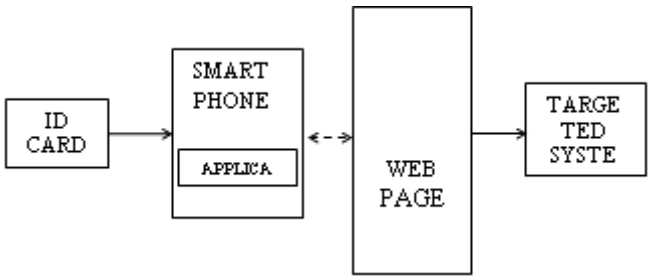
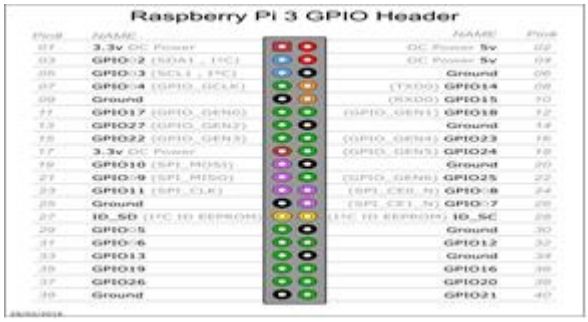


Fig 2: *Block diagram for Smart attendance system*

The hardware details used in this work are Raspberry Pi 3 model B board, SD card, android phone and LCD display. The Raspberry Pi has been chosen as the microcontroller in our system design due to its compact size and portable convenience. It has four USB ports through which four modules can be connected at a time and used simultaneously. Python, which is the programming language of Raspberry Pi is an object-oriented programming and it is comparatively easier to read and understand because of its similarity to English language. The Fig 3.3 presents the Raspberry Pi 3 Model B used in this prototype. The technical specification of Raspberry Pi 3 model B include Broadcom BCM2837 processor, quad core ARM Cortex-A53, clock speed of 1.2GHz, 1 GB RAM, RJ45 port for network connectivity, wireless LAN (Wi-Fi) and Bluetooth 4.1, four USB Ports, GPIOs and a Camera Interface with a 15-pin MIPI. The image of Raspberry Pi is shown in Figure 3.

Fig 3: *Raspberry Pi board*

The Pin diagram of Pi board is given in Figure 4.



LCD (liquid crystal display is mostly used in notebook displays, IoT application's output display, Hardware kits and other small computers display and it is shown in Figure 5.

Fig 5: *A picture of LCD display*

The pin diagram of the 16*2 LCD display is shown in the following Figure 6.

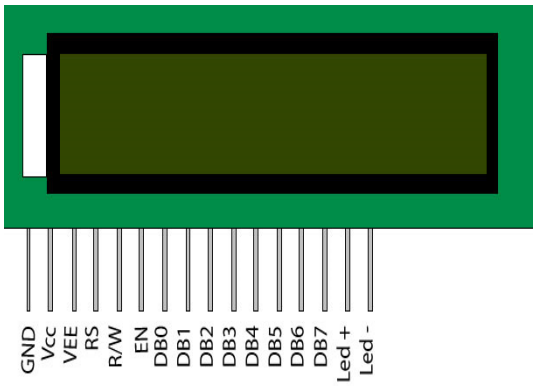


Fig 6: *Pin Diagram of the LCD display*

In LCD, there are 40 pins in it. The data pins used in our proposed model are 18, 23, 24, 16, 20, 21 which are interfaced with the Raspberry pi pins. As LCD needs 5V power supply. It is directly taken from the Raspberry pi from the power supply pin. Ground pin is also available in the LCD and Raspberry pi for preventing the circuit faults. It must be grounded properly in order to ensure there is no short circuit in the interfacing of the two devices. The processing of interfacing is done step by step because the LCD cannot able to withstand more than 5.4V power supply. Similarly, Raspberry pi must also be taken care. So it is save to give the power supply to the Raspberry pi using the Android power bank in order to save guard it. The software details used in this work is as follows: HTML, CSS, JAVA, JAVA Script and MYSQL. Web page is created and Python code is built in the Raspberry pi. LCD board is interfaced with Raspberry pi and required data pins are mentioned in the python code which are used as input pins in the LCD display. The required power supply for both LCD display and Raspberry pi is 5v. So power bank is used as supply for these devices. Web page which is created contains a textbox and submit button. When the user gives the input in the textbox, which is to be displayed in the notice board as shown in Figure. Then the user must press the submit button in order to display it in LCD board. The given input is displayed in the notice board. Application is created using MIT appvendor2. BThe required blocks and user interfaces are given as input. When the given input is

detected as speech, it is processed as an input to the google sheets. Google sheet stores the given input speech. JS is used for storing the input speech in the google sheets. New app script is used to code the program to store the input voice-command and time is also mentioned in the google sheets which is used for verification purpose. Code.gs is used for the program to be implemented in the system.

