Research Article

IoT Based Home Automation using Bluetooth and Wifi Module

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Abstract

This paper presents a design of new home automation system that uses Wifi and Bluetooth as a network Infrastructure connecting its parts. IoT (Internet of Things) is an umbrella term used for all technologies that enable the connection of a device to the internet .The data is then used for monitoring, controlling, transferring information to other devices via internet. Using home automation system we can measure temperature, relative humidity, and light intensity. In this paper a low cost and user friendly remote controlled home automation system is presented using ARDUINO board, Bluetooth module, wifi, Smartphone. This paper is also describing the Hardware and Software architecture of System, future work.

Introduction

This home automation system can temperature, relative humidity, light intensity and etc .In this paper we design the app with bluetooth and Wifi .we can use Bluetooth in short distance providing a necessary technology to make convenience, intelligence, controllability and we can use. The goal of this project is to develop a home automation system that gives the user complete control over all remotely controllable aspects of his or her home [1,2]. In this paper we design the app with bluetooth and Wifi .we can use Bluetooth in short distance providing a necessary technology to make convenience, intelligence, controllability and we can use the wifi in long distance. It is mainly used for elderly person and physically challenged person .In this modern world when we busy with the work we can actively use this app. This project possess the potential to regulate any kind of electrical appliances providing full remote access from the Smartphone using bluetooth and wifi. This can be controlled from a central host PC using internet and also remotely accessed via a pocket PC with a window mobile based application.

Block diagram

The goal of this project is to develop a home automation system that gives the user complete

control over all remotely controllable aspects of his or her home. The automation system will have the ability to be controlled from a central host PC, the internet and also remotely accessed via a pocket PC with a window mobile based application on easy-to-use hardware and software [3]. The block diagram of the proposed system is shown in fig. 1.
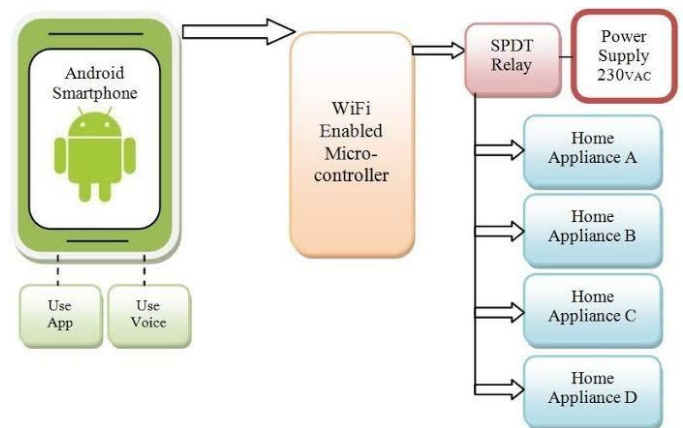

Fig. 1. Block diagram

Arduino uno

Arduino is a popular platform for IoT product development and is commonly used for STEM/STEAM projects. All around the world, hundreds of thousands of designers, engineers, students, developers, and Makers are building with Arduino for music, games, toys, smart homes, farming, autonomous vehicles, and more.

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This new "connected" paradigm where digital meets physical enables anyone to create applications that are literally changing our world. Arduino is an open-source electronics platform [3,4]. This system consists of 3 custom built arduino uno boards, two of which are connected to each other via I2C bus, one of which acts as a "master sender" and the other a "slave reciever". Home automation system can be controlled using Internet, which is achieved by using ESP8266-01 andblynk libraries. It also allows us to control the system by giving voice commands using HC-05 bluetooth module and AMR voice app. ARDUINO UNO board is shown in fig. 2.
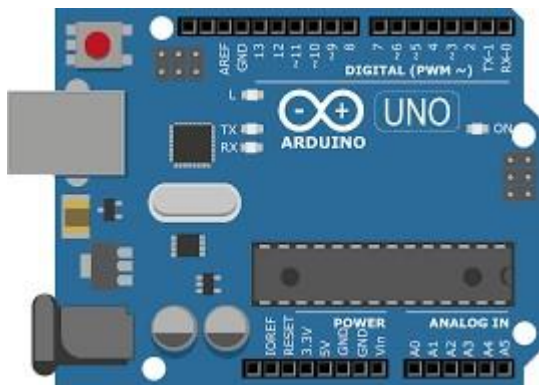

Fig. 2. ARDUINO UNO board

Arduino is a popular platform for IOT product development and is commonly used for STEM/STEAM projects. All around the world, hundreds of thousands of designers, engineers, students, developers, and Makers are building with Arduino for music, games, toys, smart homes, farming, autonomous vehicles, and more This new "connected" paradigm where digital meets physical enables anyone to create applications that are literally changing our world. Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs like light on a sensor, a finger on a button, or a Twitter message – and turn it into an output – activating a motor, turning on an LED, publishing something online [12].

