IOT Based Home Security System with IP Camera

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Declaration

It is declared hereby that this thesis paper or any part of it has not been submitted to anywhere else for the award of any degree.

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Certification

This is to certify that this project entitled "IOT Based Home Security System with IP Camera" is done by the following students under my direct supervision This project work has been carried out by them in the laboratories of the Department of Electrical and Electronic Engineering under the Faculty of Engineering, Sonargaon University (SU) in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering.

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Abstract

This project introduces an innovative IOT Based Home Security System with IP Camera designed to enhance residential safety through intelligent monitoring and alert mechanisms. The system employs a NodeMCU microcontroller as the central processing unit, orchestrating seamless communication between diverse sensors and devices. Integration of an IP camera provides real-time video surveillance, while gas and flame sensors continuously monitor the environment for potential threats. The Blynk platform serves as a user-friendly interface, enabling homeowners to remotely monitor, receive alerts, and control the security system through a mobile application. In the event of gas leaks or flames, immediate notifications are dispatched via Blynk, empowering users to take swift corrective actions. This amalgamation of advanced technologies creates a robust, connected, and responsive home security ecosystem, contributing to the evolution of smarter and safer living spaces.

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Chapter 1: Introduction

1.1 Introduction

Nowadays, we have remote controls for our television sets and other electronic systems, which have made our life real easy. Have you ever wondered about home automation, which would give the facility of controlling tube lights, fans and other electrical appliances at home using a remote control? And also the controlling will be over internet through an android application? How it sounds? Yes! But, are the available options cost-effective? If the answer is No, we have found a solution to it. We have come up with a new system called Nodemcu based home automation & fire protection system using WiFi and Android app. This system is super-cost effective and can give the user, the ability to control any electronic device without even spending for a remote control. This project helps the user to control all the electronic devices using his/her smartphone from anywhere, any country. Time is a very valuable thing. Also save electricity is the most important matter nowadays. Everybody wants to save time and electricity as much as they can. New technologies are being introduced to save our time. To save people's time and accident of fire and gases we are introducing IoT based Home Automation & fire protection system. With the help of this system you can control your home appliances from your mobile phone and canbe notified about fire and gas leakage and also a fire hydrant pump also will be on at the fire accident. You can turn on/off your home appliances from anywhere. In the era of rapid technological advancement, the integration of the Internet of Things (IoT) into our daily lives has ushered in a new paradigm of smart and connected systems. One such groundbreaking application is the IoT-based Home Security System, an intelligent and proactive solution designed to fortify the safety of residential spaces. This sophisticated system employs cutting-edge components, including the NodeMCU microcontroller, IP camera, gas sensor, flame sensor, and the Blynk platform, to create a comprehensive and responsive security infrastructure.

At the heart of this innovative system is the NodeMCU, a versatile and compact open-source IoT platform that serves as the central nervous system, orchestrating seamless communication and control among all connected devices. The integration of an IP camera elevates the system's capabilities by providing real-time video surveillance, allowing homeowners to remotely monitor their premises with unparalleled clarity and detail.

Safety concerns are addressed comprehensively through the incorporation of specialized sensors. The gas sensor, a pivotal component, continually scans the environment for any signs of gas leaks, promptly alerting homeowners to potential hazards. Simultaneously, the flame sensor acts as a vigilant guardian, detecting the slightest hint of a fire outbreak and triggering immediate alerts for swift action.

The system's user interface and remote control functionality are facilitated by the Blynk platform, a user-friendly IoT application that empowers homeowners to monitor, receive alerts, and control their security system effortlessly from the convenience of their smartphones. Blynk acts as the bridge between the user and the interconnected devices, offering a responsive and intuitive platform for managing the security ecosystem [7].

This IoT-based Home Security System transcends traditional security measures by not only detecting threats but also enabling proactive responses. In the event of a security breach, users receive instant notifications through the Blynk app, providing the opportunity for timely intervention. The amalgamation of these advanced technologies not only enhances the security posture of homes but also contributes to the realization of a smarter and more connected living environment. As we embrace the transformative power of IoT, this Home Security System emerges as a beacon of technological ingenuity, redefining the way we perceive and ensure the safety of our homes in the digital age.

