

## CLASSROOM AUTOMATION WITH THE HELP OF IoT

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**Abstract** - With the development in technology, 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). In this paper, we present such a system where classroom hold interactions is made easier by implementing automation and security along with the Internet of Things to create a system which will enable someone to remotely monitor and control some areas of a house remotely from anywhere. As a district administrator, you are in a position to do something about it. There are all kinds of ways that you can automate your classrooms and give your schools the resources they need to focus on what they do best. Even a handful of minutes saved every day will result in a rapid return on investment, measured in both actual costs and improved student outcomes. By the virtue of blooming automation industry and wireless connectivity, all the devices within the classroom can be connected. This improves the comfort, energy efficiency, indoor security, cost savings of the classroom. We also detect the presence of human in the classroom by using ultrasonic sensor the sensor head emits an ultrasonic wave and receives the wave reflected back from the target. Ultrasonic Sensors measure the distance to the target by measuring the time between the emission and reception.

**Key Words:** IoT, automation, security, MQTT, Node MCUs, ultrasonic sensor.

### 1. INTRODUCTION

The project aims at designing an advanced classroom automation system using normal web server and Wi-Fi technology. The devices can be switched ON/OFF and sensors can be read using a controller through Wi-Fi. We also able to ON/OFF our projector in the classroom. Automation is the most frequently spelled term in the field of electronics. The hunger for automation brought many revolutions in the existing technologies. These had greater importance than any other technologies due to its user- friendly nature. These can be used as a replacement of the existing switches in home which produces sparks and also results in fire accidents in few situations. Considering the advantages of Wi-Fi an advanced automation system was developed to control the appliances in the classroom. Wi-Fi (Short for

Wireless Fidelity) is a wireless technology that uses radio frequency to transmit data through the air. Wi-Fi has initial speeds of 1mbps to 2mbps. Wi-Fi transmits data in the frequency band of 2.4 GHz. It implements the concept of frequency division multiplexing technology. Range of Wi-Fi technology is 40-300 feet. The controlling device for the automation in the project is a Node Mcu. The data sent from PC over Wi-Fi will be received by Wi-Fi module connected to Node Mcu. Node Mcu reads the data and decides the switching action of electrical devices connected to it through Relays.

### 2. LITERATURE SURVEY:

When people think about classroom automation, most of them may imagine living in a smart classroom: One remote controller for every household appliance, cooking the rice automatically, starting air conditioner automatically, heating water for bath automatically and shading the window automatically when night coming. To some extent classroom automation equals to smart classroom. They both bring out smart living condition and make our life more convenient and faster.

In their paper, Tan, Lee and Soh (2002) proposed the development of an Internet-based system to allow monitoring of important process variables from a distributed control system (DCS). This paper proposes hardware and software design considerations which enable the user to access the process variables on the DCS, remotely and effectively Pota mitis, Georgila, Fakotakis, and Kokkinakis, G. (2003) suggested the use of speech to interact remotely with the home appliances to perform a particular action on behalf of the user. The approach is inclined for people with disability to perform real-life operations at home by directing appliances through speech. Voice separation strategy is selected to take appropriate decision by speech recognition.

In the year 2006, S. M. Anamul Haque, S. M. Kamruzzaman and Md. Ashraf Islam proposed a system entitled "A System for Smart-classroom Control of Appliances Based on Time and Speech Interaction" that controls the classroom appliances using the personal computer. This system is developed by using the Visual Basic 6.0 as programming language and Microsoft voice engine tools for speech recognition

purpose. Appliances can be either controlled by timer or by voice command.

Ciubotaru-Petrescu, Chiciudean, Cioarga, and Stanescu (2006) present a design and implementation of SMS based control for monitoring systems. The paper has three modules involving sensing unit for monitoring the complex applications. A processing unit, that is microcontroller and a communication module that uses GPRS modem or cellphone via serial port RS-232. The SMS is used for status reporting such as power failure. Jawarkar, Ahmed, Ladhake, and Thakare(2008) propose remote monitoring through mobile phone involving the use of spoken commands. The spoken commands are generated and sent in the form of text SMS to the control system and then the microcontroller on the basis of SMS takes a decision of a particular task. Prof. Era Johri Dept. Of Information And Technology K.J.Somaiya College Of Engineering VIDYAVIHAR, MUMBAI "Remote Controlled Home Automation Using Android Application via WiFi Connectivity".

