

IOT (Internet of Things) Based Home Automation System

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Abstract:- With advancement of Automation technology, life is getting less complicated and easier in all of the aspects. In today's world, Automatic systems are being preferred over manual system. With the speedy increase within the range of users of web over the past decade has created web a section and important element of life, and IoT is the latest and rising web technology. Internet of things could be a growing network for everyday objects-from industrial machines to consumer goods to household products which will share all data and complete your tasks while you're busy with alternative activities. Wireless Home Automation system(WHAS) using IoT is a system that uses communicating devices to regulate basic home operations and features automatically through net from anyplace round the world. An Automated home is generally known as a Smart home. It's meant to save lots of the electric power and human energy. The home automation system differs from alternative system by permitting the user to control the system from anyplace round the world through net connection. In this paper we tend to present a Home Automation system(HAS) using node microcontroller unit that employs the integration of cloud networking, wireless communication, to supply the user with remote control of variety of slights, fans, and appliances within their home and storing the information within the cloud.

Keywords:- Node MCU, IoT, Wireless Home Automation system(WHAS), Relay.

I. INTRODUCTION

A. Overview

Homes of the twenty first century can become a lot more self-controlled and automated owing to the comfort it provides, particularly once utilized during private space .. A home automation system may be a means to enable users to regulate electrical appliances of various kinds. several existing, well-established home automation systems are supported by wired communication. This doesn't create a complication if the system is planned well prior to and put in throughout the physical construction of the building. except for already existing buildings the implementation price goes terribly high.

B. Advantages of Home Automation

- In recent years, wireless systems like Wi-Fi has become common in home networking. Additionally in home and building automation systems, the employment of wireless technologies offer convenience that cannot be achieved by employing a wired network solely.

- 1) Reduced installation costs: initial and foremost, installation prices are considerably reduced since no wiring is vital.
- Wired solutions need cabling, where material as well as the labor cost for installation of cables (e.g. into walls) is exorbitant.
- 2) System computation and easy expansion: Deploying a wireless network is particularly advantageous in case the extension of the network is critical which in case of a wired installations, becomes tedious. This makes wireless installations a seminal investment.
- 3) Aesthetic benefits: reducing the area coverage , this attribute also serves as an elegant way of doing the task. Examples include representative buildings with all-glass design and historical buildings where style or conservatory reasons don't permit laying of cables.
- 4) Integration of mobile devices: With wireless networks, associating mobile devices like PDAs and Smartphones with the automation system becomes attainable all over and at any time, as a device's precise physical location is not any longer crucial for a connection (as long as the device is in reach of the network).
- For of these reasons, wireless technology isn't solely a beautiful selection in renovation and restoration, however additionally new installations.

II. SYSTEM ANALYSIS

A. Problem Specification

Home automation systems faces four main challenges, exorbitant cost, inflexibility, poor tractability, and issues in achieving full-fledged security. The main objective of this analysis is to model and implement a home automation system employing Internet of Things that is capable of supervising and automating the house appliances through a simple and a manageable network interface. The suggested system provides an increased flexibility by employing a Wireless technology to interconnect its distributed systems to home automation server. This can decrease the installation cost and can provide with flexibility to upgrade and reconfigure the system.

B. Proposed System Feature

The suggested system is a distributed home automation system which consists of server, Server controls and monitors .The microcontroller (NODE Mcu), includes an inbuilt Wi-Fi capability.. Automation System are often accessed from the browser of a host computer within the same computer network server or remotely from any

computer or mobile hand-held device connected to the net with acceptable browser through server real IP . Wi-Fi technology is chosen as the network infrastructure that connects server and therefore the controller. Wi-Fi is chosen in order to enhance system security (by employing secure Wireless connection), and to extend system quality and computational features.

III. SYSTEM DESIGN AND IMPLEMENTATION

A. Hardware Design

The proposed system consists of an ESP 8266 based microcontroller and electromagnetic relay module. Using a MQTT (Message Queuing and Telemetry Transport) server model, created using adafruit io, a free MQTT cloud service provider. The controller and the host system (both pc and hand held computing devices) are connected to the same Wi-Fi network or server. Wi-Fi is used to send data between the controller and the host system, which is done using M2M (Machine to Machine) data transfer mode in MQTT server. The inputs provided to the host system thus control the high voltage apparatus through relays.