1.2 Proposed Method

The proposed method for the IoT-based home security system with an IP camera, NodeMCU, gas sensor, flame sensor, and Blynk involves a systematic integration of hardware components, data communication protocols, and a user-friendly interface for effective security monitoring and control. Here's a step-by-step overview of the proposed method: Hardware Setup: Install and conFigure the NodeMCU microcontroller as the central processing unit and connect it to the internet. Integrate an IP camera for real-time video surveillance, ensuring it is compatible with the NodeMCU. Attach a gas sensor to detect any potential leaks and a flame sensor for fire detection. Connect the sensors to the NodeMCU GPIO pins, ensuring proper wiring and power supply. Programming the NodeMCU: Develop firmware for the NodeMCU using a suitable programming language (e.g., Arduino IDE with C++). Implement code to read data from the gas and flame sensors, control the IP camera, and establish communication with the Blynk platform. Blynk Integration: Create a

Blynk account and set up a new project for the home security system. Obtain the authentication token from the Blynk project and embed it in the NodeMCU firmware. Configure the Blynk app interface with widgets to monitor sensor readings, control the camera, and receive notifications. Sensor Data Acquisition: Program the NodeMCU to continuously read data from the gas and flame sensors. Implement logic to trigger alarms or notifications in case of abnormal sensor readings, such as detecting a gas leak or flame. IP Camera Control: Integrate code to control the IP camera, enabling users to access live video feeds through the Blynk app. Implement features like capturing images or recording videos on demand and during security alerts. Real-time Monitoring and Alerts: Utilize the Blynk app to display real-time sensor data and camera feeds. Set up Blynk notifications to alert users instantly in case of security threats, such as gas leaks or flames. User Interaction: Enable user interaction through the Blynk app, allowing homeowners to remotely control the security system. Implement features for arming/disarming the system, checking sensor status, and viewing historical data. Testing and Optimization: Conduct thorough testing to ensure the reliability and accuracy of sensor readings, camera control, and Blynk notifications. Optimize the system for performance, addressing any potential issues or fine-tuning parameters. Deployment: Deploy the fully conFigured and tested IoT-based home security system in the target environment. Provide user instructions for accessing and utilizing the Blynk app for remote monitoring and control [2].

1.3 Motivation

The motivation of the project is to design and construct a home security system that will monitor real time any house over internet connected to it from anywhere over internet, using a microcontroller, some sensors, IP camera and android application.

1.4 Objective of the Project

- To prevent fire accident.
- To prevent smoke accident.
- To prevent over temperature in home.
- To monitor using CCTV camera over internet.
- GSM based SMS on any fire and gas leak accident.
- Mobile app monitor of temperature

1.5 Proposed System

The proposed IoT-based home security system integrates a NodeMCU microcontroller, IP camera, gas sensor, flame sensor, and Blynk platform. The NodeMCU serves as the central hub, collecting data from sensors and controlling devices. The gas and flame sensors continuously monitor for potential hazards, while an IP camera provides real-time video surveillance. The Blynk platform acts as the user interface, allowing homeowners to remotely monitor and control the security system via a mobile app. In case of gas leaks or flames, immediate alerts are sent through Blynk, enabling prompt action. The system aims to enhance home security through proactive monitoring, real-time alerts, and user-friendly control, creating a connected and responsive security ecosystem.

1.6 Organization of the Project Book

This book consists of five chapters.

Chapter 1:

Gives a brief discussion of the project introduction, project objectives, project motivation and history.

Chapter 2:

Focuses on system design and theoretical background how the project is designed. How the system works. All the system is legit or not.

Chapter 3:

Focuses on hardware we used, their theoretical background and applications. Each hardware's detail. How the hardware works. How the hardware can be implementation.

Chapter 4:

Focuses on experimental result. How we gave our best result from our project that described in this chapter. Also we showed all the results visual here.

Chapter 5:

Concludes overall the project. And advantages of this project. How this project will give it's best in our daily industrial work.

Chapter 2: System Design

2.1 Introduction

The Internet of Things (IoT) has revolutionized the concept of home security, and a cutting-edge system incorporating NodeMCU, IP camera, gas sensor, flame sensor, and Blynk platform emerges as a robust solution. This innovative home security system seamlessly integrates smart technology to enhance safety measures. The NodeMCU, serving as the central hub, orchestrates the connectivity among various sensors. An IP camera provides real-time video surveillance, offering homeowners a comprehensive view of their property remotely. The integration of gas and flame sensors adds an extra layer of protection by detecting potential hazards such as gas leaks or fire incidents. Blynk, a user-friendly IoT platform, empowers users to monitor and control their home security system effortlessly through a mobile application. This not only facilitates real-time alerts but also enables users to take prompt actions in case of emergencies. The synergy of these components creates an intelligent and responsive home security ecosystem that ensures peace of mind for homeowners, even when miles away from home. The amalgamation of IoT, NodeMCU, and smart sensors heralds a new era in home security, making it both technologically advanced and user-centric.

