



# IoT Based Home Automation using NODE MCU

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## Abstract:

This paper presents a low cost and flexible home control and environmental monitoring system. It employs an embedded micro – web server in NODE MCU microcontroller, with IP connectivity for accessing and controlling devices and appliances remotely. These devices can be controlled through a web application or via Bluetooth Android based Smart phone app. The proposed system does not require a dedicated server PC with respect to similar systems and offers a novel communication protocol to monitor and control the home environment with more than just the switching functionality. To demonstrate the feasibility and effectiveness of this system, devices such as light switches, power plug, temperature sensor, gas sensor and motion sensors have been integrated with the proposed home control system. Therefore this system has been successfully designed and implemented in real time.

**Keywords:** IOT, Wi-Fi, Relay.

## I. INTRODUCTION

Internet of Things is a concept where each device is assign to an IP address and through that IP address anyone makes that device identifiable on internet. Basically it started as the “Internet of Computers.” Research studies have forecast an explosive growth in the number of “things” or devices that will be connected to the Internet. The resulting network is called the “Internet of Things” (IoT) [1]. The recent developments in technology which permit the use of Bluetooth and Wi-Fi have enabled different devices to have capabilities of connecting with each other. Using a WIFI shield to act as a Micro web server for the Arduino which eliminates the need for wired connections between the Arduino board and computer which reduces cost and enables it to work as a standalone device. The Wi-Fi shield needs connection to the internet from a wireless router or wireless hotspot and this would act as the gateway for the Arduino to communicate with the internet. With this in mind, an internet based home automation system for remote control of home appliances is designed.



Figure.1. Smart Home

## II. METHODOLOGY

Real Time clock based home automation in an advance project to control the devices in timely and systematic manner. The devices can be controlled wirelessly from other places using wireless

technology. RTC with EEPROM can record all the working parameters in the devices or appliances. Basically the project is a concept to bring automation in the industry or home. All the home appliances will be controlled by mobile app. The appliances in the industry or home will be interfaced with centralized micro controller NODE MCU for the systematic working. The inbuilt RTC and EEPROM present in the controller will be activated for the operation. The controller also interfaced with WIFI to receive the control commands from Wi-Fi shield (Wi-Fi hotspot). The operator will be provided with Mobile app having Wi-Fi in that. If operator wants to switch the Light to turn on or off he needs to switch control button provided in app. Once he switched the Wi-Fi will send the data to Wi-Fi present at microcontroller. As and when the request is received the microcontroller activates the RTC and EEPROM and as per request received the operation will be done. In the same way all other appliances can be controlled.

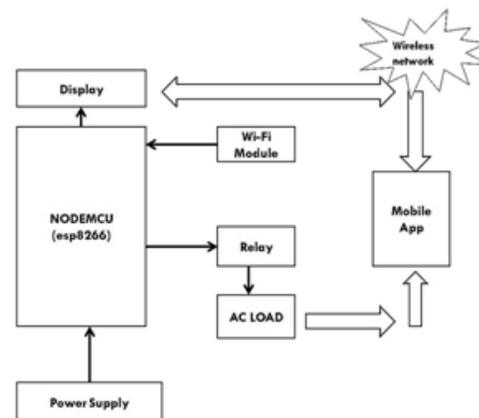


Figure.2. Block diagram

## III. HARDWARE SPECIFICATION

The components used are,

- NODEMCU esp8266
- RELAY

- LED
- NODEMCU (esp8266) has been selected as the controller for this system due to its compact size, compatibility, easy interfacing over several other type of controller including Programmable Integrated Circuit (PIC), Programmable Logic Controller (PLC) and others. ESP8266 is an open source firmware that is built on top of the chip manufacturer's proprietary SDK. The firmware provides a simple programming environment, which is a very simple and fast scripting language. The ESP8266 chip incorporates on a standard circuit board. The board has a built-in USB port that is already wired up with the chip, a hardware reset button, Wi-Fi antenna, LED lights, and standard-sized GPIO (General Purpose Input Output) pins that can plug into a bread board..Figure-3 shows the diagram of NODEMCU (ESP8266).It has Processor called L106 32bit RISC microprocessor core based on the Tensilica Xtensa Diamond Standard 106Micro running at 80 MHz and has a memory of 32 Kbit instruction RAM ,32 Kbit instruction cache RAM, 80 Kbit user data RAM&16 KbitETS system data RAM. It has inbuilt Wi-Fi module of IEEE 802.11 b/g/n Wi-Fi.



