

# Design of Home Automation System using Nodemcu with the Implementation of Iot

V.Sahiti, Yamala Teja Narayana, Yarradla Nagarjuna Reddy, Yenni Sridhar

**Abstract:** *With the advent of technology experienced by common people smart home application have increased on a large scale and have proved to be very useful to operate from their work place even when disabled people and infants are left behind homes. Internet Of Things (IOT) is an extension to the field of embedded systems which enables the user to operate from a far off distance through a webpage. Many researchers have developed different topologies of Home Automation system. However, they proved to be costly. The present paper focuses on developing a Home Automation System using a simple NodeMCU and the results are implemented and executed below.*

**Index Terms:** NodeMCU; Automation; Internet of Things.

## I. INTRODUCTION

Home Automation is controlling the objects in home automatically without human intervention and correspondingly work itself. It has paved way for many advantages like human comfort, reduction of cost and energy, home appliances got centralized and also for saving and security purposes. Sequentially, the working of the devices got much higher compared with affordability and simplicity through connectivity. The interconnection of the devices is possible through internet and servers with social networking and machine to machine interactions. All the electrical and electronic systems get connected with the communication that is transmitted wirelessly. The Home automation system mainly works with the vision of sensors and their applications. Some sensors need a signal conditioning equipment for connecting with their main controller and they work corresponding to that controller. The controllers are programmable logic controllers that receive information from sensors and actuators control according to it. The input and output modules are allowed by programmable logic controller. This can be used for loading the operations of the system. The main work and applications according to the sensors are executed by Actuators. Actuators are the devices like switches, relays, motors and anything which works on

the operation of sensors. Also, the communication work plays a major activity in remote access operations of home automation systems. Continuous monitoring and step by step scheduled process undergo with remote access applications. Implementation of home automation systems depend on various types like Power line based, wired or wireless home automation systems. Below there are some key points about Home Automation Systems. In powerline based Home automation systems, the setup built is inexpensive and more numbers of cable connections are required for transmission of signals and transferring the data. A large complexed and many converters and devices are involved in this system. Next coming up with wired home automation systems, the equipment in the setup or home are connected to the PLC (programmable logic controller using cable connections. All these equipment are connected to the actuators as they communicate with the PLC's. The whole operation, regarding this equipment is centralized by computer and again they are communicated using PLC. In wireless based Home automation systems the advanced version of wired Home automations have been created and specially many wireless technologies have been used like Zigbee, WIFI, GSM, Bluetooth, IOT etc. For understanding purpose let us consider about GSM working. GSM works for controlling Home Automation equipments by sending an SMS to GSM Modem. Also, a new type of Automation evolved which is Touch Based Home Automation System in which light loads are attached to microcontroller. These signals work according to the written programming type and works accordingly and sends commands to encoder circuit. This Automation system works according to the decoders and encoder circuits and all switches are enabled by triggering the gates. The IOT (Internet Of Things) has become more popular when IOT and Home Automation blend together for the working of the system. It has an evolving technology with the vision of globalized infrastructure with the networking and controlling the physical objects. When Embedded systems working with Internet and controlling of sensors and actuators takes place there comes the concept of IOT (Internet Of Things). These devices communicate wirelessly with humans and also among themselves using Internet. IOT's are a larger part of Home Automation System and used in many wide applications like Security purposes and many long term benefits and saving of energy whenever devices are OFF. The main use of IOT is that everything is benefited, organized and implemented using Internet only without any external device controlling or operating it. The key application of smart home is providing assistance for persons with disabilities and individuals who can't properly go on with work.

