

WIRELESS CONTROLLED HOME AUTOMATION USING IOT

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Abstract - With advancement of Automation technology, life is getting simpler and easier in all aspects. In today's world automatic systems are being preferred over manual system. With the rapid increase in the number of users of internet over the past decade has made Internet a part and parcel of life, and IoT is the latest emerging internet technology. Wireless Controlled Home Automation system (WHAS) using IoT is a system that uses computers or mobile devices to control basic home functions and features automatically through internet from anywhere around the world, an automated home is called a smart home. It is meant to save the electric power and human energy. The home automation system differs from other system by allowing the user to operate the system from anywhere around the world through internet connection.

Key Words: Automation system, IoT device, smart home, emerging internet technology, Wireless Controlled Home.

1. INTRODUCTION

Nowadays automation systems have become widespread in several industries by playing a vital role in dominating many process-related operations. We live in the world of automation wherein most of the systems have become machine-driven, such as industrial automation, automation in homes and alternative business sectors. Home automation systems advancing towards mechanization processes whereby less human efforts are required by the machinery equipment's to control numerous systems in homes. It involves automatic controlling of home appliances using completely different technologies and controllers over desktops, laptops, goods, phones or tablets



Fig1: Shows the Remote Control Appliances Diagram

In this paper we are proposing a method by using IoT technology to automate the home. In countries like China, government is supporting IoT projects by funding and currently in China, there are at least 9 billion interconnected devices, and it is expected to reach 24 billion devices by 2020. Homes of the 21st century will become more and more self-controlled and automated due to the comfort it provides, especially when employed in a private home. A home automation system is a means that allow users to control electric appliances of varying kind. Many existing, well-established home automation systems are based on wired communication [1]. This does not pose a problem until the system is planned well in advance and installed during the physical construction of the building. But for already existing buildings the implementation cost goes very high. In contrast, Wireless systems can be of great help for automation systems. With the advancement of wireless technologies such as Wi-Fi in recent years, wireless systems like Wi-Fi have become more and more common in home networking. Also in home and building automation systems, the use of wireless technologies gives several advantages that could not be achieved using a wired network only.

2. PROPOSED METHOD

The block diagram of the design is as shown in Fig 1. It consists of power supply unit, Arduino microcontroller, Wi-Fi modem, LED, RELAYS.. Hardware implementation deals in drawing the schematic on the plane paper according to the application, testing the schematic design over the breadboard using the various IC's to find if the design meets the objective, carrying out the PCB layout of the schematic tested on breadboard, finally preparing the board and testing the designed hardware[2]. The firmware part deals in programming the microcontroller so that it can control the operation of the IC's used in the implementation. In the present work, we have used the Orcad design software for PCB circuit design, the Arduino software development tool to write and compile the source code, which has been written in the C language. The Atmel AVR® core combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the Arithmetic Logic Unit (ALU), allowing two independent registers to be accessed in a single instruction executed in one clock cycle. The resulting architecture is more code efficient while achieving throughputs up to ten times faster than conventional CISC microcontrollers

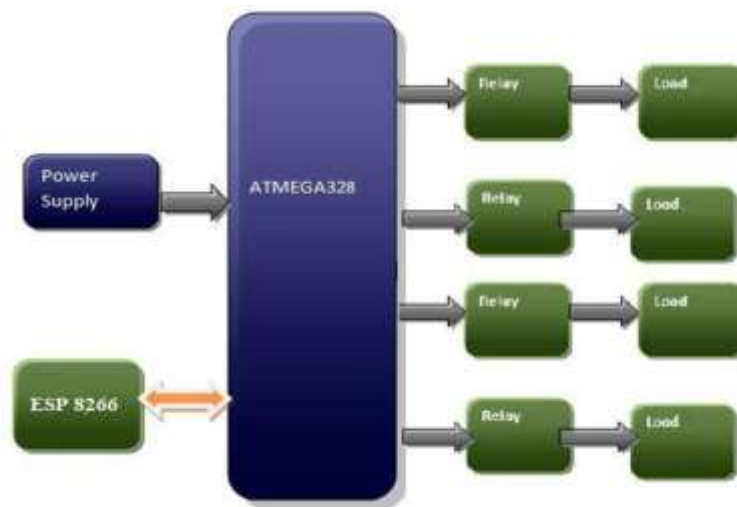


Fig -2: Block Diagram

Hardware components

ARDUINO UNO

The Atmel AVR® core combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the Arithmetic Logic Unit (ALU), allowing two independent registers to be accessed in a single instruction executed in one clock cycle. The resulting architecture is more code efficient while achieving throughputs up to ten times faster than conventional CISC microcontrollers.