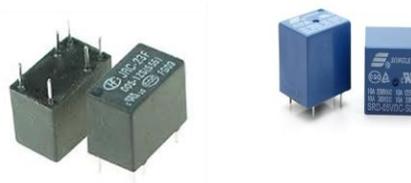
**Figure.3. Diagram of NodeMCU (esp8266)**

- A light emitting diode(LED) is a semiconductor device that emits visible light when an electric current passes through it.Figure-4 shows the diagram of LED.



**Figure.4. Diagram of LED**

- Relay is nothing but it is the electromagnetic switch. Relay allows one circuit to switch another circuit while they are separated. Relay is used when we want to use a low voltage circuit to turn ON and OFF the device which required high voltage for its operation. For example, 5V supply connected to the relay is sufficient to drive the bulb operated on 230V AC mains. Relays are available in various configurations of operating voltages like 6V, 9V, 12V, 24V and so on. Relay is divided into two parts, one is input and other is output. Input side is nothing but a coil which generate magnetic field when small input voltage is given to it. Relay having three contactors: Normally closed (NC), Normally opened (NO) and common (COM). By using the proper combinations of the contactors electrical appliances may turn ON or OFF. [2]



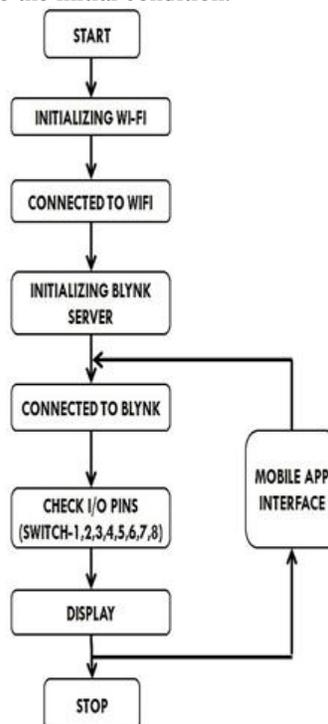
**Figure.5. Diagram of Relay**

#### IV. WIFI MODULE

Expressive Systems Smart Connectivity Platform (ESCP) of high performance wireless SOCs, for mobile platform designers, provides unsurpassed ability to embed Wi-Fi capabilities within other systems, at the lowest cost with the greatest functionality.

#### V.SOFTWARE DEVELOPMENT

Arduino software has been used as the interface between software and hardware of this project. Microcontroller needs a program to operate and execute the process associated with proposed design. It is easy to verify and compile after writing the code. The complete flowchart which gives the whole operation of system is shown in figure-6. The complete flowchart which indicates the whole operation of the system and controlled by a mobile app. The focus of this project is to bring automation in home or industries Firstly, the Wi-Fi shield (Wi-Fi hotspot) connect to the existing network infrastructure& it initializing blynk server which is of open source server ,TheWi-Fi module send single to app that provide for the client(operator) indicating system is in online or offline then it check the input-output pins i.e.switch-1,2,3,4,5,6,7,&8.If the client (operator) switches any of the switch the data will be received by blynk server and give status return to the user by display it on lcd provided in app. Lastly, this process is in continues operation the system will loop to the initial condition.



**Figure.6. Flow chart**

## VI. RESULT AND DISCUSSION

### TURN ON HOME APPLIENCES



Figure.7. Mobile app to turn on home appliances



Figure.8. Output for above figure-7

### TURN OFF HOME APPLIENCES

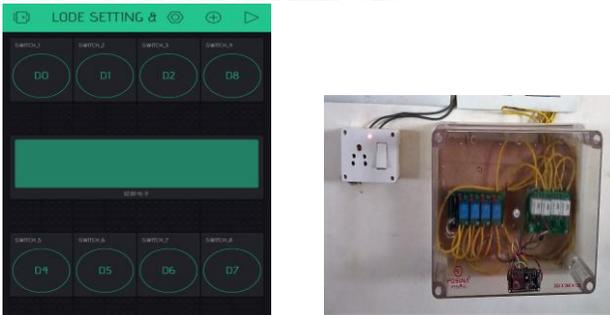


Figure.9. Mobile app to turn off home appliances



Figure.10. Output for above figure-9

## VII. CONCLUSION

It is evident from this project work that an individual control home automation system can be cheaply made from low-cost locally available components and can be used to control multifarious home appliances ranging from the security lamps, the television to the air conditioning system and even the entire house lighting system. And better still, the components required are so small and few that they can be packaged into a small inconspicuous container. The designed home automation system was tested a number of times and certified to control different home appliances used in the lighting system, air conditioning system, home entertainment system and many more. Hence, this system is scalable and flexible.

## VIII. REFERENCES

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