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ELECTRICAL APPLIANCE CONTROL USING IOT

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Abstract

The basic purpose of monitoring electrical appliances in the modern world by using Internet of Things (IoT) is to control them based on conditional demands. With the development in technology, the necessity for efficient controlling is more as it improves performance and saves unnecessary wastage of power. The electrical appliance like fan, light and water pump which consume maximum power. Unnecessary wastage of power and resources by turning on lights during day time or high speed fans in winter season or water pump during overflow of water from tank can be avoided in this way. This system has been developed to control electrical appliances anytime from anywhere in the world and efficiently utilize power by controlling appliances properly. Android app has been used to control electrical appliances. The system uses node mcu which is connected to wi-fi that employs the integration of cloud networking, wireless communication, to provide the user with remote control of various electrical appliances. This system is designed to be low cost and expandable allowing a variety of devices to be controlled.

Index Terms: *IoT, node mcu, cloud networking, app*

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1. INTRODUCTION

IoT allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit. The present generation has been experiencing high speed internet by using 4G LTE cellular technology, which allows evolution of swifter IoT-based home automation systems. When IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which encompasses technologies like controlling of different electrical appliances like light, fan, water pump and many more. Increasing reliability on mobile phone applications to deal with daily life scenarios has paved the way of modeling a system that can be used to control appliances. This also allows users to observe data and send commands by using their mobile phone application. With the advancement of technology controlling and monitoring of electronics appliances using android application with the help of internet connection has become possible. It gives us the opportunity to have full control over a particular place even being far away from it. IoT allows us to control many devices simultaneously and reduces human efforts. This process is done in low cost and controlling of many devices in a simple circuit is possible. Our user-friendly interface allows a user to easily control electrical appliances through the internet. Relays are used to switch loads. After receiving user's commands over the internet, node mcu processes these instructions to operate these loads accordingly and display the system status on mobile application. Besides monitoring sensor data and controlling household devices, the proposed system provides additional features of emergency notification and automatic turn off of an appliance to prevent wastage of power. Thus this system allows efficient home automation over the internet.With the advancement of wireless technologies such as Wi-Fi, cloud networks in the recent past, wireless systems are used every day and everywhere.

2. LITERATURE REVIEW

Kumar Mandula in his paper [2] discuss about the process of home automation using Bluetooth and Ethernet. When connectivity between Arduino and smart phone is established using Bluetooth, short range wireless communication is

possible in an indoor environment. Ethernet module is used for connecting Arduino board from any part of the world.

Bharat Bohora in his paper [3] discuss designed a system based on Blynk framework which controlled and monitored appliances via smartphone by using Wi-Fi as communication protocol and raspberry pi as private server. All the appliances and sensors are connected to the internet via NodeMCU.

Ming Wang in his paper [4] discussed about his work on system that uses a smart central controller to set up a 433 MHz wireless sensor and actuator network (WSAN). A series of control modules, such as switch modules, radio frequency control modules, have been developed in the WSAN to control directly all kinds of home appliances.

P.Siva Nagendra Reddy in his paper [5] discuss used android mobile to send commands to the Arduino board through Wi-Fi module and Arduino processed them to control all the home appliances. This system controlled the voltage levels of home appliances like fan, light etc. They got the status of their home appliances in their android mobile phone. M L Sharma developed a system in which a home automation system was interfaced with Android mobile devices. The mobile device and system communicated with each other via Wi-Fi.

Somnath Singh in his paper [8] discussed about designing a web-based control of home appliances which allowed user to switch appliances on/off by clicking on a webpage specially designed to interact with those devices, by being anywhere in the world with a computer or a smart phone connected with the Internet.

Miss. Aboli Mane used Blynk app in her project of home management system and security. Different sensors were connected with NodeMCU. With the help of Wi-Fi, NodeMCU was connected with Blynk app. On detection of any unwanted incident by different sensors, messages were sent to Blynk app.

