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Internet of Things for Smart classroom in Enhancing Efficiency among Education Institutions

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ABSTRACT: The application of Internet of Things in the modern world is the center of interest of many researchers. Educational institutions can utilize modern technologies such as IoT to deliver an interactive learning experience; it is now becoming a common practice to communicate with your day to-day interacting appliance remotely using a portable device like a Smartphone which has internet connectivity. This has been made easier by the concept of Internet of Things (IoT). 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 paper is to propose a system that is capable of providing a smart classroom interconnected to achieve automation in education institution. The model of the smart classroom will be integrated by connecting Raspberry pi with LCD display and the Smartphone that is controlled via the internet. Connected devices would definitely help teachers to transform classroom experience. It also improves the comfort, energy efficiency, indoor security, cost savings of the classroom and make the classroom smart in real time.

KEYWORDS: Smart Classroom, IoT, automation, Raspberry Pi

I. INTRODUCTION

Internet of Things is also called as Internet of Objects. It usually connects sensors, devices, things and smart technology. It links or connects the object-to-object, object-to-machines, machines-to infrastructures, person-to-objects and so on. In other words, we can say that a network that connects simple/ordinary physical objects to identifiable addresses that provide intelligent services and produces huge amount of data can be called IoT. 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. Introduction of IoT in education will lead to complete reforming of educational institutions. It changes the instructors, campus, management, teaching process, learning process etc. IoT also increases learning experience by providing various features in student learning. Nowadays many universities and other educational institutions have removed traditional learning processes. They have been currently replaced by technologies like tablets and laptops. This helps students learn at the pace at which they are comfortable. Also, it helps students have a similar learning experience at both home and college. IoT in education not only helps students, but also the instructors. The teaching process can be made a lot easier through the introduction of various technologies. It helps professors identify the pace of leaning of students and to focus more on those who need additional help in learning. This is indeed a huge advantage for the educational sector. IoT widely supports the concept of e-learning. The conventional system of books and papers is replaced by electronic devices and gadgets. This proves as a big change to students, thus increasing their interest in the process. Due to the introduction of intelligence in the process of learning, students are enabled to learn in a more interactive manner. Most students are quite bored of the same old pen-and-paper method of learning. Introduction of new methods of learning would help them overcome their boredom and help them learn with more concentration and interest. Introduction of electronic gadgets in the educational sector helps in the increase of students' interest.

Introduction of new features in their learning process helps them become more inquisitive and enables them to think and apply concepts in a much effective manner. IoT also helps to increase the level of enthusiasm in students.



Figure 1. IoT devices in classroom

II. BACKGROUND OF STUDY

SMART CLASSROOM CONCEPT

The smart classroom is an enhanced classroom of technology that improves teaching and learning opportunities by group action learning technologies, like computers, special software, response technology audiences, helpful listening devices, networking, and audio / visual capabilities. . In the process of everyday teaching, teachers or professors are usually trying to find out if the students (or more general the listeners) were satisfied with the lecture, which section of the lecture was interesting, which presentation techniques and methods were more effective and attractive than the others. Previous studies have exhibited that approximately or roughly after 10 minutes students' attention begins to decrease. And as a result at the end of a lecture, students remember about 65% of the information presented in the first ten and only around 25% of the last ten minutes. Integrating the IoT technology with the social and behavioural analysis, a standard classroom can be transformed into a smart classroom that actively listens and analyze the voices, conversations, movements, behaviour, etc., in order to come to a conclusion about the lecturers' presentation and listeners' gratification. This will help the lecturers to consistently deliver good presentations and make a better impact, while the audience or students will benefit from interesting lectures thus making the overall learning process shorter, more efficient as well as more pleasant and even entertaining.

Connected devices: These are electrical devices that are smart, courtesy of Internet connectivity as well as sensors. The Master can control these devices from their phones from anywhere in the room.

Internet of Things: It's a enchantment wand that turns the classroom into a keen classroom. In conjunction with the combination of sensors, savvy frameworks, Android apps, IOT interface every day accessible objects to a organize, which empowers these things to total errands and communicate with each other , without input commitments from the client. After you incorporate automation within the classroom, associated gadgets and IOT you'll be able get Smart Classroom. A present day shrewd domestic can be effectively overseen through a Smartphone, tablet.