2.2 Block Diagram

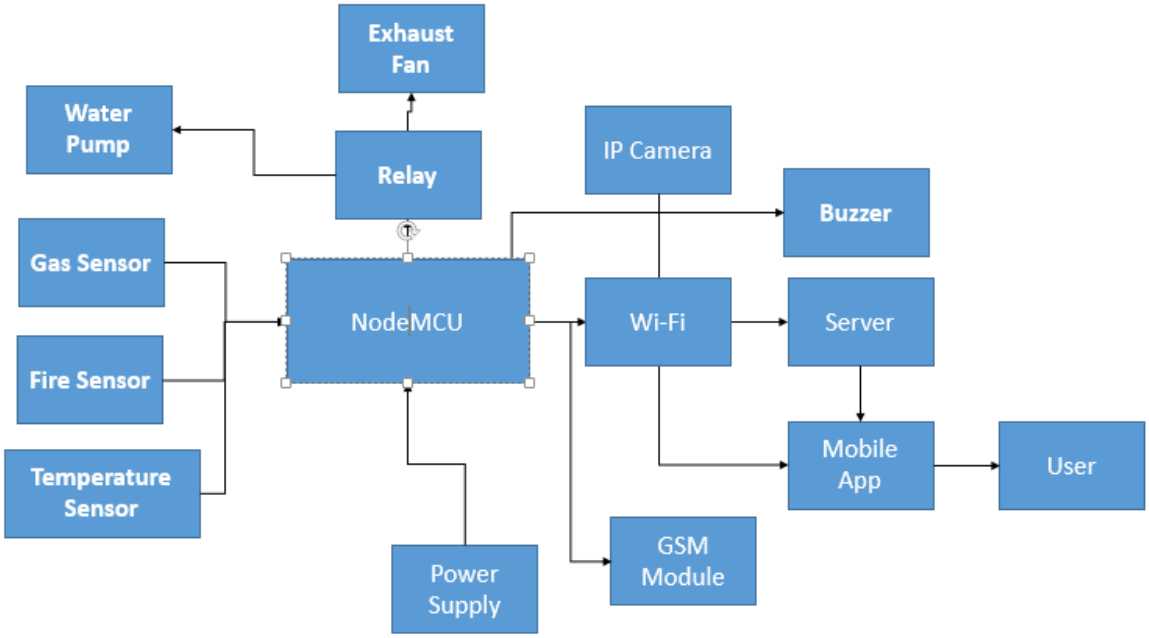


Figure 2.1: Block Diagram

Here the nodemcu is the main microcontroller also comes up with wifi connectivity. Three sensors are connected with nodemcu for gas, fire and temperature detection. Buzzer is for audible alarm two relays are for water pump and exhaust fan, GSM module is for SMS and calling feature. WiFi is for internet server connectivity for mobile app and IP camera connectivity for realtime temperature monitoring and video surveillance.