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For example, for blind persons now smart watch has been recently developed which works with Braille language and this happened only with the help of Internet Of Things (IOT). Also, for business and corporate applications a new software called “EIoT” (Enterprise IOT) has been developed which is now nearly accessible to 9.1 billion devices. Also, for health related purposes Internet Of Medical Things is an application used for research and data collection analysis of organs and every time we require Health can be monitored within no time and this is achieved with the help of IOT in medical purposes. Specialization of sensors have been equipped for special treatments that are undergoing for several purposes of requirements that are attached with IOT. They collect, process, analyze and value the problem encountered and search for a remedy for the problem observed. Also, Remote Monitoring is mainly observed with the enhancement of IOT for wireless solutions. The IOT can assist, locate various and process the information for various transformation systems. The IOT platform in transportation plays a keen role in Logistics and Fleet Management where every data recording the vehicular systems and fleet are controlled using IOT. The IOT has the capability to reach the integration of devices equipped with identification, processing, and networking capabilities. Based on high integration of cyber knowledge in IOT the industrial application and smart manufacturing process take place. Measurements, Plant Optimization are the things that are mainly encountered using supply chain networks under IOT. Industrial big Data Analytics play a major role in predictive maintenance and capability of storing Information in the Cloud with the help of Internet. Even the Intelligence Maintenance systems which degrade much faster are mainly performed using IOT. The IOT also helpful in infrastructure construction company by saving energy, manpower, cost and thus increasing in productivity. The IOT trend has been increased in recent years in growth of devices that are controlled by Internet. The wide range of applications regarding have also been much developed using IOT. In future, IOT results in every technology development and maintains economic benefits.

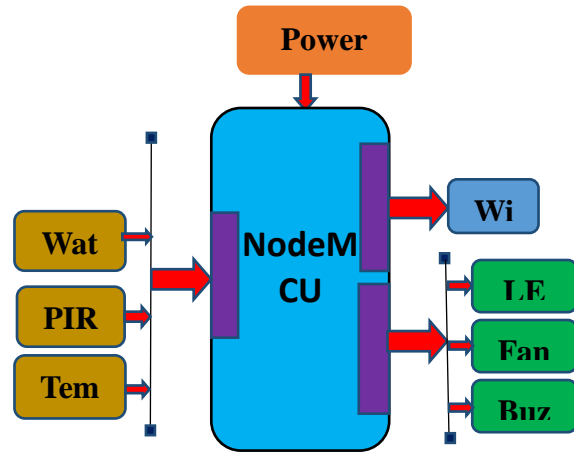


Fig 2:-Basic Block Diagram

III. RELATED WORKS

A.GSM

Worldwide System for Mobile Communications, or GSM (at first from Group Special Mobile), is the world's most standard for phone structures. GSM is seen as a second period (2G) mobile phone structure. Overall System for Mobile (GSM) based answers for the correspondence and control of home machines and security framework through Short Message Service (SMS) texts is shown in this paper. The GSM Protocol which empowers the customer to control the target framework a long way from private using the recurrence data transfer capacities. The possibility of sequential correspondence and AT-directions has been associated towards headway of the keen GSM-based home mechanization. Property holders will doubtlessly get analysis status of any home machines levelled out whether diverted on or off remotely from their mobile phones. PIC16F887 microcontroller with the joining of GSM furnishes the splendid mechanized house framework with the perfect baud rate of 9600 bps.



Fig 3.1:- GSM

B.BLUETOOTH

A cell phone application is used in the proposed framework which empowers the clients to control up to 18 gadgets including home machines and sensors using Bluetooth innovation. These days, most of standard home robotization frameworks are planned for phenomenal purposes while proposed home computerization is an extensively valuable home mechanization framework. This can without quite a bit of a stretch be completing in existing home.

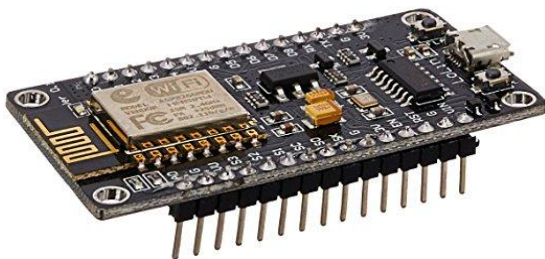


Fig1:- NodeMCU

II. BLOCK DIAGRAM

The proposed framework has a greater number of features than normal home computerization framework, for instance, a ultrasonic sensor is used for water level disclosure and soil clamminess sensor is use for modified plant water system framework.