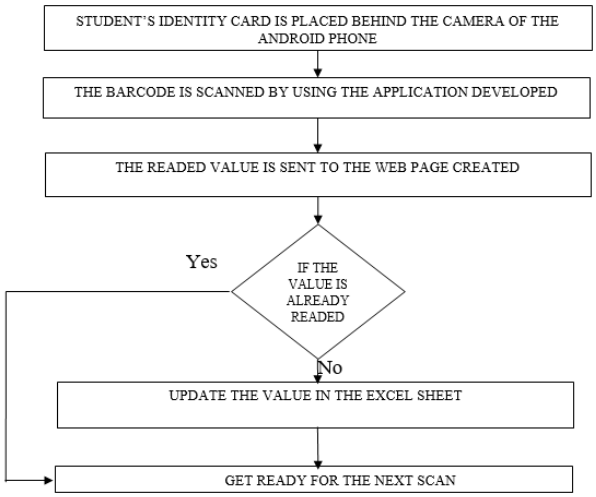


Fig 7: *Flow chart of Smart attendance system*

The flow chart gives the neat outline of the any algorithm. It makes the author to go with the flow of the project. The following four are the flow chart, which reflects our project. The flow chart of Smart Attendance is shown in Figure 7. Android phone is used for scanning the bar code in student identity card. After scanning the code. If the data is read, then the data are uploaded in the excel sheet which is created by new app script. The following Figure 8, shows the flowchart of smart lecturing notes.

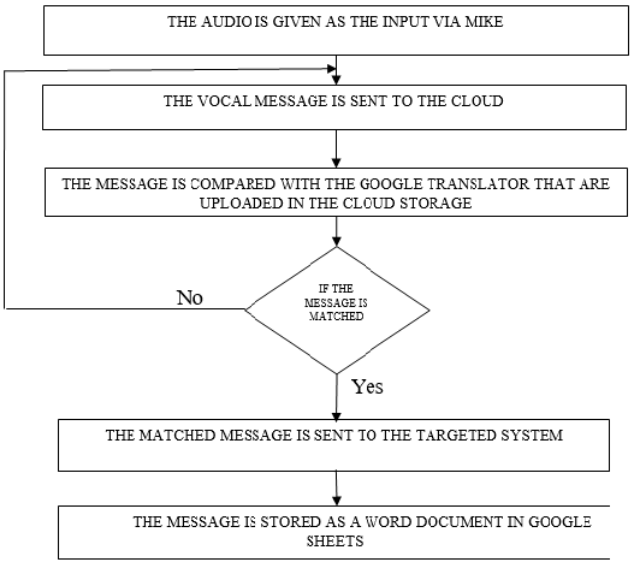


Fig 8: *Flow chart of Smart Lecturing Notes*

Smart Lecturing Notes Audio is the given as input, after that the audio is send to the cloud with help of data base. Then audio is compared with the Google translator and then the coded message from audio that is voice to text i and send to the targeted system after that the message is stored as a word document in google sheets. The following Figure 9 shows the flowchart of smart notice board. Open the webpage which is created for the smart notice board in that webpage there is an option called type click and then type the announcement details after that click the option called post. The details are send to the raspberry pi with the help of Bluetooth. The raspberry pi will display the message which is send by the faculty with the help of LCD display.