2.2.1 Flow Chart

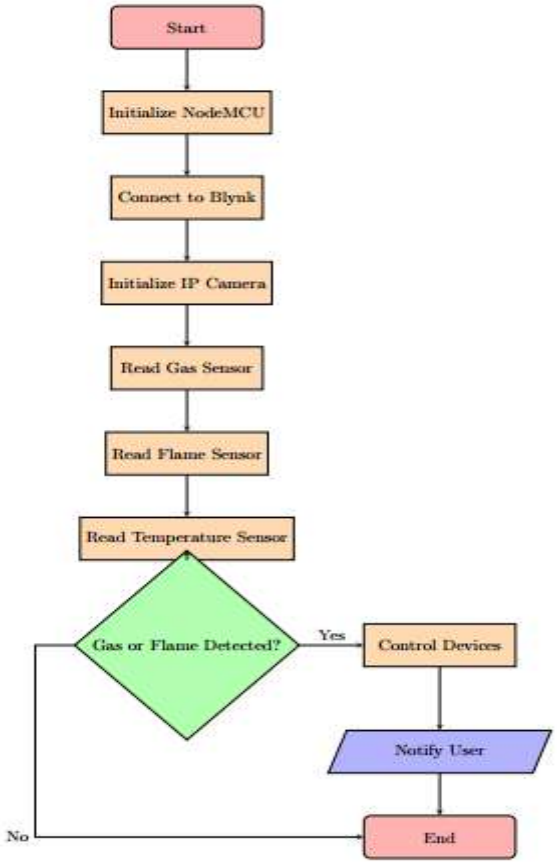


Figure 2.2: Flow Chart

2.3 Idea of the Project

The "IoT-based Home Security System" is a project that leverages Internet of Things (IoT) technology to enhance the security and monitoring capabilities of a home. The project involves the integration of various sensors, devices, and connectivity platforms to create an intelligent and responsive security ecosystem. Enhanced Home Security: Early detection of potential threats and immediate alerts. Remote Monitoring: Users can monitor their home's security remotely in real-time. Automated Prevention: Automated responses to security threats help prevent incidents. User-Friendly Interface: The Blynk app provides a convenient and user-friendly interface for

interaction. This IoT-based Home Security System not only adds an extra layer of security to the home but also brings in automation and remote monitoring capabilities for a more connected and secure living environment [1].

2.4 What is IOT

The Internet of Things (IoT) refers to the network of physical objects or "things" embedded with sensors, software, and other technologies that enable them to connect and exchange data over the internet. These objects can include a wide range of devices, from everyday items like household appliances and wearable devices to industrial machines and infrastructure components. Key characteristics of IoT include: Connectivity: IoT devices are equipped with communication capabilities, allowing them to connect to the internet, other devices, or a central system. Sensors and Actuators: IoT devices are often equipped with sensors to collect data from the environment and actuators to perform actions based on that data. Data Processing and Analytics: IoT systems generate a vast amount of data. Cloud computing and edge computing technologies are often employed to process and analyze this data for valuable insights. Automation: IoT enables automation by allowing devices to communicate and make decisions based on the data they collect. This can lead to more efficient processes and improved user experiences. Interoperability: The ability of different IoT devices and systems to work together seamlessly is crucial. Standardized communication protocols facilitate interoperability in the IoT ecosystem. Real-time Monitoring and Control: IoT devices provide real-time monitoring of physical objects and environments, allowing users to remotely control and manage devices. Examples of IoT applications are diverse and include smart homes, industrial automation, healthcare monitoring, agriculture, transportation systems, and smart cities. In a smart home, for instance, IoT devices like thermostats, cameras, and door locks can be connected to a central hub or controlled through a mobile app, offering homeowners greater convenience and control over their living spaces. IoT has the potential to revolutionize various industries, improve efficiency, enhance safety, and create new opportunities for innovation by connecting and integrating physical devices into the digital world.



Figure 2.3: IOT (Internet of Things) [5]

Chapter 3: Hardware Implementation

3.1 Introduction

An IoT-based home security system with a IP camera using NodeMCU involves combining hardware components to create a smart and connected surveillance solution. Below is a brief hardware introduction for such a system.

3.1.1 Required Components

- NodeMCU
- Gas Sensor
- Flame Sensor
- IP Camera
- Relay Module
- Mini water Pump
- Mini Exhaust Fan
- GSM Module
- Buzzer
- Bread Board
- Temperature Sensor

3.2 Node MCU

NodeMcu is a microcontroller device which attached with a Wi-Fi module. Also NodeMCU is a development board specially targeted for IoT based Applications. It includes Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module.



Figure 3.1: NodeMCU

3.2.1 Pin description of NodeMCU

NodeMcu Has total 30 pins.Where 16 digital input/output pins GPIO1- GPIOD16 and has 1 analog input A0, For interface it with computer and program it use cp2102 driver. To run it simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