The ATmega328/P provides the following features: 32Kbytes of In-System Programmable Flash with Read-While-Write capabilities, 1Kbytes EEPROM, 2Kbytes SRAM, 23 general purpose I/O lines, 32 general purpose working registers, Real Time Counter (RTC), three flexible Timer/Counters with compare modes and PWM, 1 serial programmable USARTs, 1 byte-oriented 2-wire Serial Interface (I2C), a 6- channel 10- bit ADC (8 channels in TQFP and QFN/MLF packages) , a programmable Watchdog Timer with internal Oscillator, an SPI serial port, and six software selectable power saving modes. The Idle mode stops the CPU while allowing the SRAM, Timer/Counters, SPI port, and interrupt system to continue functioning [3]. The Power-down mode saves the register contents but freezes the Oscillator, disabling all other chip functions until the next interrupt or hardware reset. In Power-save mode, the asynchronous timer continues to run, allowing the user to maintain a timer base while the rest of the device is sleeping.

The ADC Noise Reduction mode stops the CPU and all I/O modules except asynchronous timer and ADC to minimize switching noise during ADC conversions. In Standby mode, the crystal/resonator oscillator is running while the rest of the device is sleeping[6]. This allows very fast start-up combined with low power consumption. In Extended Standby mode, both the main oscillator and the asynchronous timer continue to run. Atmel offers the QTouch® library for embedding capacitive touch buttons, sliders and wheels functionality into AVR microcontrollers[3]. The patented charge-transfer signal acquisition offers robust sensing and includes fully denounced reporting of touch keys and includes Adjacent Key Suppression® (AKS™) technology for unambiguous detection of key events. The easy-to-use QTouch Suite toolchain allows you to explore, develop and debug your own touch applications.



Fig: 3: Arduino Uno

ESP8266 WI-FI MODULE

ESP8266 can be used as an external Wi-fi module, using the standard AT Command set Firmware by connecting it to any microcontroller using the serial UART, or directly serve as a Wi-fi-enabled micro controller, by programming a new firmware using the provided SDK. The GPIO pins allow Analog and Digital IO, plus PWM, SPI, I2C, etc.

The ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much Wi-Fi ability as a Wi-Fi Shield offers. The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community[4].

ESP8266 is an impressive, low cost Wi-Fi module suitable for adding Wi-Fi functionality to an existing microcontroller project via a UART serial connection. The module can even be reprogrammed to act as a standalone Wi-Fi connected device—just add power. In short, the ESP8266 module is a TTL "Serial to Wireless Internet" device. Providing your microcontroller has the ability to talk to a TTL serial device as shown in fig:4



Fig: 4: Wi-Fi Module

RELAYS

A relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism, but other operating principles are also used. Relays find applications where it is necessary to control a circuit by a low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits, repeating the signal coming in from one circuit and re-transmitting it to another. Relays found extensive use in telephone exchanges and early computers to perform logical operations. A type of relay that can handle the high power required to directly drive an electric motor is called a contactor[5]. Solid-state relays control power circuits with no moving parts, instead using a semiconductor device triggered by light to perform switching. Relays with calibrated operating characteristics and sometimes

multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called "protection relays". The current needed to operate the relay coil is more than can be supplied by most chips (op. amps etc), so a transistor is usually needed, as shown in the diagram below.

Use BC109C or similar. A resistor of about 4k7 will probably be alright. The diode is needed to short circuit the high voltage "back emf" induced when current flowing through the coil is suddenly switched off.