### 3. PROPOSE SYSTEM:

The proposed system is a union of hardware components like relay modules, voltage supplies NODEMCU and softer components like mobile applications. Both are equally important and don't any importance in the system without each other's existence. The system is divided into 2 parts for better understanding. A - The electrical equipment's automation. B - Attendance automation part. A] The electrical equipment's automation the initial phase of this will consist of a mobile application that takes care of the end user. This system of application is soulfully designed only for the user end (in case of classroom automation it will be designed for teachers). The application will require a signup at the beginning which is only for one time. Mandatory fields will be the registered email address of the teacher with the institute and the identification id (UID or the employee id). These will important if in case the password or the other fields need to be reset. In the next phase after successful registration there will be a login page that will have a username and password as the input fields. If the password is forgotten and needs to be reset there will be a field which will help to reset the password. After successful login there will be options available to perform the respective operations i.e. Lights Fans and Attendance. Lights and fans automation is explained in this part and figure 1.1 explains the detailed architecture of the proposed system.

In this module, the user performs operations on light and fan. And these operations like ON or OFF. This task will be performed by NodeMCU kit and user will give his request through android application. The mobile application will have a login page in which the user is expected to enter his credentials. After successful login process user can actually perform the operation on these devices by selecting device type means light or fan

and select operation type. Suppose user select device type as light and operation type as ON. When user sends request of LIGHTON then this request will send using Device URL request to NodeMCU through wireless communication network. In wireless communication there are two ways first is using router and second is, by creating hotspot. NodeMCU is an open source IoT platform. The NodeMCU firmware is a companion project to the popular NodeMCU dev kits. NodeMCU module provides access to the GPIO (General Purpose Input/Output) subsystem. All access is based on the I/O index number on the NodeMCU dev kits, not the internal GPIO pin. For example, the D0 pin on the dev kit is mapped to the internal GPIO pin 16 and GPIO (General Purpose Input/Output) refers to a set of generic pins of a microcontroller that can be used for digital signaling. GPIO pins can be individually set to act as input or output, and values can be either logically high (1) or low (0). The voltage value is ideally set to VCC for high and GND for low. But, the underlying technology determines the actual acceptable logic levels. This NodeMCU and relay module is connected to each other. The both VLC pins of NodeMCU and relay are connected to each other and GND pins of both devices are also connected to each other. The nature of relay module is always off when request will received via NodeMCU that time relay's circuit will become opened and device will act according to user's request means light will become O.

### 4. EXISTING SYSTEM:

- A. WiFi based home automation system Home automation systems using smartphone, NodeMcu board and WiFi technology are secured and low cost. The WiFi system uses a PC or smartphone as receiver device. It has a high communication rate, great security and low cost, so it can be implemented as a real time system. WiFi network has no range limitation for smartphone, then it will be able to control the home appliances, this is one of the main advantages of WiFi based home automation system.
- B. Voice recognition based home automation A voice recognition based home automation system proposed and implemented by a researcher [3]. The wireless communication between the smartphone and the NodeMcu is done through WiFi technology. This will be more helpful for handicapped and aged people who want to control appliances by speaking voice command. The main drawback of this system is that communication between user and voice recognition tool depends on signal to noise ratio (SNR), if voice signal is noisy then communication can highly effect and the system will fail to show accuracy.

### 5. SYSTEM ARCHITECTURE:

Following diagram is our system's architecture diagram:

