Classroom Automation

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***Abstract*—Electricity is an important part of the present life and most important to the economy of India. People use electricity for lighting, heating, cooling and refrigeration and operating appliances, computers, electronics, machinery and public transportation systems. To avoid wastage of electricity we can design a smart electric automation system. Electrical automation can wirelessly control electrical systems.**

In this classroom automation project, we are designing an automation system to control all fans and tubes in the classroom. Our system has two types of control of devices: 1st through voice commands and second through the mobile app. Detect intrusion and automatically turn on lights and activate automation functions when entering a room our controlling board will work along with our normal switchboard to operate the electric appliance. Classroom automation means controlling the classroom using a mobile application. (*Abstract*)

Keywords—ESP 32, automation, classroom, relays, Bluetooth, mobile application. (keywords)

I. INTRODUCTION

Classroom Automation definition can be understood as a room in a college, where Devices in the Classroom are operated via Software.
-Lights and Fans at Application Operated.
-Curtains go spread

At College and even at Home, we reflect Irresponsibility and Laziness by not switching OFF the Lights and Fans. Due to this Behaviour, a lots of Electricity is wasted and as a consequences, poor people have to face load shedding and increase in Electricity Rates per Unit.

The Lights and other Devices will Turn ON & OFF via Manual Swiches/Mobile Application/On Specific Time.

PIR Sensor is used to Operate the Devices in the Room as it senses the Presence of the Person.
The devices will come in Action as the Clock will touch 8 am and will be disabled as the Clock will Touch 5 pm.

II. LITERATURE REVIEW

A. Book Review:

[1]IoT (Internet of Things) is a powerful new invention in today's world that can make a person's life easier and less stressful. The scope of this field is unlimited and emerges as a winner in various fields ranging from Medicine, Engineering, Computer Science, Space and Technology, Automobiles and so on. The objective centre uses IoT-based technologies to achieve automation in classrooms. In this paper, we propose a way to control and manage electrical equipment such as fans and lamps based on human presence. Our focus is on building a solution that can help reduce energy consumption. The camera is used to detect the presence of people in the classroom and to analyse the living space. Here the class is divided into two parts. Whenever a human presence is detected in a particular area a lamp and a fan will be turned on. The purpose of this paper is to build a smart classroom where we can switch electrical items with a focus on energy saving.

[2] The rapid development of automation technology makes people's lives easier and easier. In today's world, it is all about dependence on automatic systems. An intelligent IoT-based class system primarily works with automated electronic objects in the Internet-based Material (IoT) protocol called MQTT. The system architecture contains several wireless nodes, middleware, and user interface. All wireless nodes connect to a dedicated or existing network with middleware. This communication is based on the

Message Queue Telemetry Transport (MQTT) communication protocol built-in Internet of Things. MQTT protocol uses publishing / subscribed message based on TCP / IP protocol. With the user interaction phase, the user can interact with the middleware of the system. Interaction is done by seeing the user's command with his or her speech. Basically, the secret commands are used to interact with the middleware. The Raspberry Pi is the backbone of the system. It works as a middleware, in system building. The wireless nodes used in this program are called Node MCU, and this Node MCU is assigned to each class. After performing a user interaction phase, the controller is transferred to the middleware installed in the staffroom. Finally, based on user privacy instructions, the automation of each class equipment will be done with the Node MCU which leads to class automation.

[3] This offers great benefits to smart classroom systems that use the Internet of Things. This project helps teachers in the classroom to allow them to control the classroom using the android system on the Android smartphone.

[4]This paper address two aspects of the problem of classroom automation through audio and visual methods. These factors were: (a) the institutional background on which the support of the previous audio and visual foundation by the Payne Fund and the Rockefeller Foundation compared to the current, extensive support of audio and visual teaching support systems. the Ford Foundation, its limited finances and affiliate organizations; and (b) the theoretical nature of the need for audio and visual authenticity that has been shown to be based on a shortage of teachers and equipment in the country over the next two decades of student and college enrolment, and therefore, technical solutions to classroom size problems are required. and construction site.

[5]Visual and integrated reading is suggested as a way to support students' learning through the lesson. Current research seeks to explore how one classroom teaching tool; especially Google Classroom, used by a teacher of automation and planning in high school. Another high school teacher and two of her students participated in the re-study. The data collection tools were of two types: discussions with participants with structured questions and asking the teacher to demonstrate how she used Google Classroom options to engage her students in online learning. Written interviews were analysed using theme analysis based on the De Lone and McLean Information Systems Success model. Research results have shown that the Google Classroom has contributed to student learning quality, positively affecting teacher and student satisfaction and the purpose of using this automated classroom learning tool and programs.

