

IoT based Home Automation using ATmega328 Microcontroller

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Abstract - In the modern world of automation where in most of the system become machine driven, such as industrial automation, automation in homes and alternative business sectors. Wireless home automation system using IoT is an innovative application of internet of things developed to control home appliances remotely over the cloud. This system aims to provide the switching control of light, fan or any other home appliances from anywhere around the world using IoT, which saves the electric power as well as human energy. The IoT based home automation project is done using ATmega328 microcontroller, ESP8266 wi-fi module, relays and few simple components and electrical devices can be controlled and their status can be monitored. The main goal of this project is the home automation with controlling the home appliances using wireless communication as Wi-Fi. In this project smart home system is designed with the implementation of related software and hardware.

Key Words: IoT (Internet of Things), Home Automation System, ATmega328 microcontroller.

1. INTRODUCTION

IOT is the technology which allows us to control hardware devices through the internet. we know the fact that many technological developments and innovations played a major role in our lives. As the technology is updating every minute across the world, its time, that we go ahead for the automation of our houses for complete luxury. Nowadays, people have smartphones with them all the time and want everything should be done in one click only. So, we can use these to control home appliances. Our smart home system will control lighting, climate, entertainment systems, and appliances. It's the era of smart home and it's the best thing to ever happen to people who love technology. What the home automation system can actually do for you is more than just make things easier. Home automation technology can be effective to keep people with disabilities and the elderly safe and help to make their lives a little easier. As the conventional wall switches are located at different parts in the house which requires manual operation to control the appliances. Instead home automation makes it easier. Sometimes those who are consider elderly who may forget to turn off the appliances in their homes, and the appliances continue to run and energy cannot stop consuming, this can prove to be dangerous.

Thus, this system can be used to turn the appliance OFF using smart phone. We are proposing a home automation system using a simple Android app, which you can use to control electrical appliances with clicks. Commands are sent via wi-fi module to ATmega328 microcontroller. So, you don't need to get up to switch ON or switch OFF the device while watching a movie or doing some work. Thus, having a home automation system installed in your home is generally beneficial to you and your family.

2. LITERATURE SURVEY

Home Automation using Cloud Network and Mobile Devices

This paper reviews extension of the current internet which providing communication, connection and inter-networking in between the devices and physical objects, or also known as Things, is a growing trend which is called as the Internet of Things. The Internet of Things (IoT), that's going to change everything which also include ourselves. IoT is the next evolution or generation of the Internet, it's like taking a huge leap in its ability to collect, analyse, and distribute data which ultimately, we can turn into information then knowledge and finally into wisdom [1].

An Internet of Things (IoT) Architecture for Embedded Appliances

From this paper we understood that there are a number of issues involved when designing a home automation system. It should provide a user- friendly interface on the host side, so that the devices can be easily, monitored, and controlled. The system should be cost effective in order to justify its application in smart home systems. To minimize the drawback of each system and to overcome the design issues, they integrate locally and remotely controlled systems using cloud data network. This allows the system to operate independent of a mobile provider, allows the system to be used with various mobile phone platforms, and allows the system to operate locally when phone or computer access is not available [2].

Home Automation using IoT

This paper tells that home automation is providing home safety for dwellers. It automatically turns lights on in

stairways, and other dark places. Everywhere environmental issues are increased before introducing any technology. In this regard smart home provides a better solution. Devices included in home automation consume less power. Besides, it saves energy. Thus, smart home technology is so far environmentally suitable. Moreover, the technology keeps mind in peace. In most cases, guardians face problems and always they keep tensioning for the safety of their children staying in home [3].

Home Automation using ATmega328 Microcontroller and Android Application

From this paper we understood that the automation means the use of control systems and information technologies to reduce the need for human work in the production of goods and services. Whereas mechanization provided human operators with machinery to assist them with the muscular requirements of work, automation greatly reduces the need for human physical and mental requirements as well. Automation plays an important role in the world economy and in daily experience [4].

3. PROPOSED WORK

Here we propose the system using IoT in order to control home appliances, thus automating modern homes through the internet. In this IoT based smart home project, microcontroller ATmega328 is used for performing all the operations. This system uses three loads to control house lights and a fan. Our user-friendly interface allows a user to easily control these home appliances through the internet.

The complete unit can be powered from the mains using a step-down transformer of 230V primary to 12V secondary. A full wave rectifier followed by a capacitor filter gives the output voltage. In this system, as a 12v relay module is used so 12v supply is needed, this power supply is taken from the secondary of step-down transformer. 5V supply is needed for powering the microcontroller ATmega328, LCD and some of the relay module circuit. So, 7805-voltage regulator connected with a 12v supply. This voltage regulator provides 5v output. A 3.3v power supply is used for powering the ESP8266 wi-fi module as it works on 3.3v. This supply will make by using LM1117 voltage regulator which can be configurable to 3.3v by using some voltage divider circuitry with this.