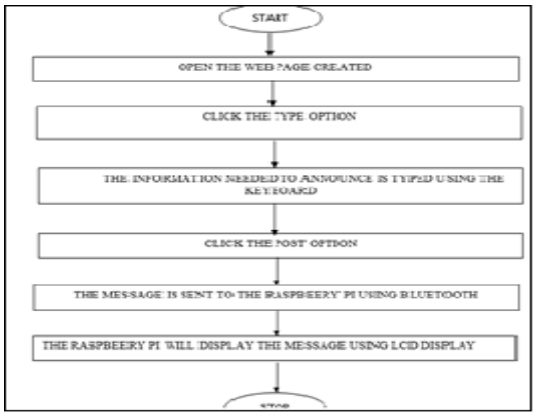


Fig 9: *Flow chart of Smart Notice Board*

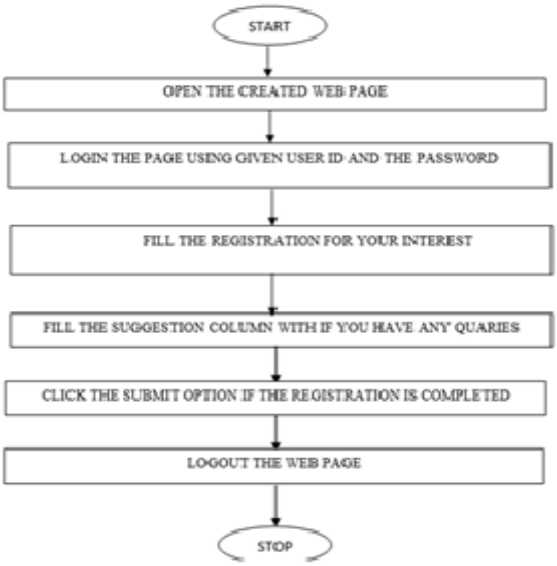


Fig 10: *Flow chart of Smart Registration*

The flowchart of smart Registration is given in Figure 10. Open the webpage which is created for smart registration after that log in by using user ID and password for each student. After that, the site gets opened. If the student is willing, he/she will register else, click the suggestion column and type the suggestions. After completing this, click the submit option to get register as well as for suggestion after logging out of the webpage.

5 RESULTS AND DISCUSSION

Hence the proposed model helps to implement the smart class

room in new technology which helps the students to listen to the class and make them think in an innovative way.

A. RESULTS ABOUT SMART ATTENDANCE

BARMAX_13, software application is developed using MIT App Inventor. This application acts a input console. Figure 11 shows the application logo and scanning the barcode in identity card using BARMAX_13. The details of the student which includes the register number of particular and login time is stored in the Google sheets. This can be viewed by the faculty at their convenient timings.

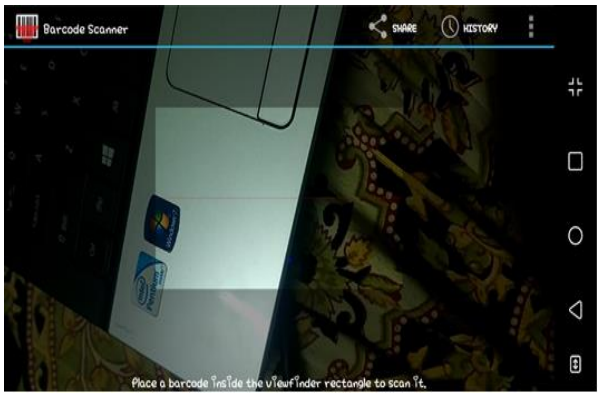
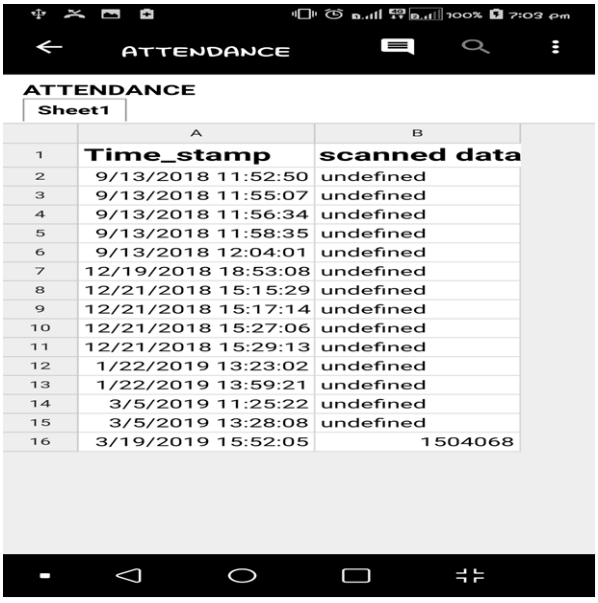


Fig 11: *Barcode scanner*



	A	B
1	Time_stamp	scanned data
2	9/13/2018 11:52:50	undefined
3	9/13/2018 11:55:07	undefined
4	9/13/2018 11:56:34	undefined
5	9/13/2018 11:58:35	undefined
6	9/13/2018 12:04:01	undefined
7	12/19/2018 18:53:08	undefined
8	12/21/2018 15:15:29	undefined
9	12/21/2018 15:17:14	undefined
10	12/21/2018 15:27:06	undefined
11	12/21/2018 15:29:13	undefined
12	1/22/2019 13:23:02	undefined
13	1/22/2019 13:59:21	undefined
14	3/5/2019 11:25:22	undefined
15	3/5/2019 13:28:08	undefined
16	3/19/2019 15:52:05	1504068

Fig 12: *Stored data in Google sheets*

In the barcode scanner, the identity card of the student is placed. The barcode scanner scans the input given and then the data is send to the Google sheets which is shown in the Figure 12. Smart classroom webpage is shown in Figure 13. By using Tomcat the web server is created and local host is initialized as http://localhost:8080/webreg. When the Tomcat server is opened and then the start button is clicked.

