

# IOT Based Smart Security and Smart Home Automation

<sup>1</sup> Sudha Kousalya

Assistant Professor

Dept. of ECE

Aditya College of Engineering  
Madanapalle ,Chittoor , India

<sup>2</sup> G. Reddi Priya

Student

Dept. of ECE

Aditya College of Engineering  
Madanapalle ,Chittoor , , India

<sup>3</sup> R. Vasanthi

Student

Dept. of ECE

Aditya College of Engineering  
Madanapalle ,Chittoor , , India

<sup>4</sup> B Venkatesh

Student

Dept. of ECE

Aditya College of Engineering  
Madanapalle ,Chittoor , , India

**Abstract**—“ Internet of Things” is fast becoming a disruptive technology business opportunity, with standards emerging primarily for wireless communication between devices and gadgets in day to day human life, in general referred to as Things. This project aims at controlling home appliances and building a smart wireless home security system using Wi-Fi as communication protocol. The Home Automation can be implemented using different types of wireless communication techniques such as ZigBee, Wi-Fi, Bluetooth, GSM, etc. These existing methods have drawbacks as they work in short range. To overcome this drawbacks, we are going to implement this project “IOT based Smart security and Smart Home Automation”. The project focuses on controlling lights and fans referred as Home Automation and providing Smart security by sending an captured image through an E-mail to the owner using internet when an object is detected. By using “Node MCU” Module we are going to implement this project. This will be more helpful for Handicapped and aged people.

**Keywords**— IOT, Arduino, Node MCU , WI-FI, Smart phone.

## I. INTRODUCTION

Home automation refers to handling and controlling home appliances by using micro-controller or computer technology. Automation is popular now days because it provides ease, security and efficiency. In this, a sensor senses the status of appliances and updates to web server. If user is far away from home, he can access and change status of appliances i.e. switches it on/off. User can use local PC. This paper will describe approach of controlling home appliances by using web server.

This IOT based smart security and smart home automation systems are trying to achieve comfort combined with simplicity. Wireless Home security and Home automation are the dual aspects of this project. The currently built prototype of the system sends alerts to the owner over E-mail using the Internet if any sort of human movement is sensed near the entrance of his house .On the other hand if the owner identifies that the person entering his house is not an intruder but an unexpected guest of his then the user/owner can make arrangements such as opening the door, switching on various appliances inside the house, which are also connected and controlled by the micro-controller in the system to welcome

his guest. The same can be done when the user himself enters the room and by virtue of the system he can make arrangements from his doorstep such that as soon as he enters his house he can make himself at full comfort without manually having to switch on the electrical appliances or his favorite T.V. channel for an example. Thus using the same set of sensors the dual problems of home security and home automation can be solved on a complementary basis. One of the main advantage of this IOT is even though Wi-Fi is not available we can go through 3G or 4G services. In other existing methods it is not possible so, by overcoming all the drawbacks we have implemented a project IOT based Smart security and Smart Home Automation. This project provides more comfort combined with simplicity.

## II. EXISTING METHODS

### A. Bluetooth based home automation system

Home automation systems using smartphone, Arduino board and Bluetooth technology are secured and low cost. A Bluetooth based home automation system proposed by R.Piyare and M.Tazil [2]. The Bluetooth system uses a PC or smartphone as receiver device. It has a high communication rate, great security and low cost, so it can be implemented as a real time system. Bluetooth network has limited range of 10 meters if the smartphone is out of range, then it will not be able to control the home appliances, this is one of the main disadvantages of Bluetooth based home automation system

### B. Voice recognition based home automation

A voice recognition based home automation system proposed and implemented by a researcher [3]. The wireless communication between the smartphone and the Arduino UNO is done through Bluetooth technology. This will be more helpful for handicapped and aged people who wants to control appliances by speaking voice command The main drawback of this system is that communication between user and voice recognition tool depends on signal to noise ratio (SNR), if voice signal is noisy then communication can highly effect and the system will fail to show accuracy.

**C. ZigBee Based Wireless Home Automation System**

ZigBee based wireless home automation system has also been studied [4], ZigBee is similar to Bluetooth technology. It is one of the broadly used transceiver standard with low data rate and power. It has physical range is between 10 to 20 meters, which can increase up to 150 meters by using direct sequence spread spectrum (DSSS). It is ideal for developing prototypes and research related activities.