B. Motivation

An ideal classroom is an environment in which teachers can focus completely on their lectures and the students can concentrate on the information they are being conveyed. Unfortunately, this does not happen in most Indian Classrooms. Disruptions also occur throughout class time such as temperature and light variation in the summer and winter seasons respectively. These problems cause affected students to wander around the class guessing for the right switch and adjusting it to equilibrate the environment back to satisfying or comfortable conditions. Also, after all the classes are completed, students forget to turn off the light and fan in the classroom which in turn results in wastage of electricity. This causes disturbances for both teachers and all the other students, and so to eliminate these irritations an automated classroom is created which allows the classroom to become more efficient, and eliminate any human assistance in controlling the atmosphere

C. Problem Definition

It is observed that consumption of electricity is high in schools and colleges to reduce human efforts and overcome the problem of overconsumption automating things and devices using a programmed microcontroller (esp32) can save electricity and reduce human efforts as well.

D. Aim

To automate the classroom using ESP 32 and to control the lights and fan in the classroom by mobile application.

E. Objectives

- To save electricity
- To Automate the fans and lights in the classroom
- To control the appliances in the classroom from anywhere in a specific range of Wi-Fi using a mobile application
- To make the device smart
- Controlling the overall devices through the software.

F. Algorithms

Our Project is basically based on the Automation of any type of Room.
We can either control the Devices in the Room via Manual Switches or a Mobile Application.

- A Signal to either turn ON or turn OFF the Device/ Devices will be sent via Mobile Application

- Micro-controller will receive it here, ESP32 C6 DEV KIT WROOM
- The Relay will receive a Command to either turn ON or turn OFF the Device
- Device (Tube Light/Fan) will be either turn ON or turn OFF

BONUS:

- We can Control the Devices via Manual Switch even though the Device is ON via Mobile Application

G. Abbreviations

USB: Universal Serial Bus
Fig.: Figure

III. PROPOSED SYSTEM

- Working of System
  - Firstly, through the software or the app, we will give the instructions that will be accepted by the microcontroller in our case it is in the Esp32c6 Module.
  - All the instructions given through the microcontroller will be then given to the Esp32c6 Module and then the instructions will be uploaded to the Module and it is attached to the server through the USB Port.
  - The instruction given to the software or the app now it is accepted by the microcontroller and then the further instruction related to turning the lights and fans (i.e. ON OR OFF) is now given to the relay module.
  - After the instructions are given through the relay module the further process of turning the lights and fans will be done.

METHODOLOGY

Through literature reviews, we have formulated some of the existing methodologies and designed our system based on the difficulties faced by the existing authors.

A. Existing Methodology

There are two methods which is being followed previously.

They are 1. Manual method 2. Automation without IoT and individual costly systems

Advantages of the existing system are:

- Manual methods are used in small schools with less number of students
- Automation can be implemented for only needy systems which may reduce cost

The main disadvantages of these existing systems are given below:

- Time-consuming
- Relatively high cost
- Contains a minimum number of automated systems
- Students and teachers will get disturbed
- Electricity is wasted due to carelessness
- However, in our system, these disadvantages are overcome effectively.

A. Figures and Tables

Now we are going to see the tables and list of figures used in classroom automation.

TABLE I. LIST OF TABLE

Sr. No.	List of Table	
	Description	***Table No.***
1.	List of Figures	Table II
2.	List of Hardware	Table III

TABLE II. LIST OF FIGURES

Sr. No.	Figures	
	Description	***Fig No.***
1.	Flowchart	Fig. 1
2.	Manual switches, ESP 32 & Relay Module Connection	Fig. 2
3.	Bulb & Relay Connection	Fig. 3
4.	Block Diagram of ESP 32 Connection	Fig. 4
5.	Operating 4 Bulb via Bluetooth Application	Fig. 5

TABLE III. LIST OF HARDWARE

Sr. No.	Hardware List	
	Description	***Fig No.***
1.	ESP-32-C6	Fig. 6
2.	Relay (5V)	Fig. 7
3.	Terminal Connector (3pin)	Fig. 8
4.	Jumper Wires	Fig. 9

Sr. No.	Hardware List	
	Description	*Fig No.*
1.	Bug strip boat type (1 strip)	Fig. 10
2.	USB cable (ESP 32)	Fig. 11

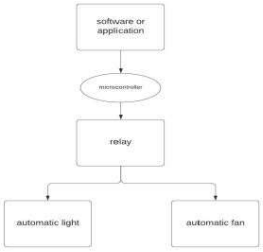

Fig. 1. Flowchart.