Fig 13: *Smart classroom webpage*

B. RESULTS ABOUT SMART REGISTRATION

Home button contains the various user inputs. These inputs are the registration process button is clicked. The user can register in the website. Then the user can able to login to the registration process. The user can give suggestions in description box. These inputs which are given in the system is stored in the PostgreSQL. The stored data can be viewed by the users and they can also able to change the user name, password and the description which they have mentioned in the suggestion. By using Editing option which is available in the home page. Instructions button contains the basic Instructions for using the webpage for smart registration and they contain series of points for which will help the user to get some knowledge about how to use the webpage.

Fig. 14. *Home page for smart registration*

About button is last button in the main webpage which contain the details of webpage. It has the information about the developer and the mail ID for suggestions. Queries can be obtained from the customers and users for future development, enhance the webpage and bug fixes in the webpage when user uses the webpage for registration.

Fig. 15. *Webpage home for smart registration*

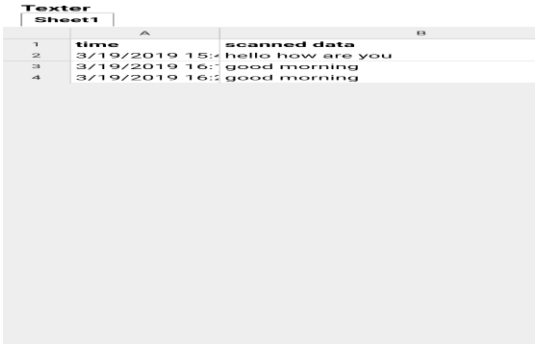


Fig .16. *Smart Lecturing Notes*

C: SMART NOTICE BOARD

Smart notice board is made of two main components. They are Raspberry pi and LCD board. To begin with, the Raspberry Pi is connected to a display device like a laptop. The Raspberry Pi is connected to the laptop via Remote Desktop connection. Raspberry pi supports both a Local Area Network (LAN) as well as the wireless connection. After establishing connection, Raspbian operating system is logged in. SD card acts as an external memory for the pi board. The SD card is booted and fixed to its respective slot.The start button is pressed and the code runs in a particular IP address. The same IP address is given as a input in the webpage. Then the webpage is displayed as shown in Figure 17. The webpage contains the input textbox and submit button. The input data is given in the textbox and then the submit button is clicked respectively. The data is displayed in the LCD display and the required data is displayed as per the given input. The hardware implementation of smart notice board is shown in Figure 18.

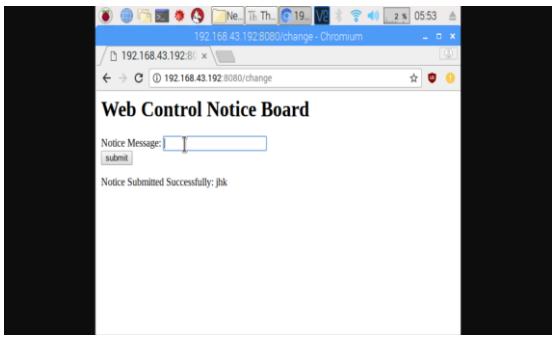


Fig. 17. *Webpage of Smart Notice board*

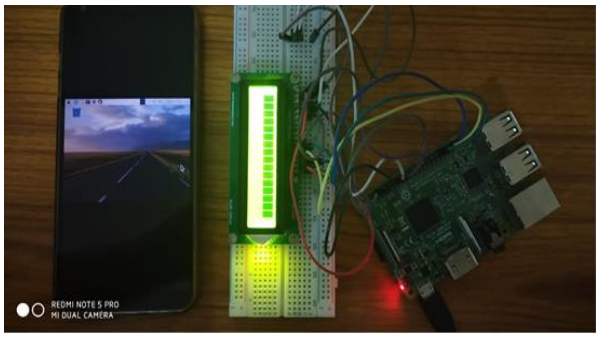


Fig .18*. Hardware Implementation of Smart Notice Board*

CONCLUSION AND FUTURE WORK

Smart classroom has been implemented successfully using the raspberry pi, LCD, software tools and MIT app inventor. Smart attendance helps to record the monitor the attendance of the student easily. Smart registration is used for storing the data of the users. Texter is the applications used for converting the speech to text and storing it in the database. Smart lecturing helps to store the vocal message as text in the google sheets.The design of our model can be extended to smart home implementation and smart office. Two applications can be put together in a single application for better use of the user. Smart registration can be used in hospitals and healthcare. While fulfilling common functional requirements, the proposed model also addresses data security in storage, access, and transmissions. Future work includes simulating the functions on a smartphone and testing its usability in a small clinic environment. The source coding of the text to speech system can be easily modified for implementing new synthesis algorithms. So the text to speech system developed here can be easily upgraded to the latest synthesis technique for speech. Even though the text to speech system developed here is for English language, it can be easily extendable for new languages also. Hence the system developed here is a robust text to speech system.

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