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IOT BASED SMART HALL AUTOMATION SYSTEM

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Abstract:

In this paper a low cost and user friendly remote controlled smart hall automation system is presented using IoT, Node micro controller, Smart phone, Relay module. A smart phone application is used in the suggested system which allows the users to control home appliances using IoT. Now a day's most of conventional hall automation systems are designed for special purposes while proposed system is a general purpose hall automation system which can easily implementing in existing hall. This paper also describes the hardware and software architecture of system, future work and scope. The proposed prototype of hall automation system is implementing and tested on hardware and it gives the exact and expected results.

Key Words: Hall Automation; Smart Phone; Node micro controller & Home Appliances

Introduction:

Hall Automation system is use of information technologies and remote control system to reduce the human labor. The rapid growth of technologies influences us to use smart phones to remotely control the home appliances. An automated device has ability to work with versatility, diligence and with lowest error rate. The idea of hall automation system is a significant use for researchers and home appliances companies. Automation system not only helps to decrease the human labor but it also saves time and energy. An early hall automation system were used in labor saving machines but now a day's its main objective is provide facilities to elderly handicapped people to perform their daily routine tasks and control the home appliances remotely. The proposed method presents the design and implementation of a robust, low cost and user friendly hall automation system using IoT. It can be to control the multiple appliances in any range by replacing the IoT instead of Bluetooth for high speed data transmission. Now a day's most of conventional home automation systems are designed for elderly handicapped people or for any special purpose. The proposed method is not only suitable for elderly and handicapped people but it also provides a general purpose hall automation system, which can easily implement in existing hall.

Related Work:

Deepali Javale, Mohd. Mohsin, Shreeang Nandanwar: The prime objective of this paper is to assist handicapped old aged people. It gives basic idea of how to control various home appliances and provide a security using Android phone tab. The design consists of Android Mega ADK. User can interact the android phone and send control other embedded devices/sensors.

Basil Hamed: The main objective of this paper is to design and implement a control and monitor system for smart house. Smart house system consists of many systems that controlled by Lab View software as the main controlling system in this paper. Also, the smart house system was supported by remote control system as a sub controlling system. The system also is connected to the internet to monitor and control the house equipment's from anywhere in the world using Lab View.

Jitendra R: He implemented a system with the ZigBee network and showed how to eliminate the complication of wiring in case of wired automation.

System Description:

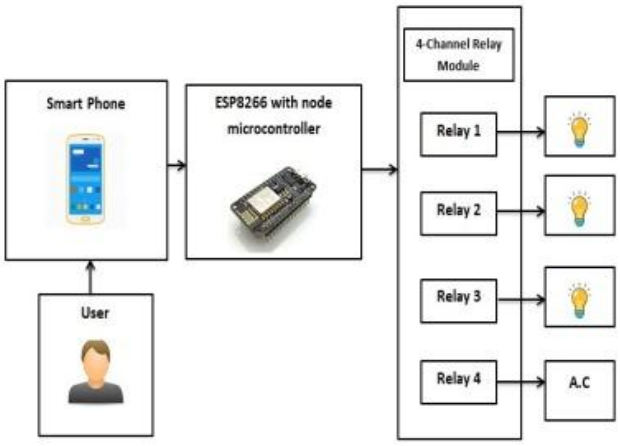


Figure 1

The Proposed system has two main parts hardware and software. The hardware part before consists of three main hardware components are Smartphone, Node micro controller and IoT module and other components are Transformer, Rectifier, Filter, Regulator, Relay. A software part consists of Arduino (IDE) and IoT module smart phone application (BLYNK) which is used for wireless communication between Smartphone and Node micro controller. IoT module is also used in this method to provide more easily and facilities to the users. Figure 1 illustrates block diagram of proposed hall automation system

Hardware Architecture:

The proposed hall automation system contains three hardware components Smart phone, Node micro controller and IoT module. Smart phone is used to communicate with node micro controller and IoT module. In this research work IoT module and node micro controller are used for hardware implementation by the help of Power supply.