Fig 3.2:- Bluetooth

### C.IOT

Using the concept of digitization of time and robot usage the life of mankind is made less troublesome as almost everything is customized, superseding the old manual systems. Nowadays, individuals have made web an important bit of their normal everyday presence without which they are helpless. Web of things (IOT) gives a phase that empowers devices to relate, recognized and controlled remotely over a framework system. In this paper we base primarily on the home mechanization using propelled cell phone and PC.

The iot gadgets controls and screens the electronic electrical and the mechanical frameworks utilized in different sorts of structures. The gadgets associated with the cloud server are constrained by a solitary administrator who encourages various clients to which various sensor and control hubs are associated. The administrator can access and control every one of the hubs associated with every client except a solitary client can control just the hubs to which the client itself is associated. This entire framework utilizing Internet of Things (IOT) will enable cell phones and PCs to remotely control every one of the capacities and highlights of home apparatuses from anyplace around the globe utilizing the web association. The system planned is conservative and can be extended as it permits association and controlling of various distinctive gadgets.

With the fast advancement IOT, keen home which viewed as one of the principle application spaces, acquired an ever-increasing number of individuals' consideration. In this task, the attributes and disservices of savvy home system are examined. Clients can control the family unit gadgets helpfully and remotely. Its framework engineering, equipment plan, and execution approach will be given. This system gives a progressively adaptable and increasingly advantageous control for savvy home system and is gainful for the prevalence and advancement of shrewd home system. A portion of the components that impact the plan of a home automation system incorporate the versatility of the system, the simplicity of coordinating new device into the system and security. Additionally, critical is the usability and cordial client controlling interface. A financially savvy system would qualify it for mass appropriation.

## IV. SYSTEM SEPCIFICATIONS

### A. Hardware Components

In this we are going to introduce the NODEMCU controller which belongs to the Arduino family and is an open source platform, which is easy to interact while receiving the output from the sensing element .It is Programmable, simple and cost effective . It is a 32-bit MCU dependent on ESP8266 WI-FI module which is regularly called as open source IOT stage. The term NODEMCU alludes to the firmware as opposed to advancement units. The firmware utilizes the LUA scripting language in different cases it tends to be customized by utilizing Arduino C too. It has 12 general purpose input output pins (GPIO) which includes the digital and analog pins and PWM, I2C and ADC all in one board. It is Arduino like hardware IO which can dramatically decrease the work for configuring and manipulating the device .It provides the best platform for IOT development and is cost effective. The workbench for development system needs additional components especially a TTL-USB adapter and an external 3.3 power volt supply but, when going to NODEMCU, it includes USB to UART bridge and a micro USB connector coupled with a 3.3v supply. The controller is a low power 32 bit one sided chip which contains SOC with coordinated transmission control convention alongside the web convention stack utilized as an application processor and enables our inserted framework to conveyed by means of remote advances. It has incredible installed handling and capacity abilities that permit the microcontroller for interfacing with the sensors and other application explicit gadgets through its broadly useful info yield pins . It has highlights like 16mb blaze memory with processor speed is 80-160MHZ and RAM has 32KB in extra and it has one ADC stick with 1024 stage goals.

The automation consists of four sensors which includes a motion detector which is known as PIR sensor, another one is temperature sensor, Humidity sensor and an LDR. While coming to PIR sensor it is an electronic gadget used to distinguish an infrared transmitting source normally a human body or creature. It is comprised of a crystalline material that creates an electric charge when it is presented to warm as infrared radiation. The sensor is produced using regular or counterfeit pyroelectric materials as a rule as a slight film.

In our project the PIR sensor detect the motion if anyone is moving in front of the sensor and gives the output to the microcontroller. The MCU processing input from the sensor and gives the input to the actuator. Here the actuator is an buzzer which sounds when there is any input from the MCU. The second sensor is temperature sensor here we can use LM35 as an temperature sensor. It is an precision integrated temperature circuit whose output voltage is linearly proportional to the Celsius temperature. It has low output impedance which enables to usage in the remote applications. The LM35 detects the temperature in the room and gives the updated values to the microcontroller .Earlier in software component we gave some threshold values to the controller.