- *Node Mcu*

NODE MCU (Microcontroller Unit) is an open source Internet of Things platform that runs on ESP 8266 Wi-Fi SoC and hardware is based on ESP 12 module. The firmware present in the system uses Lua scripting language. It includes an inbuilt MQTT library, CP2102 TTL to USB chip for programming and debugging. The one used in the project is based on ESP-12E module. Microcontroller allows SPI and UART modes of communication along with Wi-Fi. The system works on 5V.

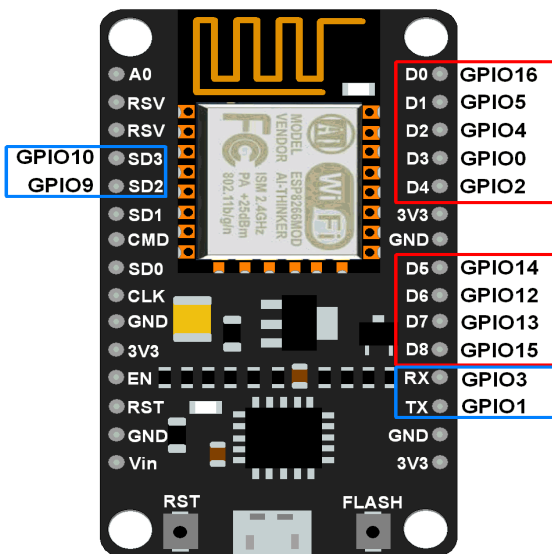


Fig 1:- Node Mcu

- *Relay*

The relay used in the system is an electromagnetic type relay which operates on the principle of electromagnetic attraction. The relay module used in the project consists of optocoupler, two 5V relay. The triggering voltage and triggering current of the relay is 5V and 70 milliamps and the

relay is capable of handling maximum load current of 10A at 250/125V in an AC circuit and 10A at 30/28 V dc circuit.

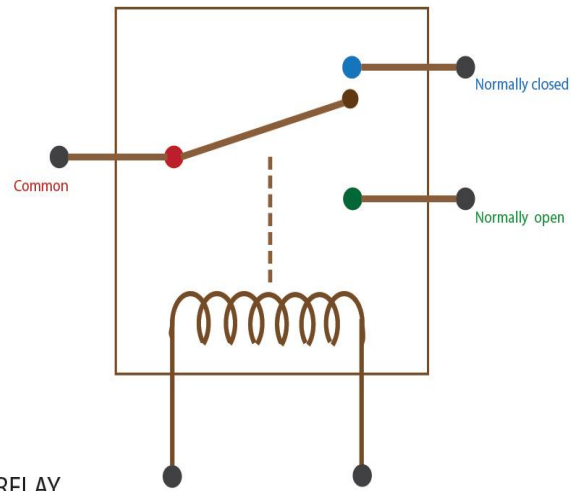


Fig 2:- Relay

B. Software Implementation

- *Code*

The code for the test system can be divided into 3 parts:

- The first part is responsible for establishing a connection with the server.
- The second part of the code is necessary to establish a connection with the MQTT server which has been created using an open source cloud service provider, Adafruit IO.
- The third part is responsible for fetching the input from the cloud and publishing it on the microcontroller board.

```
// Function to connect and reconnect as necessary to the MQTT server.
// Should be called in the loop function and it will take care if connecting.
void MQTT_connect() {
    int8_t ret;

    // Stop if already connected.
    if (mqtt.connected()) {
        return;
    }

    Serial.print("Connecting to MQTT... ");

    uint8_t retries = 3;
    while ((ret = mqtt.connect()) != 0) { // connect will return 0 for connected
        Serial.println(mqtt.connectErrorString(ret));
        Serial.println("Retrying MQTT connection in 5 seconds...");
        mqtt.disconnect();
        delay(5000); // wait 5 seconds
        retries--;
        if (retries == 0) {
            // basically die and wait for WDT to reset me
            while (1);
        }
    }
    Serial.println("MQTT Connected!");
}
```

- *Mqtt Server*

Message Queuing Telemetry Transport or MQTT is a data publisher or subscriber, which has a very simple and light-weight messaging protocol, designed for devices having low-bandwidth, high-computing or undependable networks. The planning principles are to reduce network bandwidth and device resource necessities whilst also trying to make sure its dependability. These principles result to form the protocol ideal for the emerging “machine-to-machine” or “IoT” - the world of connected devices, and for mobile applications where bandwidth and battery power are at a premium.



Fig 3:- Virtual Switches

IV. RESULT

After the successful connection to the server, the values being generated by the control switches in the cloud are scanned, fetched and used to control the high voltage apparatus in the house using electromagnetic relay.

V. ACKNOWLEDGMENT

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