**D. GSM Based Home Automation System**

A smart home automation system implemented by using Global System for Mobile communication (GSM) [5]. In GSM based home automation systems, communication between main module and appliances is done through text messages. The main drawback of GSM based home automation system is that, there is no guarantee text message deliver to the system every time so it is not a reliable system.

These are the drawbacks of existing methods, To overcome that drawbacks we are implementing "IOT Based Smart security and Smart Home Automation".

**III. COMPONENTS REQUIRED**

- A. Arduino UNO, Node MCU
- B. Relays for connecting home appliances,
- C. Air purity Sensor(MQ135)
- D. Humidity and Temperature(DHT11)
- E. IR Sensor
- F. Camera module(OV7670)
- G. Mobile phone to operate home appliances and Blink app in mobile phone to see results.
- H. Arduino IDE (Software)

**A. ARDUINO UNO**

Arduino Uno is a microcontroller board based on the ATmega328 (datasheet).it has 14 digital input/output pins (of which 6 can be used as PWM outputs),6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.it contains everything needed to support the microcontroller, simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. It's operating voltage is 5v and DC current per I/O pin is 40mA and DC current for 3.3v pin is 50mA and it is having 2kb of SRAM and 1kb of EEPROM and it's clock speed is 16MHz.

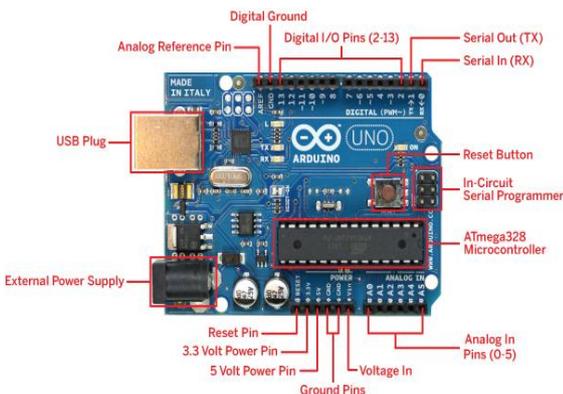


Fig.1 Arduino UNO

**B. NODE MCU**

Node MCU is an open source IOT platform. It includes

firmware which runs on the ESP8266 Wi-Fi SOC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "Node MCU" by default refers to the firmware rather than the dev kits. It's having 128KBytes of memory and its storage space is 4Mbytes and power is supplied through an USB and it is a single board microcontroller and also it is having 16 GPIO pins.

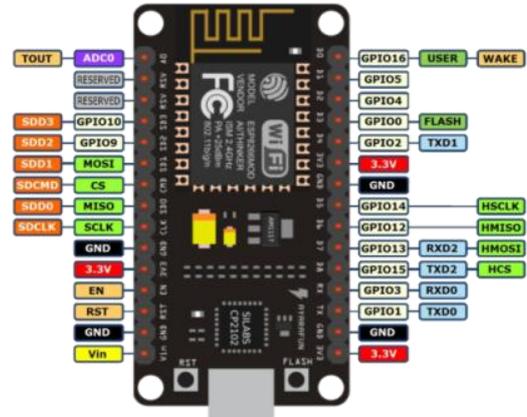


Fig.2 Node MCU

**C. IR SENSOR**

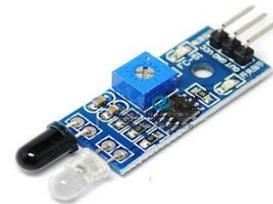


Fig.3 IR Sensor

An infrared sensor is an electronic instrument which is used to sense certain characteristics of its surroundings by either emitting and/or detecting infrared radiation. Infrared sensors are also capable of measuring the heat being emitted by an object and detecting motion. Definition and relationship to the

electromagnetic spectrum. Infrared radiation extends from the nominal red edge of the visible spectrum at 700 nanometers (nm) to 1 mm. This range of wavelengths corresponds to a frequency range of approximately 430 THz down to 300 GHz.

**D. RELAY BOARD**



Fig.4 Relay board

A relay is an electromagnetic switching device consisting of an armature which is moved by an electromagnet to operate

one or more switch contacts. Some advantages of relays are that they provide amplification and isolation and are straight forward. Here we are using 5v 4-channel relay interface board, and each channel needs a 15-20mA driver current. It can be used to control various appliances and equipment with large current relays that work under AC250V 10A or DC30V 10A. It has a standard interface that can be controlled directly by microcontroller.