ESP8266 wifi module

The ESP8266 is a low cost wifi module microchip, with a full TCP/IP stack and microcontroller capability. This small module allows a microcontroller to connect a wifi network and make simple TCP/IP connection using Hayes style command [11]. ESP8266 is Wi-Fi enabled system on chip (SoC) module developed by Espress if system (Fig. 3). It is

mostly used for the development of the Internet of Things (IoT) embedded applications [7,8]. The ESP8266 is a low-cost Wi-Fi microchip with full TCP/IP stack and microcontroller capability produced by Shanghai-based Chinese manufacturing company Espress if Systems. The ESP8266 is capable of either hosting an application or offloading all the Wi-Fi networking functions from another application processor. Each ESP8266 Wi-Fi module comes pre-programmed with an AT command set firmware, now you can simply hook this up to your Arudino device and get as much Wi-Fi ability as a Wi-Fi Shield offers. The ESP8266 module is an extremely cost-effective board with a huge and fastest ever growing, community.
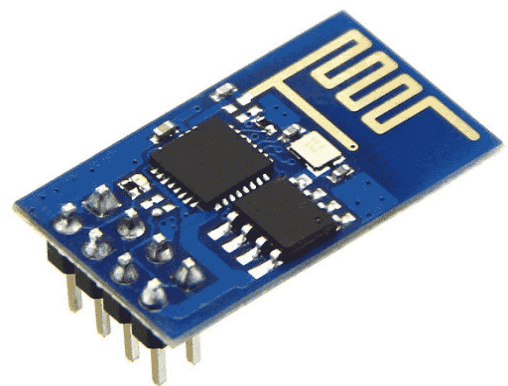

Fig. 3. ESP8266 Wifi module pinout

Bluetooth module

Bluetooth Module HC-05 is shown in fig. 4.

PIN NUMBER 1-RX RECEIVER: Receive Serial Data. Every serial data given to this pin will be broadcasted via Bluetooth

PIN NUMBER 2&3-GPIO: General Purpose Input and output

PIN NUMBER 4-GROUND: Ground pin of module, connect to system ground.

PIN NUMBER 5-TX TRANSMITTERS: Transmits Serial Data. Everything received via Bluetooth will be given out by this pin as serial data.
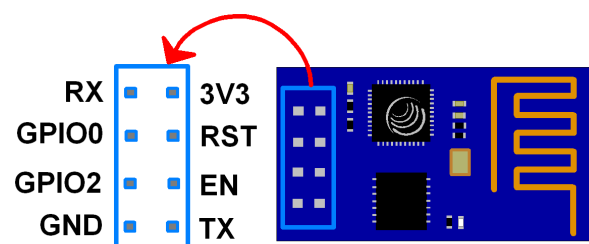

Fig. 4. Bluetooth Module HC-05

PIN NUMBER 6-ENABLE /KEY: This pin is used to toggle between Data Mode (set low) and AT command mode (set high). By default it is in Data mode.

PIN NUMBER 7-RESET: Resets the data.

PIN NUMBER 8-Vcc: Powers the module. Connect to +5V Supply voltage.

