IoT - Based of Automatic Electrical Appliance for Smart Home

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Abstract— Human life is improving and advancing due to the industry's quick development. Automatic systems are currently favoured over non-automated systems. The Internet has grown significantly in popularity among customers over the past few years, and IoT is the newest and most cutting-edge online technology. Because they can deliver information and accomplish tasks while we are busy with other chores, internet of things plays a significant part in human existence as well as in the field of education. This project showcases a smart home automation prototype with Wi-Fi implementation. An example of ESP12E technology is Wi-Fi. A hardware interface and a software interface make up the suggested system. An application is supplied for managing home appliances with smartphones, and the hardware interface manifests the integration of ESP8266 Wi-Fi technology with Arduino Nano for controlling home appliances. This system is one of the greatest ways to manage energy efficiently while easily allowing many users to handle various home appliances. The system's administrator only grants various people access to the entire system. As long as there is Wi- Fi network coverage, this system can also be expanded to manage other household appliances as well as to use sensors for home security and safety.

I. INTRODUCTION

A "Electrical Appliance Automation" system is one that makes controlling home appliances much simpler and more energy-efficient while also enabling consumers to control a variety of appliances of various kinds. Automation systems are utilised relatively frequently in homes and buildings today. On the other side, they make things more comfortable, especially while everyone is busy at work. In addition to enabling for centralised control of ventilation, heating, air conditioning, and lighting, "home automation systems" installed in homes also improve comfort.

As a result, they lower costs overall and are also helpful in preserving energy, which is undoubtedly the biggest issue of the day. The foundation of many well-known smart home systems is wired connectivity. Yet, the cost of already installed home automation systems is relatively expensive. Home automation systems, on the other hand, can be quite useful in the home. Moreover, Wi-Fi systems have been widely employed in the past. Wi-Fi has become more widespread in recent years when it comes to home networking. Smart homes and building automation systems that don't just rely on wired networks have several benefits.

The benefits of smart home automation often come under the headings of energy conservation, house safety, user ease, and improved control. The following are the primary characteristics of smart home automation:

a. Energy Savings: Energy-efficient lightbulbs, fans, and switchboards lower utility costs while also using less energy.

b. Home Security: The best technologies for home security are provided by several home

automation systems. Users purchase these gadgets to make their homes more secure and safe. People can enter a room and roam around at night with the help of automated lighting systems and motion- detecting sensors.

c. User-Friendly: Since home automation allows users to carry out job tasks on their own, it is very user-friendly for them. For instance, you could use inside sensors to turn lights on and off as needed.

d. Improved Control: This method gives end customers more control over their homes. Using this technology, one may readily learn what is happening within their home.

e. Convenient and Pleasant Environment: By delivering dependable lighting, temperature, and sound, all connected gadgets in and around our house may help us create a convenient and comfortable atmosphere.

f. Provide Consumers Comfort: This technology may bring customers comfort.

II.   PROBLEM STATEMENT

To create a system for home automation with the following capabilities:

- It is possible to utilise the internet to remotely control appliances from anywhere in the world.
- Be alert if smoke is detected.
- Minimize electricity wastage.
- More convenience.

III.   METHODOLOGY

1. This system uses a Node MCU ESP12-E microcontroller.

2. The Kodular Android App Development Platform is used to create an Android app.

3. To enable remote connectivity between an Android app and a hardware system, use the Thing Speak Cloud Server.

4. Value is delivered to cloud storage by commands provided from an Android app.

5. Node MCU reads the values kept in cloud storage.

6. Node MCU then turns relays on or off in response to the commands it receives, which turns on or off any associated devices.