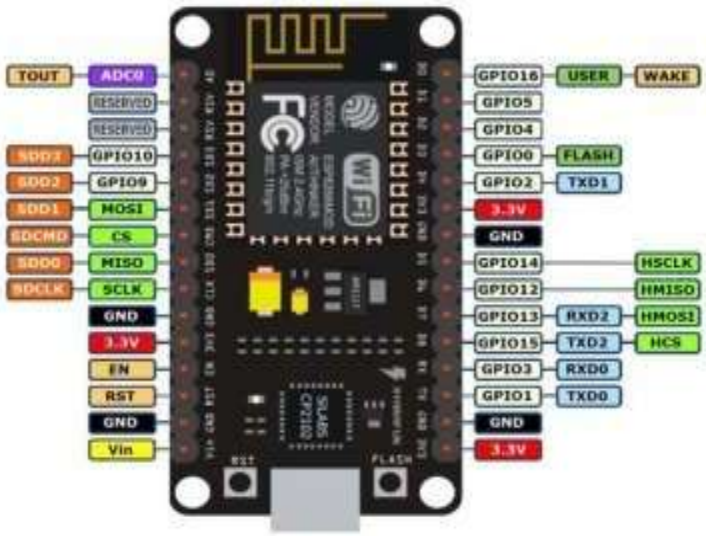


Figure 3.2: Pins of NodeMcu

3.2.2 NodeMCU Specifications & Features

- Microcontroller: Tensilica 32 bit.
- Voltage: 3.3V
- Input Voltage: 7-12V
- Digital I/O Pins: 16
- Analog Pins : 1
- UART: 1
- SPI: 1
- I2C: 1
- Flash Memory: 4 MB
- Static RAM: 64 KB
- Clock Speed: 80 MHz
- USB-TTL Communication for programming
- Antenna
- Small Size

3.3 Relay Module

Relay is an electromagnetic switch which is used to defer two circuits electrically and connect magnetically. When NodeMcu transmit the signal then relay driver receive signal and start its work. They are frequently used to interface an electronic circuit to an electrical circuit which works at extremely high voltage. For instance, a hand-off can make a 5V DC battery circuit to switch 230V AC mains circuit. In this way a little sensor circuit can drive, say, a fan or an electric knob. A transfer switch can be separated into two sections: information and yield. The info area has a loop which creates attractive field when a little voltage from an electronic circuit is connected to it. This voltage is known as the working voltage. Generally utilized transfers are accessible in various arrangement of working voltages like 5V, 6V, 9V, 12v, 24V and so on. In a basic hand-off there are three contactors: ordinarily shut (NC), regularly open (NO) and normal (COM). At no info express, the COM is associated with NC. At the point when the working voltage is connected the transfer curl gets charged and the COM changes contact to NO. Diverse transfer setups are accessible like SPDT and DPDT which have distinctive number of changeover contacts. By utilizing legitimate blend of contactors, the electrical circuit can be turned on and off.

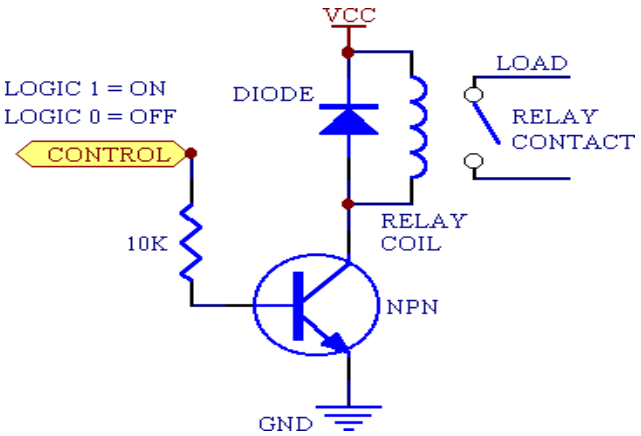


Figure 3.3: Relay circuit Diagram

So as to drive the hand-off, we use transistor and just less power can be utilized to get the transfer driven. Since, transistor is an intensifier so the base lead gets adequate current to make increasingly current stream from Emitter of Transistor to Collector. In the event that the base once gets control that is adequate, at that point the transistor lead from Emitter to Collector and power the transfer. When the power is transmit to the relay works as switch due to electromagnetic effect so that we can switch ON or OFF our home appliances.