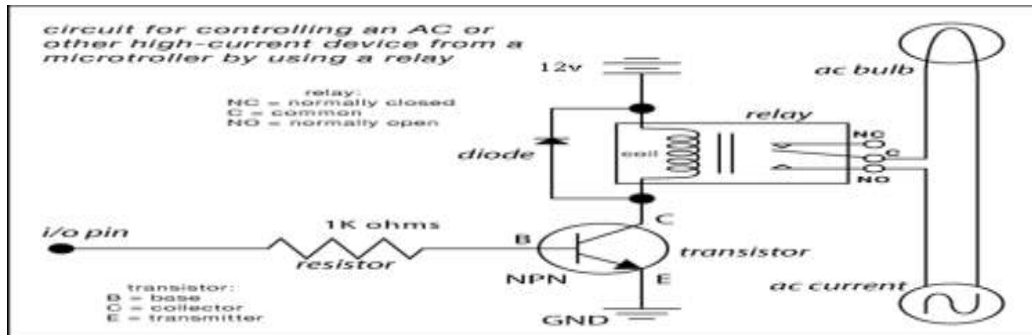


Fig.5: Showing Relay Operation Circuit

AC LOAD (BULB)

An incandescent light bulb, incandescent lamp or incandescent light globe is an electric light with a wire filament heated to such a high temperature that it glows with visible light (incandescence). The filament is protected from oxidation with a glass or fused quartz bulb that is filled with inert gas or a vacuum. In a halogen lamp, filament evaporation is slowed by a chemical process that redeposit metal vapor onto the filament, thereby extending its life. The light bulb is supplied with electric current by feed-through terminals or wires embedded in the glass. Most bulbs are used in a socket which provides mechanical support and electrical connections [6].



Fig. 6: Bulb

3. SCHEMATIC AND DESCRIPTION

The below figure shows the connections of all the modules and the loads of the project. The following steps or the procedure to follow in order to control the home appliances by using IoT concept as we discussed:

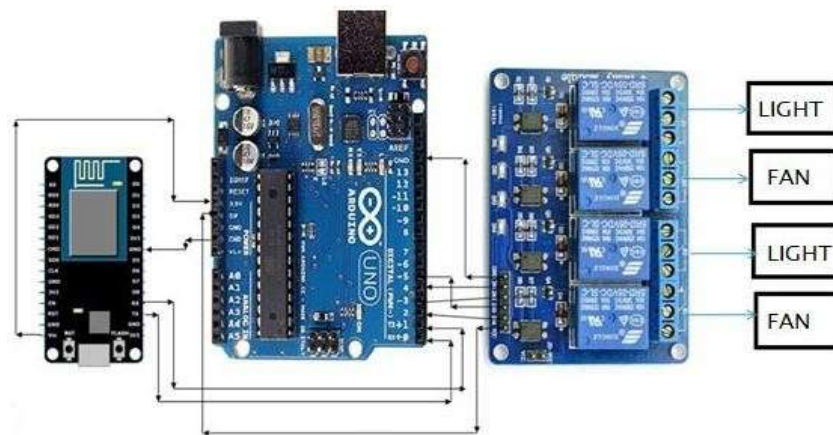


Fig-7: Schematic Diagram

First Connect the respective arduino board with the help of USB cable and install the Arduino IDE software which will install the respective drivers. After opening the app write the program in the sketch window by using C language. We have to check for the errors in the program by clicking the Tick mark on the menu bar of the sketch window. Then compiled file is generated and stored in the location where the software is installed. The path will be shown in the message box below the sketch window. Now open the Proteus simulator software of ISIS Professional. Connect the circuit by dragging the components from the library of the simulator[7]. Double click on the Arduino UNO board and paste the path in the program file section of edit component window and select OK. Now check the functionality of the program and the circuit by running the simulation. Again open the Arduino IDE software; now write the program for ESP 8266 module in HTML for controlling the home appliances in the smart phones[8]. Again check for errors and dump the program by using USB2.0 Micro TypeB Plug cable. Coming to the hardware connections, first from transmitter pin of Power section of the Arduino board is connected to receiver pin of ESP 8266 module and receiver pin of arduino board is connected to transmitter pin of ESP 8266 module. In arduino board, transmitter pin of Power section is connected to receiver pin of ESP 8266 module and receiver pin of arduino board is connected to transmitter pin of ESP 8266 module. The power pin of ESP 8266 is connected to Vin pin of arduino board. The ground pins of each board are shorted.