AT mega 328p microcontroller

The main control centers of system are the three AT mega 328p microcontrollers. This part of the system manages the controllers and gets the commands from the user. It also sends temperature and humidity measurement to the mobile application [5]. AT mega 328p (Fig. 5) also gets sensor data and processes them to perform useful functions. The microcontroller also switches the relays to turn on/off the electrical devices when required. It displays the date and time using the RTC and the LCD display device.
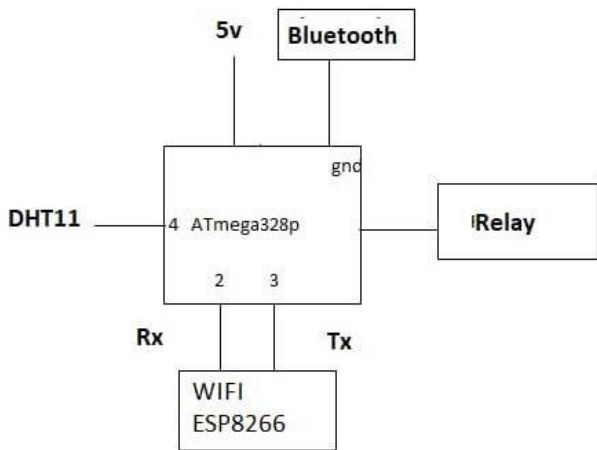
Fig. 5. AT mega 328p microcontroller

Power supply

The power supply (Fig. 6) of 230v AC is given to transformer and it is given to the bridge rectifier and 5v Dc is get from buck converter [10].
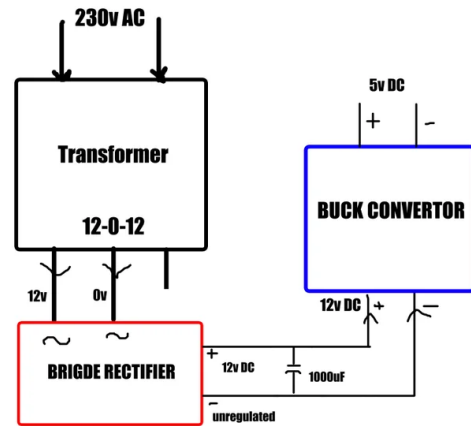
Fig. 6. Power supply

Working principle

Here a simple app for home automation was created (Fig. 7). In this we can switch on and off the light by the mobile having this app, either by bluetooth or by wifi. In this design the lights: Light 1, Light 2, Light 3, Light 4 is connected to this app [6]. Any light can be switched at any time. In the picture below Light 3 and Light 4 are ON and remaining lights are OFF. We can use the shutdown button to OFF all Lights. It is easy to OFF the whole lights and other electrical appliances to switch OFF.

Fig. 7. Working model

First home automation home page is shown and the second page has Bluetooth and wifi module are created and then in future also we can add any mobile data and so on….and then we can connect how many lights and fan and any power appliances are need we design and use the button to operate. We operate ON, and OFF [9]. We can use multiple options in single switch option.

Relay

Relays are the switches which aim at closing and opening the circuits electronically as well as electromechanically. It controls the opening and closing of the circuit contacts of an electronic circuit. When the relay contact is open (NO), the relay isn't energizing with the open contact. However, if it is closed (NC), the relay isn't energize given the closed contact. However, when energy (electricity or charge) is supplied, the states are prone to change [7].

A relay is basically an electrically controlled mechanical switch. Inside that harmless looking plastic box is an electromagnet that, when it gets a jolt of energy, causes a switch to trip. The microcontroller provides 5V signal to the relay it is converted to a 12V signal by the driver circuit which consists of a transistor and a diode.
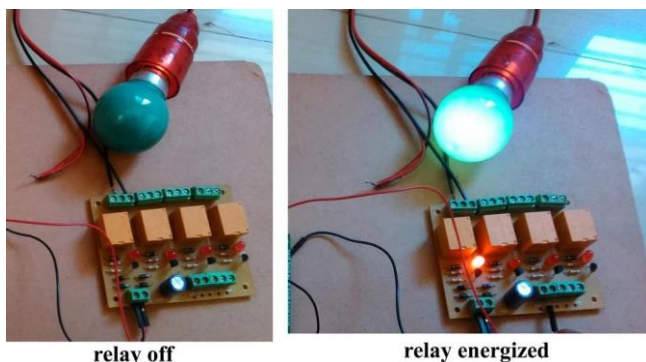

relay off   relay energized

Fig. 8. Relay circuit

Conclusion

The home automation using IOT Internet of Things has been experimentally proven to work satisfactorily by   connecting simple appliances to it and the appliances were successfully controlled using remote through IoT. From this paper we conclude that we easily access web and the manual switch .It gave a flexibility and reliability to home application. In future we create app for multiple application like, measuring the temperature humidity, lights on off, door lock, shutter open and close, leakages of LPG level.

Conflict of interest

The authors declare no conflict of interests.

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