Figure 3.4: Relay Module

3.3.1 Pin Descriptions Relay Module

Pin	**Configuration**
VCC	Positive 5V supply voltage
GND	Ground
IN1—IN2	Relay control port
Common (For Each Relay)	Common for NO/NC
NC (For Each Relay)	Normally Close
NO (For Each Relay)	Normally Open

Table 3.1: Pin Description of Relay Module

3.4 Power Supply

A 12-volt adapter is a device that converts electrical power from a standard electrical outlet (usually at 120 volts AC in the United States or 230 volts AC in many other parts of the world) to 12 volts DC (direct current). This type of adapter is commonly used to power electronic devices, such as small appliances, LED lights, routers, and various other gadgets that require a 12-volt power supply. The 12-volt adapter typically consists of a plug that goes into the electrical outlet and a cord with a connector that matches the power input requirements of the specific device. It contains internal circuitry to convert the higher voltage from the outlet to the lower voltage needed by the device. These adapters are widespread and come in various shapes and sizes, making them versatile for powering a wide range of electronic equipment.



Figure 3.5: Power Supply

3.5 IP Camera

An IP camera, or Internet Protocol camera, is a type of digital video camera that is used for surveillance and can transmit and receive data via a computer network and the internet. Unlike traditional analog CCTV cameras, IP cameras digitize video signals at the source and then transmit the data as digital streams over an IP network. Key features of IP cameras include: Digital Video Quality: IP cameras provide high-resolution digital video, allowing for clearer and more detailed images compared to analog cameras. Network Connectivity: IP cameras connect to a network, such as a local area network (LAN) or the internet, which enables users to access the camera's feed remotely. Power Over Ethernet (PoE): Many IP cameras support Power over Ethernet, which means they can receive power and transmit data over a single Ethernet cable. This simplifies installation and reduces the need for separate power cables. Remote Viewing and Management: Users can access the video feeds from IP cameras remotely using a web browser or dedicated software. This allows for monitoring and management from anywhere with an internet connection. Advanced Features: IP cameras often come with advanced features such as motion detection, pan-tilt-zoom (PTZ) capabilities, infrared night vision, and audio recording. Integration with Network Video Recorders (NVRs): IP cameras are commonly used with Network Video Recorders, which are devices that store and manage the video footage captured by multiple IP cameras on a network. Scalability: IP camera systems can be easily scaled by adding more cameras to the network, making them suitable for both small and large surveillance setups. IP cameras are widely used in various settings, including homes, businesses, public spaces, and government facilities, due to their flexibility, improved image quality, and remote accessibility. They play a crucial role in modern surveillance systems.



Figure 3.6: IP Camera

3.6 Mini Exhaust Fan

A 5-volt mini exhaust fan is a small fan designed to operate at a voltage of 5 volts. These fans are commonly used in electronic devices, such as laptops, tablets, or other electronic gadgets, to dissipate heat generated by components like processors or graphics cards. Here are some key features and aspects of 5-volt mini exhaust fans: Voltage: The fan operates at a low voltage of 5 volts, which is common in many electronic devices where lower power consumption and compatibility with the device's power supply are essential. Size: "Mini" suggests that the fan is compact and generally has a smaller form factor compared to standard-sized fans. This is important in devices where space is limited. Exhaust Function: The primary purpose of the exhaust fan is to expel hot air from the device, helping to maintain optimal operating temperatures and prevent overheating. Application: These fans are commonly used in various electronic devices where heat dissipation is crucial for the proper functioning and longevity of components. Connector: The fan typically comes with a connector compatible with the device's power supply or motherboard. Common connectors include 2-pin or 3-pin connectors. Quiet Operation: Mini exhaust fans are often designed to operate quietly to avoid disturbing users while providing effective cooling. Materials: The fan blades and housing are usually made from lightweight and durable materials, such as plastic. It's important to note that the specific design and features of a 5-volt mini exhaust fan can vary depending on the manufacturer and the intended application. Users often choose fans based on factors such as airflow, noise level, and compatibility with their devices.



Figure 3.7: Mini Exhaust Fan

3.7 Gas Sensor

MQ5 is one of the commonly used gas sensors in MQ sensor series. It is a Metal Oxide Semiconductor (MOS) type Gas Sensor also known as Chemoreceptors as the detection is based upon change of resistance of the sensing material when the Gas comes in contact with the material. Using a simple voltage divider network, concentrations of gas can be detected. MQ2 Gas Sensor MQ2 Gas sensor works on 5V DC and draws around 800mW. It can detect LPG, Smoke, Alcohol, Propane, Hydrogen, Methane and Carbon Monoxide concentrations anywhere from 200 to 10000ppm.