#### E. AIR PURITY CHECKING SENSOR



Fig.5 Air checking purity sensor (MQ135)

The MQ series of gas sensors utilizes a small heater inside with an electro chemical sensor. These sensors are sensitive to a range of gasses and are used at room temperature. MQ135 alcohol sensor is a SnO<sub>2</sub> with a lower conductivity of clean air. When the target explosive gas exists, then the sensor's conductivity increases more increasing more along with the gas concentration rising levels. By using simple electronic circuits, it converts the change of conductivity to correspond output signal of gas concentration.

#### F. HUMIDITY AND TEMPERATURE SENSOR



Fig.6 Humidity and temperature sensor (DHT11)

Humidity sensors detect the relative humidity of the immediate environments in which they are placed. They measure both the moisture and temperature in the air and express relative humidity as a percentage of the ratio of moisture in the air to the maximum amount that can be held in the air at the current temperature. As air becomes hotter, it holds more moisture, so the relative humidity changes with the temperature.

Most humidity sensors use capacitive measurement to determine the amount of moisture in the air. This type of measurement relies on two electrical conductors with a non-conductive polymer film laying between them to create an electrical field between them. Moisture from the air collects on the film and causes changes in the voltage levels between the two plates. This change is then converted into a digital measurement of the air's relative humidity after taking the air temperature into account.

#### G. CAMERA MODULE



Fig.7 Camera module (OV7670)

The camera module is powered from a single +3.3V power supply. An external oscillator provides the clock source for camera module XCLK pin. With proper configuration to the camera internal registers via I2C bus, then the camera supply pixel clock (PCLK) and camera data back to the host with synchronize signal like HREF and VSYNC. The OV7670 camera module is a low cost 0.3 mega pixel CMOS colour camera module, it can output 640x480 VGA resolution image at 30fps. The OV7670 camera module built in on board LDO regulator only single 3.3V power needed and can be used in Arduino, STM32, Chipkit, ARM, DSP, FPGA and etc..

#### IV. PROPOSED SYSTEM

The proposed system is implemented using Node MCU by overcoming all the drawbacks of previous existing methods. In this project all the sensors are connected to the Node MCU board and the results can be seen in Smart phone. For every second it shows new value. If any gas leakage happens the value of air purity sensor shows the high value at that time we can turn on the fan to send the gas out. The camera module is connected to the Arduino UNO board because in Node MCU board we have only one analog pin. For camera module we will use more analog pins, so we are connecting camera module to Arduino UNO. When IR sensor detects the motion, the camera module will be turned on. The captured images will be stored in folder of our PC and, it sends captured images to the user email.

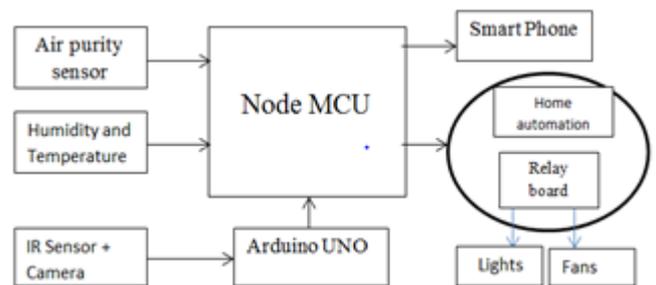


Fig 8 Block diagram

#### WORKING OF PROTOTYPE

The prototype can be used in following two ways:

- a. As a smart security system
- b. As a smart home automation system
- c. Environment monitoring

*a. As a smart security system*

If we place a IR sensor at the entrance of a building. These sensors as explained earlier detect the motion of obstacle. This signal which detects their presence becomes the input trigger for the micro-controller. The owner, who may or may not be present in that building, will receive an image captured by an camera module through an E-mail on his mobile phone (whose Mail is predefined in the program) stating that 'There is an Intruder in the House'. To turn ON the lights and fans, so that the intruder will be warned, the owner can press '1' from his mobile keypad. Moreover if the owner finds that his building is not safe, he can send an SMS to the concerned authority to police department explaining his situation.

*b. As a smart home automation system*

Under the Home Automation we can control all electrical appliances from long distance through an mobile phone. In this project we are controlling Lights and Fans through an Internet. Even though if Wi-Fi is not available we can go to 3G or 4G services to operate the system. This will helps us to operate our home appliances through a long distance. This will helps the handicapped and aged people to control their home appliances easily.