1.2 BLOCK DIAGRAM

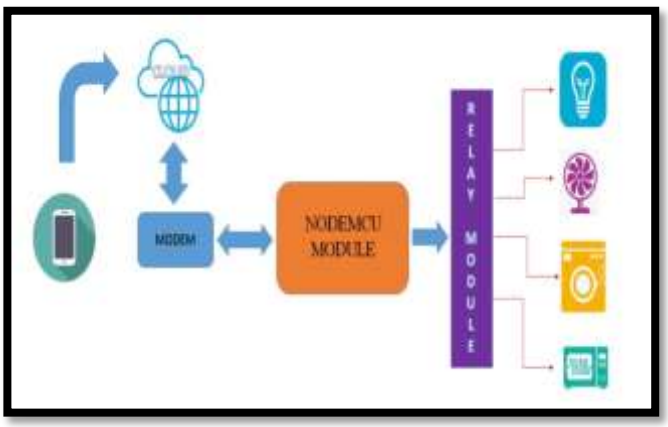

Fig.1: Block diagram of proposed system

The above figure shows the block diagram of proposed system. The heart of the system is node mcu NodeMCU is an open source IoT based firmware developed for ESP8266 WiFi chip. It has inbuilt WiFi with TCP/IP protocol. It also provides access to various GPIO through which we connect various devices or sensors. In the proposed system we uses one app on our mobile through which we are able to control the various appliances with the help of IoT. Our mobile is connected to cloud through internet so that we can send command to the node mcu. Node mcu is also connected to cloud through Wi-fi as it have inbuilt Wi-fi and therefore it controls relay module to which our various appliances are connected. The relay module is a separate hardware device used for remote device switching.

2. HARDWARE

2.1. NODE MCU:

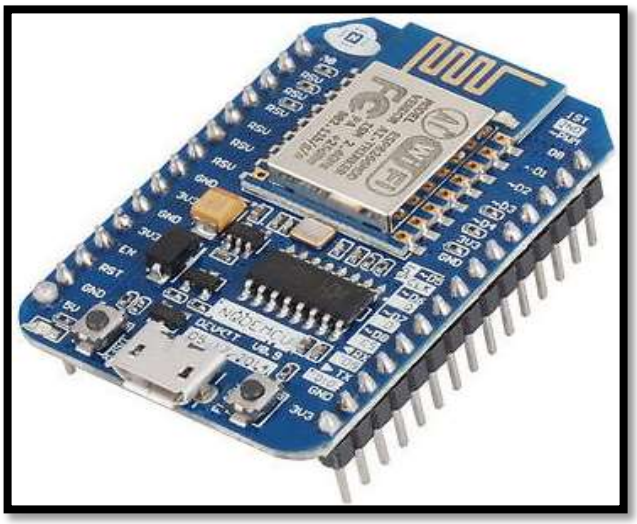

Fig.2: Node mcu

NodeMCU is an open source IoT based firmware developed for ESP8266 WiFi chip.It has inbuilt WiFi with TCP/IP protocol. It also provides access to various GPIO through which we connect various devices or sensors. NodeMCU Development board is featured with WiFi capability, analog pin, digital pins and serial communication protocols. Node mcu included more 40 different modules by summer 2016. Due to resource constraints user need to select the modules relevant for their project and build a firmware tailored to their needs.

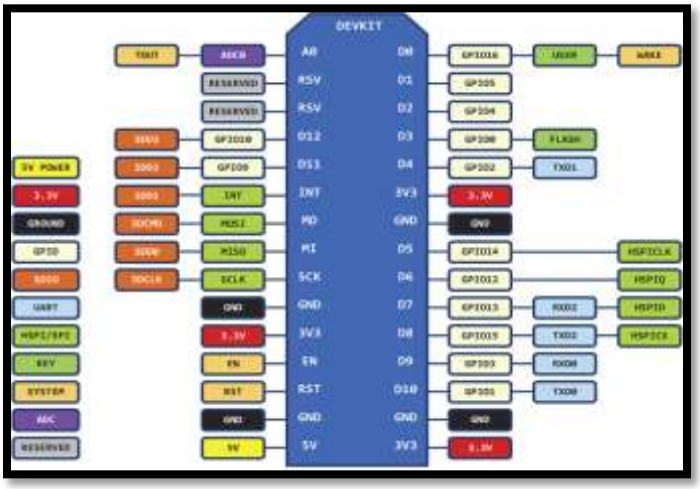

Fig.3: Pin diagram of node mcu

2.2. RELAY MODULE:

The relay module is a separate hardware device used for remote device switching.

- **GND:** goes to ground
- **IN1:** controls the first relay (it will be connected to an Arduino digital pin)
- **IN2:** controls the second relay (it should be connected to an Arduino digital pin if you are using this second relay. Otherwise, you don't need to connect it.
- **VCC:** goes to 5V

Fig.4: Relay module

2.3. OTHER COMPONENETS:

IC 7805 is used for power supply. The system requires 5V of supply. The other component includes Transistors BC547, Resistors of 3k, 10k and 330 ohms, capacitors of 1000 and 470 micro farad, diode 1N4007.