The microcontroller will communicate with ESP8266 Wi-Fi module to send and receive data from the server and take action accordingly to turn ON/OFF relay or load and displaying the status of loads over LCD. 16x2 LCD display is used for displaying the status of connected AC appliances. Thus, this system allows for efficient smart home over the internet. The block diagram of IoT based Home Automation is as shown in Fig. 1

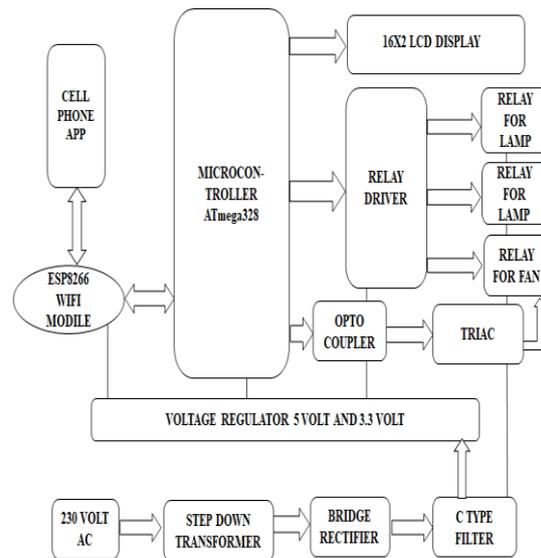


Fig-1: Block Diagram of IoT based Home Automation

4.COMPONENTS REQUIRED FOR HOME AUTOMATION

The system mainly consists of hardware, software and an android application.

A. Hardware required—

1.Microcontroller ATmega328 —

ATmega328 is an 8-bit and 28 Pins AVR Microcontroller ATmega328P is a high performance and low power consumption 8-bit AVR microcontroller. The ATmega328 has 28 pins. It has 14 digital I/O pins. It operates on DC voltage of 5V. It is the brain of the system. It will communicate with ESP8266 Wi-Fi module to send and receive data from the server and take action accordingly.

2.ESP8266 wi-fi Module—

The ESP8266 Wi-Fi Module can give any microcontroller access to your Wi-Fi network. ESP8266 works on 3.3Volts. The ESP8266 is a low-cost device to provide internet connectivity to our project. The module can work both as an Access point (can create hotspot) and as a station (can connect to Wi-Fi), hence it can easily fetch data and upload it to the internet making Internet of Things as easy as possible.ESP8266 is one of the most practical modules for wireless connection (Wi-fi). These modules can be used in both server and client operating modes.

3.UIN2003 Relay Driver IC—

ULN2003 is very famous relay driver integrated circuit. It is high voltage and high current integrated IC. The ULN2003 is a 16-pin IC. It contains seven Darlington pair of transistors which have high voltage and high current carrying capability. So, it can drive up to seven relays at a time. It contains 7 high-voltage and high current Darlington pairs. Each pair is rated for 50V and 500mA. Input pins can be triggered by +5V.

4. LM1117 Voltage Regulator—

It converts the logic level, that is, the voltage you are using for the logic. If the controller sends bits to the ESP8266 at 5V, the inputs of the latter will be damaged. So, the voltage should be reduced to 3.3V, that is what the converter does. It needs to be powered with the lower voltage. There are three main pins on LM1117 which are the input pin, the ground pin, the output pin which outputs at 3.3V.

5. LM7805 Voltage Regulator—

A LM7805 Voltage Regulator is a voltage regulator that gives output of +5 volts. We need 5v for powering the microcontroller ATmega328, LCD and some of the relay module circuit. So, we will use a 7805-voltage regulator connected with a 12v supply. This voltage regulator provides 5v output.

6. 16x2 LCD Display—

16x2 LCD is named so because it has 16 columns and 2 rows. It works on 5 volts. In this project, the 16x2 LCD display is used for displaying the status of connected AC appliances.

7. Relays—

A relay is a form of electrical switch that is operated by electromagnet which changes over the switching when current is applied to the coil. Relays are used to switch loads ON & OFF.

8. TRIAC—

TRIAC (Triode for AC) is the semiconductor device widely used in power control and switching applications. It is bidirectional device. Here it is used for speed control of fan.

B. Software Required—

1. AVR Studio 6—

AVR studio is an Integrated Development Environment (IDE) developed by ATMEL for developing different embedded applications based on 8-bit AVR microcontroller.

2. Prog ISP—

This software supports programming of Atmel microcontrollers ATmega (AVR). This software is to burn program into microcontroller. It can be used to erase built-in Flash and EEPROM memories as well as read and program them. ISP Programmer also supports serial Atmel Data Flash memories.

3. PCB Artist—

PCB Artist is a software application to design electrical circuits boards. PCB Artist is a user friendly & free PCB layout software that you will find easy to use. It is used to design the microcontroller and relay boards.

C. Android Application—

The android app Blynk was designed for the Internet of Things. It can control hardware on one click only, it can display the data, it can store data, visualize it and do many other things. When we press a button in the Blynk app, the message sends to the blynk cloud, where it finds its way to the hardware. It works and everything happens in a blynk of an eye.

5. APPLICATIONS

- 1) Controlled electrical fixtures such as lights and air conditioners
- 2) Simplified garden or lawn management
- 3) Controlled smart home appliances
- 4) Enhanced safety and security at home
- 5) Water and air quality control and monitoring
- 6) Voice based home assistant supporting natural language
- 7) Smart locks and switches

6. FUTURE SCOPE

- 1) The various future applications may be used by controlling various household devices of house with internet.
- 2) Industrial automation and management through internet.
- 3) Improvement of security problems.

7. CONCLUSION

In this proposed work, the event of a home management using internet of things technology is introduced. Not every has made progress in terms of adopting IoT. Many still need to make technology upgrades at the most basic levels. As the new technology is developing day by day, smart home automation is not just about entertainment but it covers other important aspects related to our daily life it can also change our lives for the better.

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