

# Smart IOT Automation for Advanced Home Security

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## ABSTRACT

“Internet of Things” is fast and becoming a emerging 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 paper aims at controlling home appliances and building a sensible wireless home security system using Wi-Fi as communication protocol. The Home Automation are often implemented using differing types of wireless communication techniques like ZigBee, Wi-Fi, Bluetooth, GSM, etc. These existing methods have drawbacks as they work in short range. To overcome these drawbacks, we are getting 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 a captured image through an E-mail to the owner using internet when an object is detected. By using “Node MCU” Module we are getting to implement this project. This will be more helpful for handicapped and aged people.

**Keywords:** IOT, Arduino, Node MCU, WI-FI, Smart phone, Smart Security, system, techniques

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## INTRODUCTION

Home automation refers to handling and controlling home appliances by using micro-controller or 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 try to realize comfort combined with simplicity.

Wireless Home security and residential automation are the twin aspects of this project. The currently built prototype of the system sends alerts to the owner over E-mail using the web if any kind of human movement is sensed near the doorway 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 like opening the door, switching on various appliances inside the house, which also are connected and controlled by the micro-controller within the system to welcome is 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 modify on the electrical appliances or his favorite T.V. channel for an example. Thus using an equivalent set of sensors the twin problems of home security and residential automation are often solved on a complementary basis. One of the most advantage of this IOT is albeit Wi-Fi isn't available we will undergo 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.

## EXISTING METHODS

### **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 are often implemented as a true time system. Bluetooth network has limited range of 10 meters if the smartphone is out of range, then it'll not be ready to control the house appliances, this is often one of the most disadvantages of Bluetooth based home automation system.

### Voice recognition based home automation.

Voice recognition based home automation system proposed and implemented by a researcher [3]. The wireless communication between the smartphone and therefore the Arduino UNO is completed 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 therefore the system will fail to point out accuracy. ZigBee Based Wireless Home Automation System.

ZigBee based wireless home automation system has also been studied [4], ZigBee is analogous to Bluetooth technology.

### GSM Based Home Automation System.

A smart home automation system is implemented by using Global System for Mobile communication (GSM) [5]. In GSM based home automation systems, communication between main module and appliances is completed through text messages. The main drawback of GSM based home automation system is that, there's no guarantee text message deliver to the system whenever so it's not a reliable system. These are the drawbacks of existing methods, to beat that drawbacks we are implementing "IOT Based Smart security and Smart Home Automation".

### Components Required

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

### ARDUINO UNO

The Arduino is an open source microcontroller boarded supported the microchip ATmega28p microcontroller and developed by Arduino cc , simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to urge 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 !kb of EEPROM and its clock speed is 16MHz. firmware which runs on the ESP8266 Wi-Fi



Fig.1 Arduino UNO

### NODE MCU

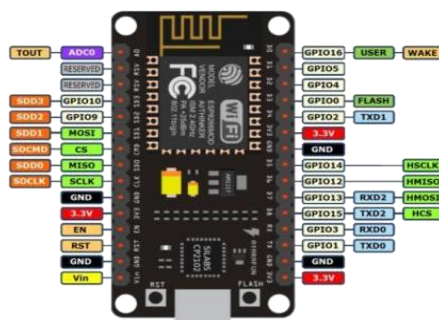


Fig.2 Node MCU

## 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.

## RELAY BOARD



**Fig.4 Relay board**

A relay is an electromagnetic switching device consisting of Node MCU is an open source IOT platform. It includes 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.

## AIR PURITY CHECKING SENSOR



**Fig.5 Air checking purity sensor (MQ135)**

The MQ series of gas sensors utilizes a small heater inside with an electrochemical sensor. These sensors are sensitive to a range of gases and are used at room temperature. MQ135 alcohol sensor is a  $\text{SnO}_2$  with a lower conductivity of clean air. When the target explosive gas exists, then the sensor's conductivity increases more and more along with the gas concentration rising levels. By using simple electronic circuits, it converts the change of conductivity to correspond to the output signal of gas concentration.

## 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 lying 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 their temperature into account

## CAMERA MODULE

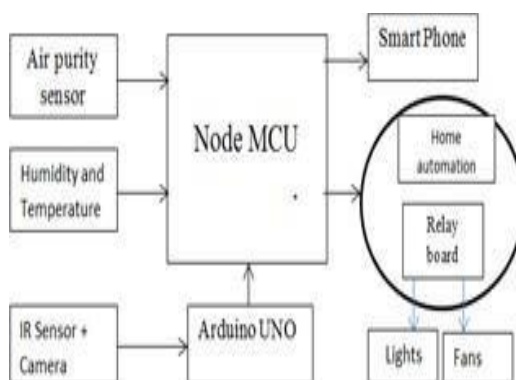


**Fig.7 Camera module (OV7670)**

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 build in on board LDO regulator only single 3.3V power needed and can be used in Arduino, STM32, Chipkit, ARM, DSP, FPGA and etc..

## 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 doorway 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 might not be present therein building, will receive a picture captured by a camera module through an E-mail on his mobile (whose Mail is pre defined 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 knows 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 sensor are used to check the weather condition because when we at home it detect the humidity and body temperature and act like provided system. Here DHT11 sensor shows the values of humidity and temperature and MQ135 sensor checks the air purity if any poisonous gases are mixed, every min. it shows the different temp. if we start the fan to cool down the temperature of room but it also stand in this situation and perform well beyond of our thinking.

## Advantages

1. This system helpful for handicap people who not able to stand on their leg. To lock or unlock the door and light
2. Devices can be easily operated from long distance with the help of IOT
3. Most secured system and very reliable.
4. Cost required for implementing it is very low as compared to analog system.

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

We can use this system only presence of internet and due to rapid growth of internet 4G and 5G system now implementing in the world so our project should use in that situation and due to use of camera owner of house can check the capture image of unknown person or any person who come at the home and after any uncertain situation this save image we use as proof in police station. This project can also be implemented by using Raspberry system help to enhance our life style.

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