While receiving the input from the sensor the MCU compares the value to that threshold value if the sensor value is beyond the threshold value then the fan in the room automatically turn on and we also keep the end temperature also when the room reaches that temperature fan automatically turns off. The third sensor is humidity sensor which is very important to measure the environmental humidity. The features of this sensor is its output voltage is linear and it can provide better results over wide usage. The main factor that can be taken in to the considerations while selecting a humidity sensor is that its accuracy, output reusability and last one is circuit complexity. In this project we are going to use DHT11 as humidity sensor whenever the sensor detects the humidity a buzzer will be on and values are updated in the IOT page. The last sensor is LDR it is a gadget that has variable obstruction that changes alongside the force of the light when light falls up on it .This property enables them to use in the light detecting circuits.The main purpose of this sensor is earlier in home and other appliances we used to operate light manually which results in lot of wastage of power and in that case it plays a major role because it can operate with respect to the intensity of the light. In our project

we used to give a threshold value in code itself according to that value the sensor can operate whenever the intensity of light is less than the threshold voltage we want to give a three phase bulb as an actuator it will automatically turn on and we want to put as an end threshold voltage for turn off the light also when the intensity of light reaches that value the light will automatically turns off.



Fig 4.1:- PIR Sensor

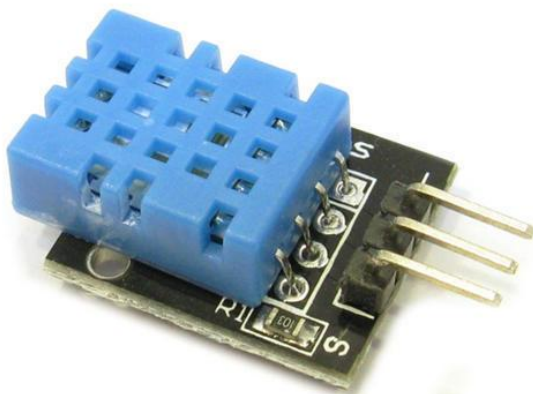


Fig 4.2:- DHT 11 SENSOR

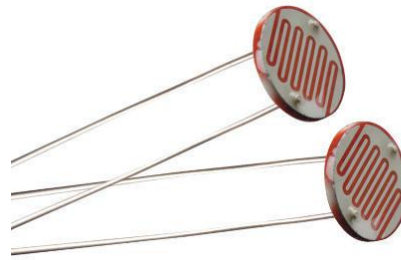


Fig 4.3:-LDR



Fig 4.4:- Buzzer

## B. Software Component

We are going to use Arduino software which is an open source platform of web servers and embedded applications. The web servers consists of core for controlling, monitoring authenticating of distributed system process. The frontend applications incorporate the web and versatile applications which makes the stage of graphical interfaces for controlling the client hardware and sensors information. We can utilize any language for playing out the web tasks like SQL, java and C. The installed programming must be written in C or C++ which facilitates the information and the yield interface for the ESP8266 microcontroller. The inserted code is written in C language. Here we write a code to create a html page or IOT because we can control all the appliances from that page itself. This type of operation is most time saving accurate and we can control the appliances from anywhere with help of WI-FI. We update all type of parameters like temperature etc and also observe the output values from the same page .IOT is the result of the mankind curiosity to lead a convenient and connected lifestyle, ease of reducing the labor and reducing the chances of humankind errors.

## V. IMPLEMENTATION

Firstly, the hardware part is implemented by understanding the connections with the specifications of the modules used and the wiring is done accordingly with the block diagram. Then we go for the software implementation and first we go according with how the connections are established and give the inputs. As, we considered several sensors like ldr, temperature, light sensors and actuators like buzzer, fan and led and so that with sensing inputs we give the actuators as outputs as of our choice.

Here as we are dealing with IOT concept we mainly create webpage by writing HTML code and link it with Arduino coding and create buttons and all the controlling options on the webpage.