*c. Environment monitoring*

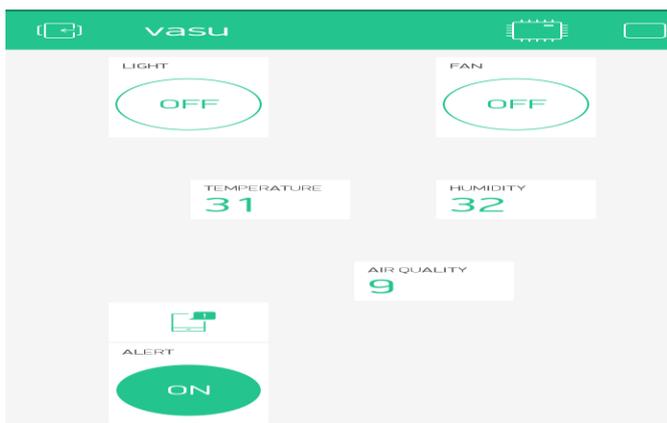
Under this environment monitoring, we are using DHT11 and MQ135 sensors. These two sensors are more useful to know about weather condition, In this project we are placing these two sensors inside the home to know the weather condition of our home. Here DHT11 sensor shows the values of humidity and temperature and MQ135 sensor checks the air purity if any poiseness gas is mixed, For every second it will shows the new value in our mobile phone. If the temperature or air impurity becomes high at that time we can switch on fans to send that air outside.

**ADVANTAGES**

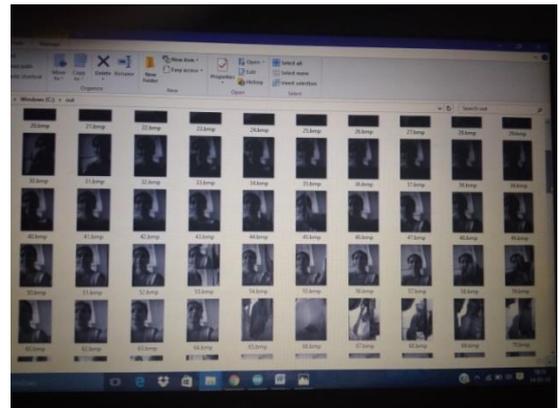
1. This low cost system with minimum requirements takes Care of both home security as well as Home automation.
2. More helpful for handicapped and aged people.
3. Devices can be controlled from long distance.
4. Highly secured and Time saving.

**RESULT**

The results that have been obtained from the above set up can be seen in blink app that has been shown below.



The captured image of OV7670 camera shall be stored in one folder of our PC and it sends the captured image to the user mail.



**CONCLUSION AND FUTURE SCOPE**

Internet of things based home automation system can only work in the presence of internet. The rapid growth of IoT devices brings concerns and benefits. Even though Wi-Fi is not available we can go to 3G or 4G services. This is one big advantage of IOT In this project, the use of a camera connected to the microcontroller might help the user in taking decision whether to welcome the guest after receiving the captured picture of the guest or intruder, If the user identifies he is an unknown person then the user can further forward the same photograph to the police station by explaining his situation. This project can also be implemented by using Raspberry.

**REFERENCES**

- [1] Ravi Kishore kodali and Vishal jain " IOT based smart security and Home Automation system" International conference on computing, communication and automation (ICCCA 2016)
- [2] R. Piyare and M. Tazil, "Bluetooth based home automation system using cell phone," Consumer Electronics (ISCE), 2011 IEEE 15<sup>th</sup> International Symposium on, Singapore, 2011, pp. 192-195.
- [3] S. Sen, S. Chakrabarty, R. Toshniwal, A. Bhaumik, "Design of an intelligent voice controlled home automation system", International Journal of Computer Applications, vol. 121, no.15, pp. 39-42, 2015
- [4] H. AlShu'eili, G. S. Gupta and S. Mukhopadhyay, "Voice recognition based wireless home automation system," Mechatronics (ICOM), 2011 4th International Conference On, Kuala Lumpur, 2011, pp. 1-6.
- [5] R. Teymourzadeh, Salah Addin Ahmed, Kok Wai Chan and Mok Vee Hoong, "Smart GSM based Home Automation System," Systems, Process & Control (ICSPC), 2013 IEEE Conference on, Kuala Lumpur, 2013, pp. 306-309.
- [6] A. R. . C. Y. . O. K. Withanage, C., "A comparison of the popular home automation technologies," pp. 1 – 11, may 2014