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HOME APPLIANCES AUTOMATION USING NODE MCU IOT BASED WEBSERVER

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Abstract: This project presents a low cost and flexible home control and environmental monitoring system. It employs an embedded micro – web server in NODE MCU microcontroller, with IP connectivity for accessing and controlling devices and appliances remotely. This NODE MCU device can be controlled through a web application or via Bluetooth Android-based Smart phone app. In this work, we will be using a Local Web Server. A web server is a device that runs websites. It's a program or a bunch of code that distributes web pages as they are requisitioned. The basic objective of the Web Server is to store, process, and deliver web pages to the users. This intercommunication is done using the Hypertext Transfer Protocol. To demonstrate the feasibility and effectiveness of this system, devices such as light switches, power plug, temperature sensor, gas sensor and motion sensors have been integrated with the proposed home control system. Therefore this system has been successfully designed and implemented in real-time.

Keywords: Node MCU(ESP8266), Relay.

1. INTRODUCTION

Home robotization frameworks have gotten inescapability beginning late, paralleling the advances in the likelihood of the Internet of Things. Notwithstanding the manner in which that robotization for business structures is a make improvement, computerization applications for habitations are a decently new upgrade, which is being gotten a handle on by customers. Home robotization joins the checking and control of exercises, for example, lighting, warming, ventilation, cooling (HVAC), electrical mechanical gatherings, sound frameworks, perception cameras, passage shocks, and cautions. Home robotization has various focal points, for instance, comfort, extended security, and essentialness viability. The wide usage of home computerization can be found in cold urban networks, for instance, Milwaukee, where people set warming of go outside the house and they leave and switch on the more sultry 15 minutes before returning. The framework is called HVAC and is the best choice for home mechanization. In a period of remote development, for instance, Bluetooth, WiFi, Zigbee, and GSM, customers need home mechanical assemblies to be related remotely. All of these remote developments has their very own giganticness and subtleties. This endeavor adequately uses Bluetooth with an open repeat of 2400 Hz, an extent of 100 meters, and a speed of around 3 Mbps. There are two or three stresses to be kept an eye on while organizing a home computerization structure. The system should be arranged such that facilitates new devices, with the objective that these devices shouldn't be an issue at a later stage. On the host side, the framework should be straightforward, with the objective that the devices can be checked and controlled viably. In the occasion of any issues later on, the interface of the structure should give definite organizations. Finally, the structure should be smart with the objective that it might be commonly used by anyone in the market.

Figure.1. Smart Home

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2. METHODOLOGY

Proposed System Feature

As we enter the twenty-first century, the transaction among individuals and pc is breaking vintage confinements and coming into another domain. inside the massive innovation-driven worldwide of these days' phones have developed as a piece of our ways of life. cell phones are not simply discussion device. Our endeavor attempts to infer arrangement furnishing better oversee on local machine with assistance of cell phone. the current contraption incorporates substantially machines in our home which can be been controlled through switches. those gadgets can be turned ON and OFF physically at whatever point needed. This contraption is substantially less verified and subject to electric threats. likewise the wastage of vitality tends to a central point of subject. The proposed task is considered systems administration our cell mobile to all machines through a smart trustworthiness circuit. The proposed gadget incorporates astute practical insight Circuit associated with the home hardware. The notoriety of every single home apparatus may be made do with the guide of buyer from distant with help of individual's cell phone.

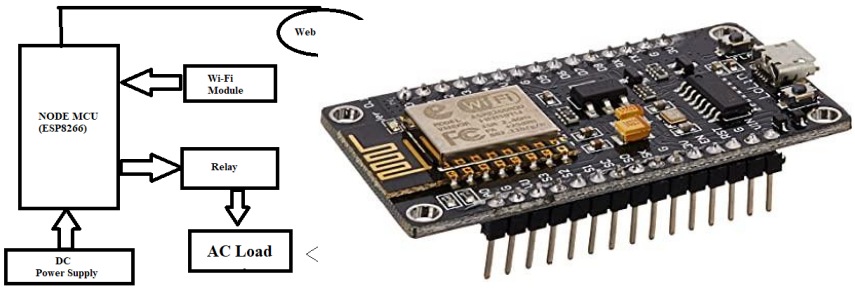

Figure.2. Block diagram

Proposed Home Automation System

The end individual can utilize their mobile phone or PC to sign into the machine. A fundamental test is accomplished for whether the equipment instrument is ON or not. handiest on the off chance that the equipment is approved and ON, at that point the individual is verified. when the confirmation is done accurately, individual is then equipped to send the control alarms to the equipment machine. at the equipment device the SL intention power program will always follow for the change inside the distinction and will thusly transport the markers to the Circuit. while a client chooses an exchange inside the notoriety for any of the instrument [I. e .. ON or Off], the records from the hand-held is sent to the web Server in a string design, wherein the web – site is the host. at the server the status is spared in the database of their non-open device field. at the equipment end, the circuit power program a web website page is utilized to rescue the notoriety of the contraptions in a reasonable example [for each 10sec]. those changes come quite close to treats [which are transitory web files] from the web server and are spared at the PC inside the name of the net site on the web. thusly every 10 sec on the grounds that the site page is revived and the new treat esteems are modernized.