Figure. 3.8: Gas Sensor

3.7.1 Pin Configuration

Sl No	Pin Name	Description
1	Vcc	This pin powers the module, typically the operating voltage is +5V
2	Ground	Used to connect the module to system ground
3	Digital Out	You can also use this sensor to get digital output from this pin, by setting a threshold value using the potentiometer
4	Analog Out	This pin outputs 0-5V analog voltage based on the intensity of the gas

Table 3.2: Pins of Gas Sensor

3.8 Flame Sensor

A flame sensor is a device designed to detect the presence of a flame or combustion in a particular area. It is commonly used in various applications, such as in gas appliances, industrial burners, and heating systems, to ensure the proper functioning and safety of the equipment. The primary function of a flame sensor is to monitor the flame and provide feedback to the control system. If the flame goes out unexpectedly or if there is a problem with combustion, the flame sensor sends a signal to the control system to shut down the fuel supply, preventing the release of unburned fuel and potential hazards. There are different types of flame sensors, but one common type is based on the use of a photocell or flame rectification. In a photocell-based sensor, the presence of a flame generates light that is detected by the photocell, triggering the sensor to signal that the flame is present. In a flame rectification sensor, a small electrical current is applied through an electrode in the presence of a flame. The conductive properties of the flame allow the sensor to detect its presence. Flame sensors play a crucial role in ensuring the safety and efficiency of systems that rely on combustion, such as furnaces, boilers, and water heaters. They are an essential component in maintaining proper control and preventing potential hazards associated with uncontrolled combustion.

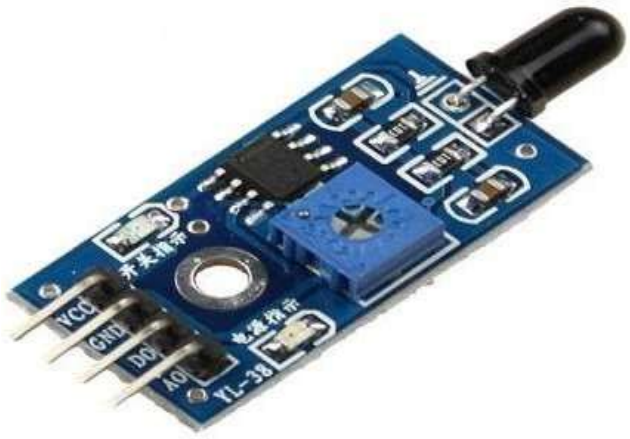


Figure. 3.9: Fire Sensor

3.8.1 Pin Configuration

SL No	Pin Name	Description
1	Vcc	This pin powers the module, typically the operating voltage is +5V
2	Ground	Used to connect the module to system ground
3	Digital Out	You can also use this sensor to get digital output from this pin, by setting a threshold value using the potentiometer
4	Analog Out	This pin outputs 0-5V analog voltage based on the intensity of the gas

Table 3.3.: Pins of Flame Sensor

3.9 GSM Module

The SIM800L is a GSM (Global System for Mobile Communications) module commonly used for communication in embedded systems. It is produced by SIMCom Wireless Solutions and is widely used in various applications, including IoT (Internet of Things) devices, home automation, tracking systems, and more. Here are some key features and characteristics of the

SIM800L GSM module: Communication Technology: The SIM800L supports GSM/GPRS communication, allowing devices to connect to mobile networks and communicate data over the cellular network. Frequency Bands: The module supports various frequency bands, making it compatible with different cellular networks around the world. Data Transmission: It can handle data transmission through GPRS (General Packet Radio Service), enabling the transfer of small packets of data over the mobile network. SMS and Call Functionality: The module supports Short Message Service (SMS) and can be used for sending and receiving text messages. It also allows for making and receiving phone calls. Embedded TCP/IP Stack: Some variants of the SIM800L come with an embedded TCP/IP stack, allowing for internet connectivity in addition to basic GSM communication. Compact Size: The SIM800L is known for its compact size, making it suitable for applications with space constraints. Low Power Consumption: It is designed to operate with low power consumption, making it suitable for battery-powered devices. Serial Communication Interface: The module communicates with the microcontroller or host device through a serial UART (Universal Asynchronous Receiver-Transmitter) interface. Developers often interface the SIM800L module with microcontrollers like Arduino, Raspberry Pi, or other embedded systems to add GSM functionality to their projects. Keep in mind that while the SIM800L is popular, there are also other GSM modules available in the market, each with its own set of features and capabilities.