7. As a result, the system is created so that it may be managed online from any location in the world.

8. The device also includes a gas sensor that detects smoke and sends an emergency signal through an attached on-board buzzer.
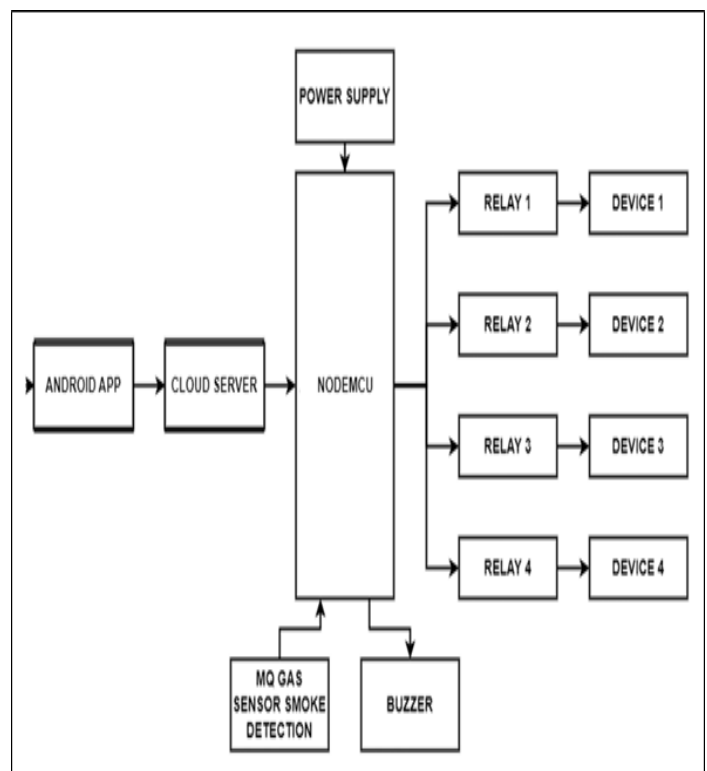

Fig. 1: Block diagram.

IV.   SYSTEM DESCRIPTION

1. NodeMCU ESP12E Microcontroller

An open source IoT platform is NodeMCU. It consists of hardware based on the ESP-12 module and firmware that runs on Espressif Systems' ESP8266 Wi-Fi SoC. The firmware is typically referred to as "NodeMCU" rather than the development kits. The Lua programming language is employed by the firmware. It was created using the Espressif Non- OS SDK for ESP8266 and is based on the eLua project. It makes extensive use of open-source initiatives like SPIFFS and lua-cjson.

Specifications:

• USB-powered, 4.5V to 9V (10VMAX) power input

• Data transfer: 110-460800bps

• Provide data transmission interfaces for UARTand GPIO

• Support Wi-Fi Link Advanced Networking

• Thermostat operating range: -40°C to +125°C

• Dual high-power H-bridge as the drive type

• No need to download reset software, Excellent tools for creating the ESP8266, Flash memorysize: 4Mbyte

2. Channel Relay Module

The 4 Channel Relay Module is a handy piece of equipment that may be used to manage high voltage, high current loads such AC loads, motors, solenoid valves, and lighting. It is made to connect to microcontrollers like the Arduino, PIC, and others. With a screw terminal, the relays' terminals (COM, NO, and NC) are removed. Moreover, an LED is included to show the relay'sstatus.

Specification:

• Digital output can be adjusted.

• Supports all 5V microcontrollers, including Arduino.

• Through-current rating: 10A (NO) 5A (NC).

• TTL level is the control signal.

• Maximum switching current 10A; Maximum switching voltage 250VAC/30VDC.

• Dimensions: 76 x 56 x 17 mm.

3. MQ Gas Sensor Smoke Detection

This low-cost semiconductor gas sensor module has both analogue and digital output and is incredibly simple to operate. The gas sensing component for this module is the MQ2 Smoke & Flammable gas sensor. You only need to connect the Vcc and ground pins, and then you're ready to go. An on-board potentiometer can be used to conveniently set the threshold value for digital output. With the help of this module, you can quickly connect an Arduino, Raspberry Pi, or any other microcontroller to a MQ2 smoke and combustible gas sensor. This Gas Sensor Module

can be used to detect fires because it is sensitiveto smoke.

Specifications:

Dimensions: 36x20x21 mm, Operational Voltage: +5V, Preheat Time: 20 s, Analog Output Voltage: 0 to 5 V.

4. Buzzer

For indication notifications, a 5V Piezo electric buzzer is utilised.

Specifications:

• Body Size: 12 x 8mm • Pin Pitch: 6mm • Input Voltage (Max.): 5V • Resistance: 42 • Resonance Frequency: 2048 Hz

5. Jumper Wires

Simply said, jumper wires are wires with connector pins at either end that can be used to connect two places without soldering. With breadboards and other prototype tools, jumper wires are frequently used to make it simple to change a circuit as required.