3.HARDWARE REQUIREMENT

- NodeMCU ESP8266-12E Board
- Relay -5V Relay
- Voltage Regulator IC-LM7805 5V IC
- Diode -1N4007
- Resistor -330ohm
- LED-5mm LED Any Color
- Female Header-2.54mm Female Header
- Light bulbs

SOFTWARE REQUIREMENT

- Arduino software

4.HARDWARE DESCRIPTION

4.1 NODEMCU esp8266:

NODEMCU (esp8266) has been selected as the controller for this system due to its compact size, compatibility, easy interfacing over several other type of controller including Programmable Integrated Circuit (PIC), Programmable Logic Controller (PLC) and others. ESP8266 is an open source firmware that is built on top of the chip manufacturer's

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proprietary SDK. The firmware provides a simple programming environment, which is a very simple and fast scripting language The ESP8266 chip incorporates on a standard circuit board. The board has a built-in USB port that is already wired up with the chip, a hardware reset button, Wi-Fi antenna, LED lights, and standard-sized GPIO (General Purpose Input Output) pins that can plug into a bread board..Figure-3 shows the diagram of NODEMCU (ESP8266).It has Processor called L106 32bit RISC microprocessor core based on the Tensilica Xtensa Diamond Standard 106Micro running at 80 MHz and has a memory of 32 Kbit instruction RAM ,32 Kbit instruction cache RAM, 80 Kbit user data RAM&16 KbitETS system data RAM. It has inbuilt Wi-Fi module of IEEE 802.11 b/g/n Wi-Fi.

Figure.3 . Node MCU

4.2.Relay:

Relay is nothing but it is the electromagnetic switch. Relay allows one circuit to switch another circuit while they are separated. Relay is used when we want to use a low voltage circuit to turn ON and OFF the device which required high voltage for its operation. For example, 5V supply connected to the relay is sufficient to drive the bulb operated on 230V AC mains. Relays are available in various configurations of operating voltages like 6V, 9V, 12V, 24V and so on. Relay is divided into two parts, one is input and other is output. Input side is nothing but a coil which generate magnetic field when small input voltage is given to it. Relay having three contactors: Normally closed (NC), Normally opened (NO) and common (COM). By using the proper combinations of the contactors electrical appliances may turn ON or OFF

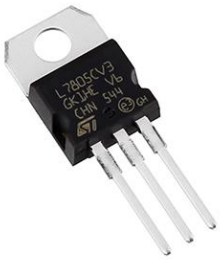

Figure.4 .Relay

4.3. Voltage Regulator IC (LM7805 5V IC):

A voltage regulator is an integrated circuit (IC) that provides a constant fixed output voltage regardless of a change in the load or input voltage. It can do this many ways depending on the topology of the circuit within, but for the purpose of keeping this project basic, we will mainly focus on the linear regulator.

Figure.5. Voltage Regulator

4.4 Diode-1N4007:

The most common function of a diode is to allow an electric current to pass in one direction (called the diode's forward direction), while blocking it in the opposite direction (the reverse direction). As such, the diode can be viewed as an electronic version of a check valve.

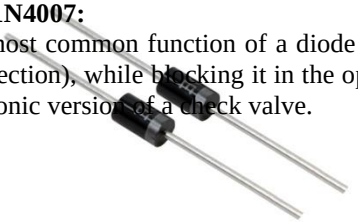

Figure.5. Diode

4.5 Resistor -330ohm:

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A resistor is a passive electrical component with the primary function to limit the flow of electric current.

Figure.5. Resistor

4.6 LED:

A light emitting diode(LED) is a semiconductor device that emits visible light when an electirc current passes through it.