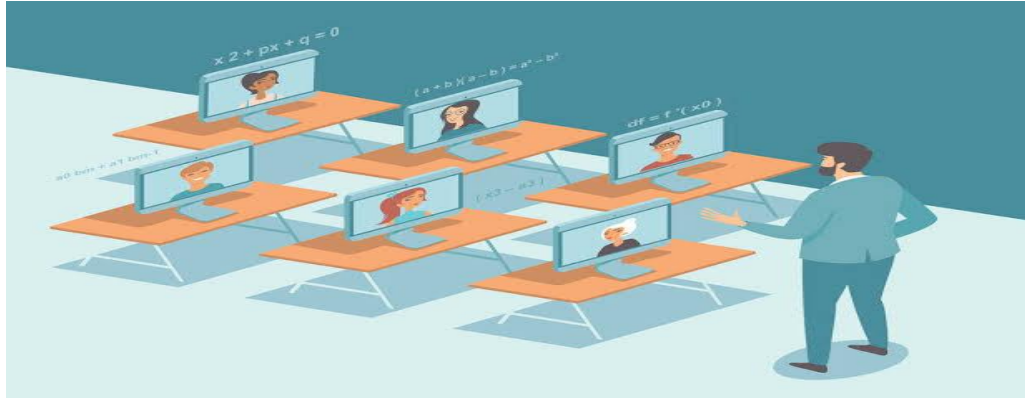
Figure 2 Smart Classroom

III. SIGNIFICANCE OF STUDY

Technologies can work wonders and application of IoT education proves it. In fact, IoT is a technology that has many ways to make use of, so everything depends on requirements of government or educational institution administration. Internet of Things predicts the future that, the advance digital world and the physical world will get linked by means of proper information and wireless communication system technologies. The machine-to-machine interaction provides better efficiency, hence; accurate results can be obtained fast. This results in saving valuable time. Instead of repeating the same tasks every day, it enables people to do other creative jobs.

IV. LITERARY 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 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 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 modern 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.

V. METHODOLOGY

An Android based application that would be pivotal for carrying out many jobs such as taking attendance and controlling the lighting of the room will be developed. This application would run on the local server with the help of the routers that needs to be installed in every class room and lecture halls. The faculty members would be accessing this application. Inter alia, there would be a camera that needs to be installed in class room for the attendance through the facial recognition. The study material would be mailed to each and every student after a fixed span of time. The teachers would upload the material in a folder which they want to be accessed by the students.

- An Android based application would be the controlling tool along with the role of Raspberry Pi.
- A router in the room would be another requisite.
- The application would run on the local server provided with the help of this router
- A Raspberry Pi would be included in the switch control of the classroom.
- The lines of lights, fans and projector would be connected to the different pins in the Pi.
- The Android application would be used to command the Raspberry Pi with the help of which different objects would be controlled. Along with this a camera in room would also be linked to the application. On the command the camera would capture photo, repeating the process 5 times, that would be matched to the existing photos in the database and attendance would be marked.

VI. PROPOSED SYSTEM

HARDWARE USED

1. Raspberry Pi Raspberry Pi is a sequence of small single board computers developed in the United Kingdom by the Raspberry Pi Foundation. It was released to encourage basic computer education in