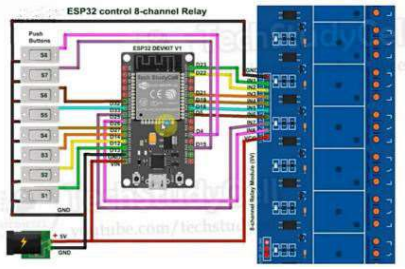

Fig. 2 Manual switches, ESP 32 & Relay Module Connection

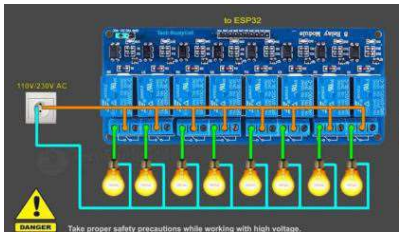

Fig. 3 Bulb & Relay Connection

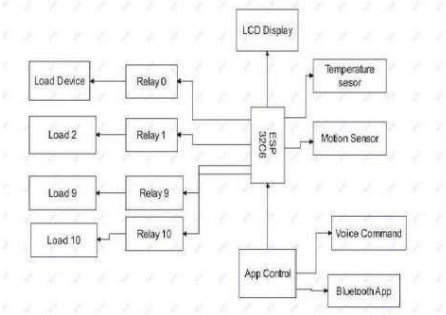

Fig. 4 Block Diagram of ESP 32 Connection

Fig. 8 Operating 4 Bulb via Bluetooth Application

- This figure shows that the Bulb is glowing with the help of the Bluetooth control app.

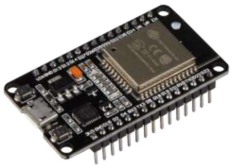

Fig. 9 ESP 32

ESP32-C6 has a single-core, 32-bit RISC-V microcontroller that can be clocked up to 160 MHz. It has a 384KB ROM, a 400KB SRAM, and works with external flash.It comes with 22 programmable GPIOs, with support for ADC, SPI, UART, I2C, I2S, RMT, TWAI andPWM

Fig. 10 Relay (5V)

Description:-

A relay is **an electrically operated switch**. It consistsof a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts, or combinations.

Fig. 13 Terminal Connector (3pin)

A terminal block (also called as connection terminal or terminal connector) is **a modular block with an insulated frame that secures two or more wires together**. It consists of a clamping component and a conducting strip.

Fig. 16 Jumper Wires

Jumper wires are used to connect the two points in the circuit. All the electronic jumper wires consists of the different length and assortments. These are frequently used with the bread borads for the connection.

Fig. 21 USB Cable (ESP32)

The USB cable is used, whatever the instructions stored into the Esp32 that information will be then that instructions will be connect with the code, for that purpose we use the USB cable port through that we connect the one part of the USB to the ESP-32 and other end to the pc.

Advantages of the Automation without IoT and individual costly systems are:

- Electricity wastage will be drastically reduced
- Fast and Effortless controlling of Devices
- Controlling of devices by kids without going close to main switch board would
- be possible and dangerous situation would be avioded

Disadvantages of the Automation without IoT and individual costly systems are:

- Laziness will be motivated.
- Mobile is a must for controlling of devices

B. Authors and Affiliations

In today's world, it is all about dependence on automatic systems. An intelligent IoT-based class system primarily works with automated electronic objects in the Internet-based Material protocol called MQTT. The system architecture contains several wireless nodes, middleware, and a user interface. All wireless nodes connect to a dedicated or existing network with middleware.

This communication is based on the Message Queue Telemetry Transport communication protocol built-in Internet of Things. Interaction is done by seeing the user's command with his or her speech. Basically, the secret commands are used to interact with the middleware.

Finally, based on user privacy instructions, the automation of each class equipment will be done with the Node MCU methods

IV. RESULT

- We can reduce the usage of electric energy or save energy.
- As energy usage will reduce it will lower Utility Bills.
- Quantifiable Metrics: Eliminate the guesswork. Know how much energy is being used where and when.
- However, in our system, these disadvantages are overcome effectively

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