Figure.5. LED

5.SOFTWARE DEVELOPMENT:

5.1 Programming NODE MCU:

NODE MCU board should be modified using a code so it can interface with the application. NODE MCU gives an adaptable stage, which composes a code so as for any capacity to be executed by the Node mcu and transfer to board. Addendum A demonstrates the full source code for the NODE MCU. Interfacing the Atmega 328 with Electrically Erasable Programmable Read Only Memory (EEPROM) is finished utilizing the All inclusive Synchronous Asynchronous Receiver Transmitter (USART) convention. The code is written in Embedded C utilizing Atmel studio 6.0. The code is then arranged and changed over to HEX code. A short time later, the HEX code is then scorched to the Atmega 328 microcontroller.

Figure.6. Programming NODE MCU

5.2 Associating the Appliance to the Node MCU Board:

After every one of the associations are done, the home machines ought to be associated with the Node MCU. The positive end of the home apparatus must be associated with the anode port of the optocoupler and negative end of the machine must be associated with the power source utilizing wires.

Utilizing distinctive optocouplers and Node MCU ports, the associations is made for different apparatuses. At last, with the assistance of a Bluetooth associated Android telephone, the majority of the electronic machines in the houses are controlled using remote.

5.3 ALGORITHMS:

Programming the Node MCU isn't extremely troublesome errand. When the circuit has been made on the breadboard, you'll have to transfer the program (known as a draw) to the Node MCU. The draw is an arrangement of guidelines that tells the board what capacities it needs to perform. An Arduino load up can just hold and perform one outline at any given moment. The product used to make Node Mcu portrays is known as the IDE which represents

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Integrated Development Environment. For, this particular project we have developed a simple code. The code has been illustrated using screen shots taken from our laptop.

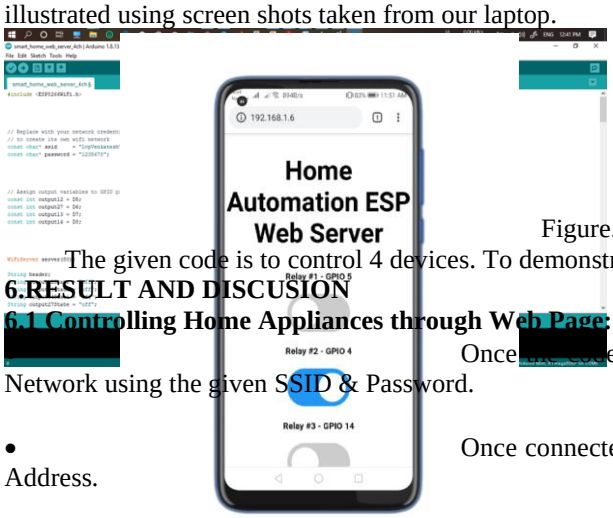

Figure.7.Algorithm

The given code is to control 4 devices. To demonstrate our project we use 4 light bulbs.

6.RESULT AND DISCUSION

6.1 Controlling Home Appliances through Web Page:

Once [redacted] code is uploaded, the NodeMCU Board will try connecting to the Network using the given SSID & Password.

- Once connected to the network, the Serial Monitor will display the Local IP Address.
- Now you can copy the IP Address and paste it to the web Browser. The Web Browser will display the beautiful webpage.
- Now you can send 1 or 0 to turn ON & OFF the home appliances. The ON command is assigned to certain GPIO Pin as 1 & OFF command as 0.
- Apart from all this, if your NodeMCU ESP8266 Board is connected to your PC, the Serial Monitor will display the following message.

Figure.8. Controlling Home Appliances through Web Page

6.2 Demonstration:

- Now, after completing the coding part and made necessary changes. Its time to upload the code to your ESP8266 NodeMCU board using Arduino IDE.
- Open the Serial Monitor at a baud rate of 115200. Now, Press the ESP8266 RST button to get its IP address.
- Then, open a browser in your local network and type the ESP8266 IP address. You will now get access to the web server.
- Additionally , should get something as shown below with as many buttons as the number of relays defined in your program sketch.

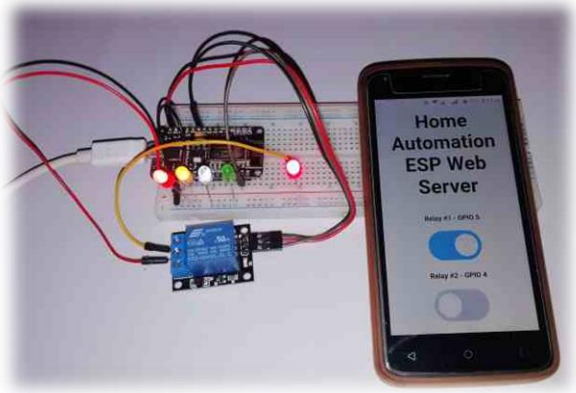

Figure.9. Demonstration

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7.CONCLUSIONS

It is evident from this project work that an individual control home 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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