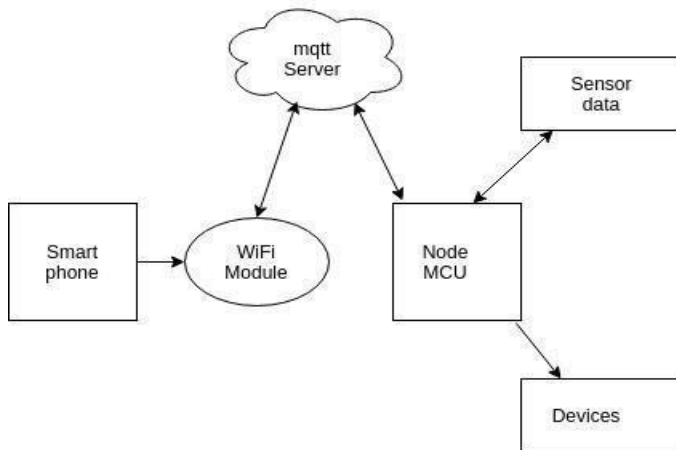


Figure 1: system architecture

The system is used to automate the classroom through smart phone. Using the internet connectivity all devices in the classroom controlled with the help of IOT. Android Application with user interface control the remote devices. The command from android system is send to controller through wifi device using mqtt server. Mqtt server work on pub/sub technology. The sensor data (ultrasonic sensor) monitor by controller. Depends on the status of sensor data further command is initialize. Ultrasonic sensor detect the movement and send status to controller. Relay module is provided to handle the response from controller. All 230V devices controlled by circuit. All automation system is provided for classroom with internet connectivity and wifi interface.

### 6. IMPLEMENTATION:

#### 1. Arduino:-

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 6 analog inputs, 14 digital input/output pins (of which 6 can be used as PWM outputs), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; all we have to do is simply connect it to PC with a USB cable or power it with an AC-to-DC adapter or battery to get started.

#### 2. Hardware connection:-

- Connect the Vcc pin to the positive rail on your breadboard.
- Connect the Gnd pin to the negative rail on your breadboard.
- Connect the Trig pin to any digital pin on the arduino.
- Connect the Echo pin to any digital pin on the

arduino.

- Finally, connect the positive rail of the breadboard to 5V pin on the arduino and the negative rail of the breadboard to the Gnd pin on the arduino.

#### 3. Wires:-

Wires are nothing but single, cylindrical, flexible strands of metal. They are usually used to bear loads of electric or telecommunication signals.

#### 4. Breadboard:-

While building electric circuits, breadboards are the most fundamental pieces.

#### 5. Software:-

Programming the sensor and the Arduino to function the way desired and then assigning values to the outlets of the Arduino and the sensor i.e. Vcc, ground, trigger, echo, etc.

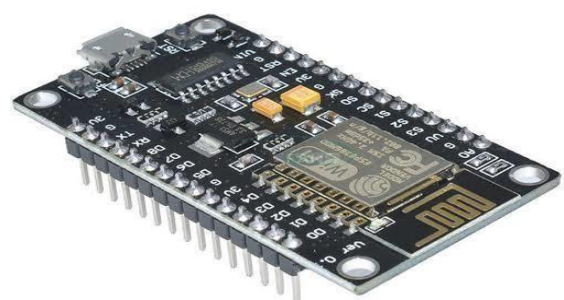
#### 6. Final assembly of the design required for functioning.

#### 7. Test and execute.

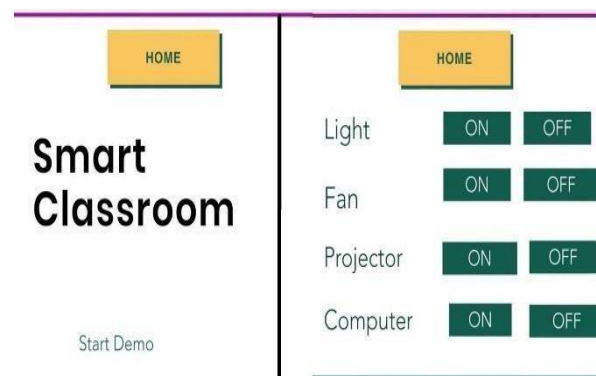
### 7. METHODOLOGY:

1. Use IR sensors at IN & OUT for the lab.
2. Arduino will use increment & decrement counter.
3. System will count the students in the lab & switch off light and fans when no in the lab.
4. Power consumption is reduced.

### 8. DIAGRAM OF NODE MCU:



### 9. CLASSROOM APPLICATION:



## 10. ADVANTAGES:

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

## 11. CONCLUSION:

It is evident from this project work that an individual control classroom automation system can be cheaply made from low-cost locally available components and can be used to control multifarious home appliances ranging from the security lamps, the television to the air conditioning system and even the entire house lighting system. And better still, the components required are so small and few that they can be packaged into a small inconspicuous container. The designed home automation system was tested a number of times and certified to control different home appliances used in the lighting system, air conditioning system, home entertainment system and many more. Hence, this system is scalable and flexible.

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