6. Zero PCB

A material for electronic circuit prototyping is termed perfboard or zero PCB (also called DOT PCB). It consists of a thin, stiff sheet with pre-drilled holes spaced uniformly along a grid, often a square grid with 0.1 inches (2.54 mm) spacing. Although bare boards are also an option, these holes have round or square copper pads surrounding them. While more expensive perfboard may only have pads on one side, higher-quality perfboard often has pads on both sides (plate-through holes). The builder uses wire wrapping or small point-to-point wiring methods to complete all connections because each pad is electrically independent. The prototype board is soldered using discrete parts including resistors, capacitors, and integrated circuits. Often, laminated paper serves as the substrate.

7. Male Header

Pin headers are brittle metallic connectorsthat stick up from a circuit board after being soldered to it. They are designed to connect to a female socket. While female counterparts are also

extremely prevalent and are referred to as female headers (FH) or header connectors, pin headers (commonly referred to as PH, or headers) are male by definition.

8. Female Header

In most cases, the female connection acts as a receptacle to hold and accept the male connector.

9. USB

Universal Serial Bus is what USB stands for. It functions both as a power source and a data wire for programming.

V. SOFTWARE USED

1. Arduino Ide

Java was used to create the cross-platform Arduino integrated development environment (IDE), which is available for Windows, macOS, and Linux. Writing and uploading programmes to an Arduino board are done using it. The GNU General Public License, version, applies to the IDE's source code. The Arduino IDE has specific code organisation guidelines to support the languages C and C++. A software library from the Wiring project, which offers numerous standard input and output operations, is provided by the Arduino IDE. The GNU tool chain, which is also distributed with the IDE, is used to compile and link user-written code into an executable cyclic executive programme, which only needs two fundamental functions to start the sketch and the main programme loop.

2. Thingspeak Cloud

As stated by its creators, "Using the HTTP and MQTT protocols over the Internet or through a Local Area Network, Thing Speak is an open-source Internet of Things (IoT) application and API that stores and retrieves data from objects. Application development for location tracking, sensor logging, and a social network of things with status updates are all made possible by Thing Speak ". In order to facilitate IoT applications, ioBridge initially introduced Thing Speak in 2010. The mathematical computer programme

MATLAB from Math Works is integrated with Thing Speak, enabling users to analyse and visualise uploaded data using Matlab without having to buy a Matlab licence from Math Works. Mathworks, Inc. and Thing Speak have a close working partnership.

3. Frtizing

An open-source hardware project called Fritzing enables anyone to use electronics as a creative medium. In the spirit of Processing and Arduino, we provide a software tool, a community website, and services. By establishing a creative environment, we enable users to document their prototypes, share them with others, teach electronics in a classroom, and layout and produce expert PCBs.

4. Mit App Inventor 2

The Massachusetts Institute of Technology now maintains the web application integrated development environment known as App Inventor, which was first made available by Google (MIT). It enables those who are new to computer programming to construct software applications (apps) for two operating systems (OS): Android and iOS, which, as of July 8, 2019, is undergoing final beta testing and will be made available to the general public in the following summer. It is free and open-source software distributed under two licences: an Apache License 2.0 for the source code and a Creative Commons Attribution ShareAlike 3.0 Unported licence.

It makes use of a graphical user interface (GUI) that is remarkably reminiscent of the StarLogo TNG user interface and the Scratch programming language, allowing users to drag and drop visual items to construct applications that can run on mobile devices. Google drew on extensive earlier research in educational computing as well as internal Google work on online development environments while developing App Inventor.

Constructionist learning theories, which highlight that programming may be used as a

vehicle for engaging profound ideas through active learning, inform App Inventor and the projects on which it is built. As a result, it is a part of an ongoing trend in computers and education that was started in the 1960s by Seymour Papert and the MIT Logo Group and has since taken several forms.

VI. APPLICATION

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- Lighting control, HVAC, outside lawn irrigation, and kitchen appliances are the most typical applications of home automation.
- Security measures
- Burglar alarms
- Gas identification
- Fire detection
- Home theatre system, etc.

VII. ADVANTAGES

- It save our energy.
- It improves our Home security.
- It is user friendly.
- It improves control
- It is convenient & pleasant environment.
- It provides consumers confort.

VIII. CONCLUSION

This study uses a smartphone to operate electronic devices including a lamp, an air conditioner, and a vertical blind in a space. The ping delay value serves as a gauge for the responsiveness of the designed computer's communication. This study demonstrates how

simple advice control's typical delay response is.

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