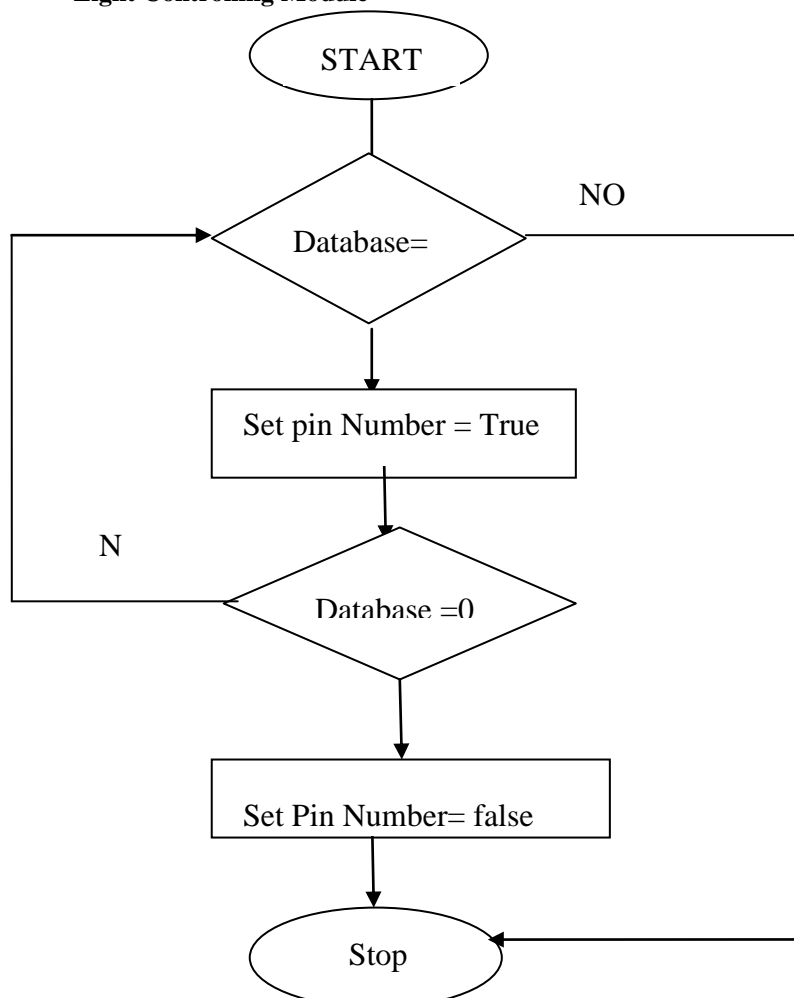
schools and developing countries. There are several generations of raspberry that were released. All models has a Broadcom Chip (SoC) system with included ARM processor and integrated graphics processing unit.

**SOFTWARE USED**

1. Raspbian :

Raspbian is a Debian-based PC working framework for Raspberry Pi. Since 2015 it has been officially given by the Raspberry Pi Foundation as the vital working method for the group of Raspberry Pi single-board PCs. Raspbian utilizes PIXEL, Pi.

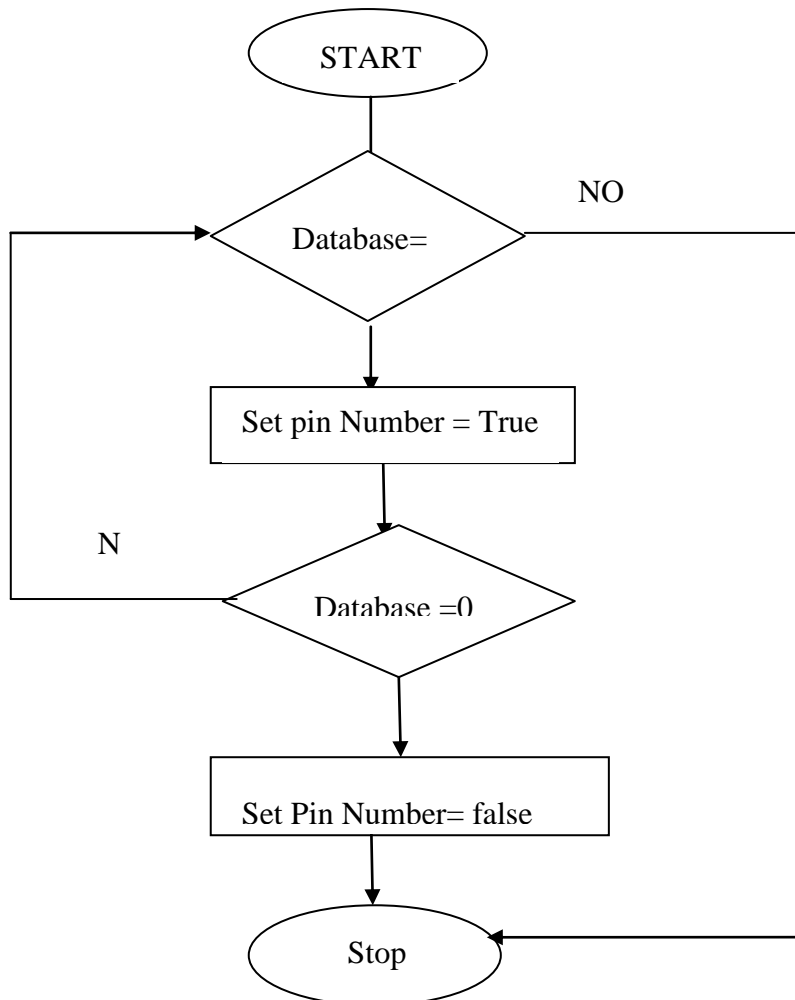
2. 2. MYSQL MySQL is an open-source relational database Management framework. The MySQL improvement venture has impacted its source to code reachable under the stipulations of the GNU General Public License, MySQL is world's most famous open source database.