## VI. RESULTS AND DISCUSSIONS

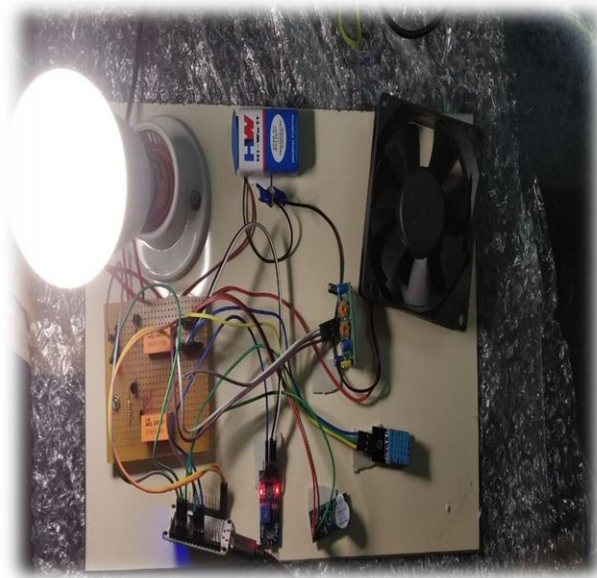


Fig:-6.1 Hardware NodeMCU Interface

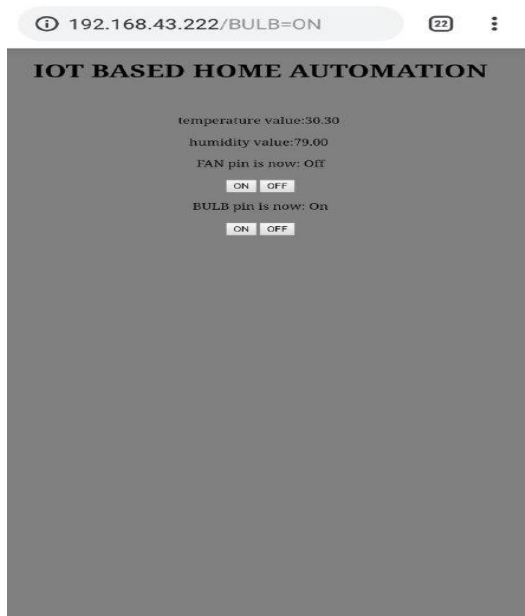


Fig:-6.2 WebPage Controlling

The Results obtained will be like the automation system constructed can be controlled from anywhere in the world by remote sensing applications. Whenever the level is HIGH in the Level sensor it sends a message indicating HIGH and similarly LOW for Low level Sensor. Basically, we have chosen the Node MCU which is a Wi-Fi Module and family of Arduino At mega 328P. A code is written based on the pins and sensors used using Embedded C language. The Temperature Sensor sensed the temperature change as HIGH

TEMPERATURE whenever the temperature is High and LOW TEMPERATURE whenever the temperature is Low and the Buzzer is set as an Actuator for any response change in Temperature. Also when PIR Sensor detects any object it is observed as MOTION DETECTED in the Serial Monitor and if no object is detected it is observed as MOTION NOT DETECTED in it. Her, also the Buzzer is given connection as an actuator and whenever the motion is detected the buzzer responds stating that change has been occurred in the PIR Sensor. Also, LDR sensor is used for detecting level of indicator when we place in any substance like water etc. It indicates the level of the sensor when placed. If the analog pin is given to the output, it also gives the particular analog values till where it is indicated. For this LDR Sensor, Led is placed as an Actuator and whenever certain value is indicated the LED glows indicating that the value is obtained and identified.

## VII. CONCLUSION

In this paper, we have proposed an idea for smart home application using IOT. We have considered several sensors and connected them through a webpage where the status of each sensor is updated on a timely basis. This experimentation though it is implemented on small scale the results proves to be very much efficient and opened the scope for expanding it further. The results of this paper shows that the technique used is simple, less complicated, cost effective and user friendly while operating from work places.

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