3. CIRCUIT DIAGRAM

3.1. POWER SUPPLY:

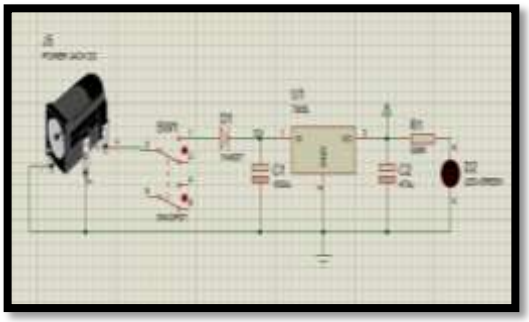

Fig.5: Circuit Diagram of Power Supply

The proposed system requires 5v supply. In this circuit we are using 1N4007 to block reverse current and it conduct in forward bias mode. The capacitor C1 and C2 are used for filtering and blocks the ripples to give sustained output.The 7805 IC is used to regulate the supply and convert the voltage from 12V to 5V DC and maximum current of 1 ampere.

3.2. MAIN CIRCUIT DIAGRAM

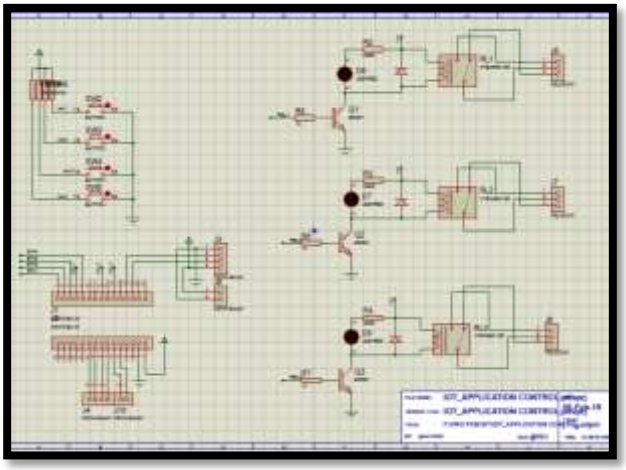

Fig.5: Main circuit diagram

In the above circuit diagram, the relays are connected to D4, D8 and D10 and the four switches that we are using for controlling the devices are connected to the pin number 1,2,3 and 5. We are connecting USART to the pin number 12 and 13 and we are the serial peripheral interface (SPI) to the node mcu for future purpose.

4. WORKING

In the given system, the node mcu is connected to mobile through the internet and in this we are using the Blynk app through which we are able to turn on and off the device. Blynk app will generate the authentication code and we have to use this authentication code whenever we are coding the actual program. And due to this, mobile phones get connected

to the cloud and the link is established in between mobiles and the user. In this the Cloud acts as communication link between user and the devices. After the authentication is done, the code which is generated by our mobile is send as a command to the node mcu. The node mcu will switch on and off relay accordingly and then relay take the actions to turn on and off the devices.

5. ADVANTAGES

1) Reduced installation costs: First and foremost, installation costs are significantly reduced since no cabling is necessary. Wired solutions require cabling, where material as well as the professional laying of cables (e.g. into walls) is expensive.

2) System scalability and easy extension: Deploying a wireless network is especially advantageous when, due to new or changed requirements, extension of the network is necessary. In contrast to wired installations, in which cabling extension is tedious. This makes wireless installations a seminal investment.

3) Aesthetical benefits: Apart from covering a larger area, this attribute helps to full aesthetical requirements as well. Examples include representative buildings with all-glass architecture and historical buildings where design or conservatory reasons do not allow laying of cables.

4) Integration of mobile devices: With wireless networks, associating mobile devices such as PDAs and Smartphones with the automation system becomes possible everywhere and at any time, as a device's exact physical location is no longer crucial for a connection (as long as the device is in reach of the network).

6. CONCLUSION

This work can further be upgraded by using different sensors and different home appliances. Since smart phones are wide used nowadays, this user-friendly system can be used for benefitting the mass. The cost of the system is also within reach. The circuit used for controlling AC fan speed can also be implemented in AC light dimming applications. The features of automatic turn off and sending emergency notification can be very useful in geyser and air conditioner. When water is heated to a particular temperature in geyser, it can be automatically turned off or when room temperature is lowered to a specified value the air-conditioner can be turned off automatically. In both the above cases notifications can also be sent to user through his/her Blynk app. Mobile application development companies with dedicated teams are working extensively on IoT-based applications that are connected to the cloud. Not only old-aged or physically challenged people can be benefitted using this, but any person with a smart phone can monitor and control the electronic devices without much difficulty. As awareness grows, the adoption rate is likely to increase for IoT-based mobility solutions that will automate business operations and end-to-end processes. This will help the user to analyze the condition of various parameters in the home anytime anywhere.

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