In relay module 2 pins are connected to load, Vin pin and Vcc pin are connected to one of the digital pin and 5V pin of Arduino board respectively. Now in the Arduino software, select the board in the port which will be in the tools button of the menu bar. Now connection is established between system and the board, which will be indicated by the yellow light blinking on the board. Now upload the program from the button on the menu bar. Connect the WIFI, open the web page by entering the IP address. All the loads details will be displayed on the webpage opened along with the controlling switch. By using these switches we can control the different home appliances.

4. RESULTS

With the help of Arduino, ESP8266 and IoT concept home appliances can be controlled in the following way. We can access the appliances with any internet connected devices, in order to open a portal for controlling the appliances we should enter local IP address in the URL of any browser

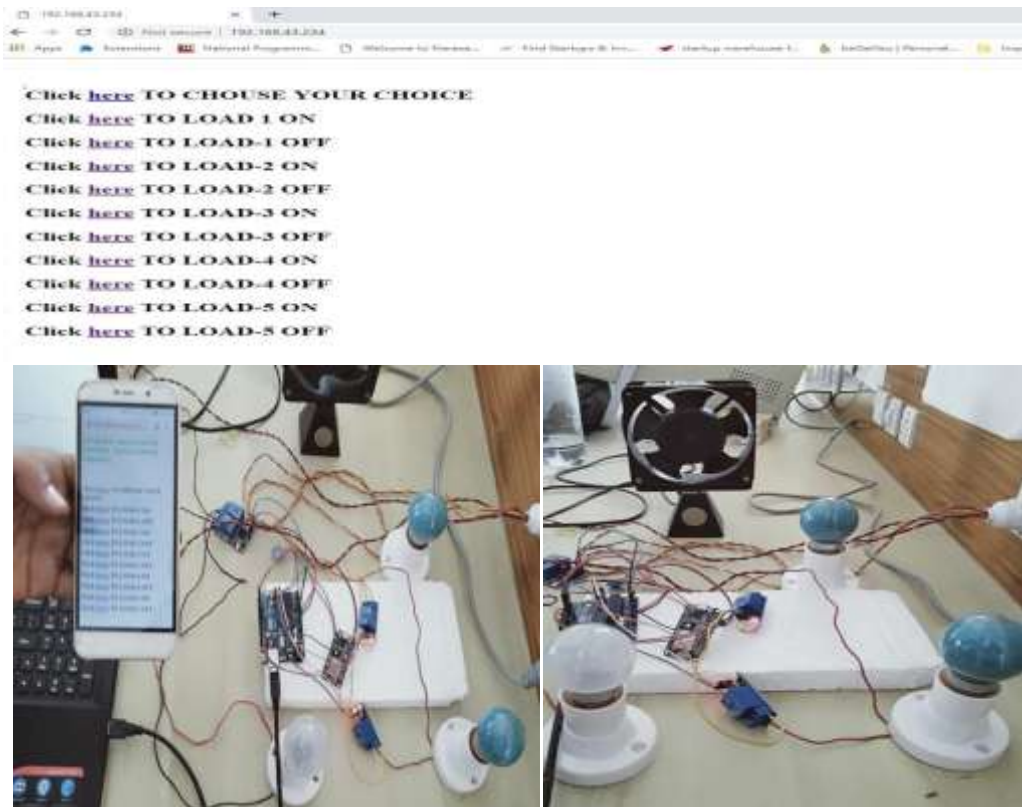


Fig-8: Shows web portal by which we can connect to devices



Fig. 9: Shows the all the loads in ON Condition

5. CONCLUSION

In this paper different home automation systems surveyed and their pros and cons are discussed. Bluetooth based home automation system is a flexible and low cost, such system can only work in the short range of Bluetooth wireless network. Another automation system used ZigBee RF modules for the implementation of wireless network, inside this wireless network user has full remote controlled access of home appliances. A GSM based home automation system is also studied, according to this system user can control and monitor the home appliances by sending a text message from the mobile phone. Internet of things based home automation

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