A. Node Micro Controller (ESP8266):

The Node MCU (Node Micro Controller) is open source software and Hardware development environment that is built around a very inexpensive System-on-a-Chip (SoC) called the ESP8266. The term "Node MCU" by default refers to the firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESp8266. It uses many open source projects, such as lua- cjson, and spiffs. The ESP8266, designed and manufactured by Espressif Systems, contains all crucial elements of the modem computer: CPU, RAM, networking (Wi-Fi), and even a modem operating system and SDk. When purchased at bulk, the ESp8266 chip costs only $2 USD a piece. That makes it an excellent choice for IoT projects of all kinds. That makes it an excellent choice for IoT projects of all kinds. However, as a chip the ESP8266 is also hard to access and use. You have to solder wires, with the appropriate analog voltage, to its PINs for the simplest tasks such as powering it on or sending a keystroke to the "computer" on the chip. And you have to program in the low-level machine instructions that can be interpreted by the chip hardware. While this level of integration is not a problem when the ESP8266 is used as an embedded controller chip in mass-produced electronics, it is a huge burden for hobbyists, hackers, or students who want to experiment with it in their own IoT projects.

Borrowing a page from the successful playbooks of Arduino or a Raspberry Pi, Node MCU project aims to simplify ESP8266 development. It has two key components.

- An open source ESP8266 firmware that is built on top of the chip manufactures proprietary SDK. The firmware provides a simple programming environment based on eLua (embedded Lua), which is a very simple and fast scripting language with an established developer community. For new comers, the scripting language is easy to learn.
- DEVKIT boards that incorporate the ESP8266 chip on a standard circuit board. The board has a built-in USB port that is already, LED lights and standard- sized GPIO (General purpose Input Output) pins that can plug into a bread board.

Below are some interesting options that you might want to choose:

- ADC: Support for measuring analog input (voltage level) on the Node MCU boardsA0 pin.
- HTTP: Support for writing code to handle HTTP requests.
- SSL / TLS: Support for HTTPs secure connections.
- MQTT: Support for the MQTT protocol to send data to other devices or servers using a publish / subscribe model over TCP/IP.
- Web socket: A convenience library to access web socket-based web services.
- DHT: A convenience library to read from DHT family of environmental sensors.
- End-user setup: Support a "capture portal" to let the user enter her own Wi-Fi password, without having to hardcore Wi-Fi credentials in application code.

B. Power Supply:

The power supplies are designed to convert high voltage A.C mains electricity to a suitable low voltage supply for electronic circuits and other devices. A RPS (Regulated Power Supply) is the power supply with rectification, filtering and regulation being done on the A.C mains to get a regulated power supply for micro controller and for the other devices being interfaced to it. A power supply can be broken down into a series of blocks, each of which performs a particular function. D.C power supplies

which maintain the output voltage constent irrespective of A.C mains fluctuations or load variations is known as "Regulatd D.C power supply.
For example a 5V regulated power supply system as shown below:

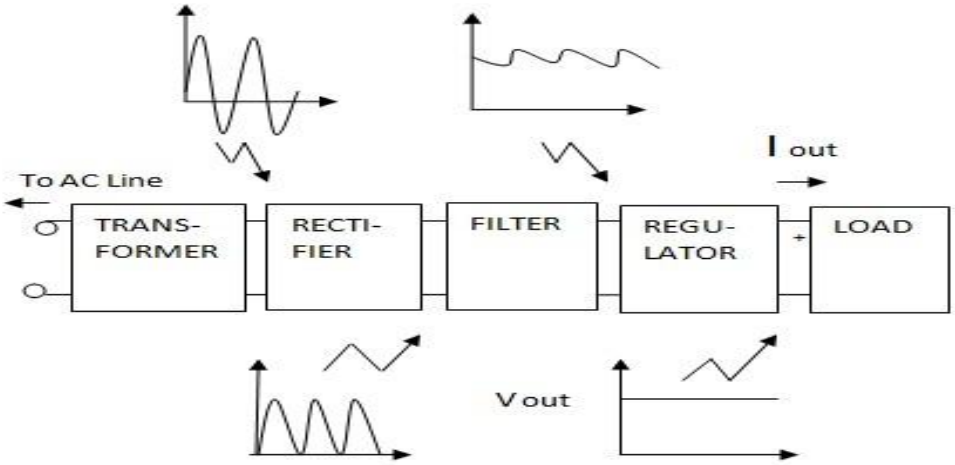


Figure 3: Components of a Typical Liner Power supply

C. Transformer:

A transformer is an electrical device which is used to convert electrical power from one electrical circuit another without change in frequency. Transformers convert AC electricity from one voltage to another with little loss of power. Transformers work only with AC and this is one of the reasons why mains electricity is AC output voltage, step-down transformers decrease in output voltage. Most power supplies use a step-down transformer to reduce the dangerously high mains voltage to a safer low voltage. The input coil is called the primary and the output coil called the secondary. There is no electrical connection between the two coils; instead they are linked by an alternating magnetic field created in this soft- iron core of the transformer. The two lines in the middle of the circuit symbol represent the core. Transformers waste very little power so the power out is (almost) equal to the power in. The ratio of the number of turn on each coil, called the turn's ratio, determine the ratio of the voltages. A step-down transformer has a large number of turns on its primary coil which is connected to the high voltage mains supply, and a small number of turns on its secondary coil to give a low output voltage.

Figure 4: Transformer

An Electrical Transformer:

Turns ratio = Vp/ VS = Np/NS
Power Out= Power In
VS X IS=VP X IP
Vp = primary (input) voltage
Np = number of turns on primary coil
Ip = primary (input) current

Rectifier:

A circuit which is used to convert A.C to D.C is known as rectifier. The process of conversion A.C to D.C is called "rectification".

Types of Rectifiers:

- Half Wave Rectifier
- Full Wave Rectifier
- Centre Tap Full Wave Rectifier

- Bridge Type Full Bridge Rectifier

Full Wave Rectifier:

We came to that full wave bridge rectifier as more advantage then the other two rectifiers. So, in our project we are use full wave bridge rectifier circuit.

Bridge Rectifier:

A bridge rectifier makes use of four diodes in a bridge arrangement to achieve full-wave rectification. This is a widely used configuration, both with individual diodes wired as shown and with single component bridge where the diode bridge is wired internally. Filtering is performed by a large value electrolytic capacitor connected across the DC supply to act as a reservoir, supplying current to the output when the varying DC voltage from the rectifier is falling. The capacitor charges quickly near peak of the varying DC and then discharge as it supplies current to the output. Filtering significantly increases the average DC voltage to almost the peak value (1.4 × RMS value)

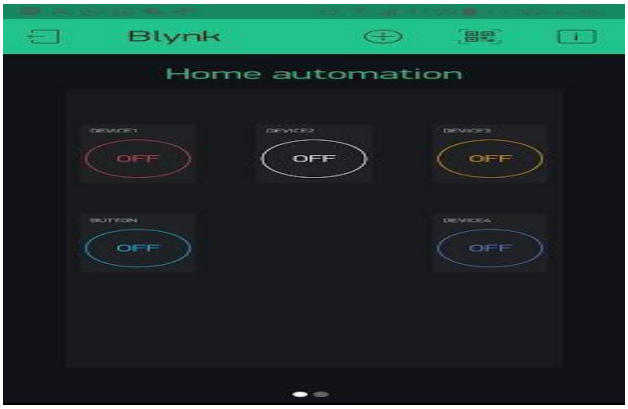
To calculate the value of capacitor (C), $C = ¼ * \sqrt{3} * f * r * RL$

Where,

f = supply frequency,
r = ripple factor,
RL = load resistance

Software Architecture:

In this research work tow software Arduino Integrated development Environment (IDE) and IoT module application as Blynk are used.



Result:

Proposed home automation system implemented on hardware using IoT, Node micro controller, smart phone, relay module. The home appliances like lamp, electric motor and fan were connected with Arduino digital output ports with the help of relays. Relays were used for 5V to 240V switching circuitry. Blynk application was installed in Smart phone and a IoT module wireless connection was established between smart phone and node micro controller. Password protection was used for pairing of Smartphone with IoT module to only allow authorized user. The suggested hall automation system was tested within the range of 1km and it attained 100% accuracy. All the connected LEDs & appliances were controlled from the Smartphone application and the notification was also received on Smartphone.

Conclusion:

In this research work a low cost and user friendly design for hall automation system is presented. It has better performance than existing Bluetooth based conventional home appliances automations systems, it provides a general approach for home automation which is not only suitable for elderly and handicapped people but it is also beneficial to reduce human labor and save energy. Moreover smart phone application used in proposed system has ability to interface the home appliances. Proposed system is analyzed and tested within the range of 1Km and it achieved 100% accuracy, for future research work it is recommended to increase the device and it should be a low cost and user friendly system.

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