VII. DESIGN**Light Controlling Module**

Algorithm

User press the button on android app Database updated to 1
Setup GPIO Pin for light
Read the database
If (database_light ==1):
while True:
GPIO.output(PinNumber,True)
Read the database
If(database_light == 0)
GPIO.output(PinNumber, False)
Exit of loop

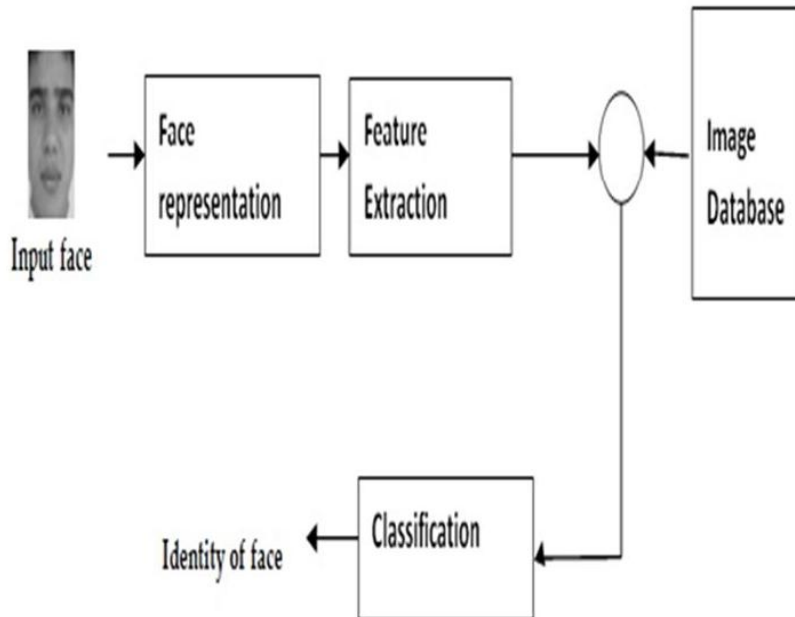
Fan Controlling Module



Algorithm

User press the button on android app Database updated to 1
Setup GPIO Pin for Fan
Read the database
If (database_Fan ==1):
while True:
GPIO.output(PinNumber,True)

Read the database
If(database_Fan== 0)

Attendance Marking Module:**Algorithm**

```
Data set creation  
faceDetect=cv2.CascadeClassifier('haarcascade_frontalface_default.xml');  
assign roll number/id number to each data set o gray scale conversion  
gray=cv2.cvtColor(img,cv2.COLOR_BGR2GRAY)
```

VIII. ADVANTAGES

- 1) Maximizing Classroom security.
- 2) Remote control of Classroom functions.
- 3) Increased energy efficiency.
- 4) Improved appliance functionality.
- 5) Classroom management insights.

CONCLUSION

IoT will become a reality in the near future, IoT in education is about the skill of learning new things especially. Like, if a student wants to study an object, then only by touching the object information will be displayed. Using mobile which are now-a-days connected with our PC and we can access it anywhere and anytime is contributing a lot towards smart learning. It has been experimentally proven that classroom automation using the Internet of Things is working satisfactorily by linking simple devices plus devices being effectively controlled. The planned system not only controls the light, the fans and the projector, but also takes the participation. This will help the teacher and students save time and focus on studying.



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