Figure. 3.10: GSM Module

3.10 Temperature Sensor

The DHT11 is a commonly used Temperature and humidity sensor that comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to output the values of temperature and humidity as serial data. The DHT11 is a commonly used Temperature and humidity sensor. The sensor comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to

output the values of temperature and humidity as serial data. The sensor is also factory calibrated and hence easy to interface with other microcontrollers. The sensor can measure temperature from 0°C to 50°C and humidity from 20% to 90% with an accuracy of ±1°C and ±1%. So if you are looking to measure in this range then this sensor might be the right choice for you.[2]

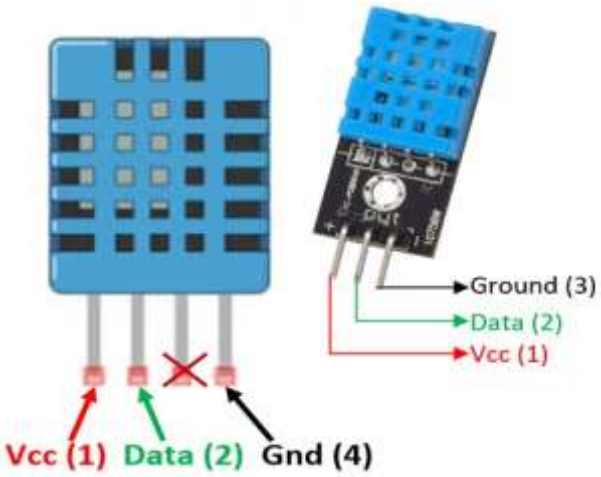


Figure 3.11: Temperature Sensor

3.11 Circuit Diagram

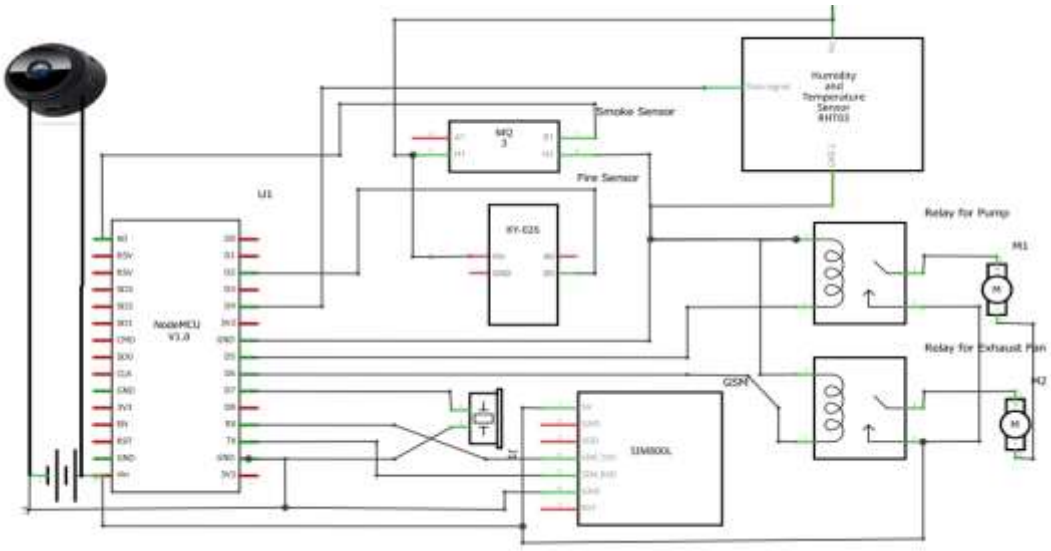


Figure. 3.12: Circuit Diagram

3.12 Software

To make this project we used 2 software. One is programming code editor software which name is Arduino Ide. The one is an Android app name is Blynk which is for controlling our appliances. [7]

3.12.1 Arduino IDE Installation

Now one after another the Arduino software and the USB driver for the board have to be installed.

3.12.2 Installation and setup of the Arduino software

1. We have downloaded the Arduino software from www.arduino.cc and installed it on the computer (This was NOT connected to the PC). After that we opened the software file and installed the program named arduino.exe. [4]

Two set ups on the program are important and should be considered.

a) The board that we want to connect has to be selected on the arduino software. The "Arduino Uno" is here known as "Arduino / Genuino Uno ,Nano, Lilipo or any name can be".

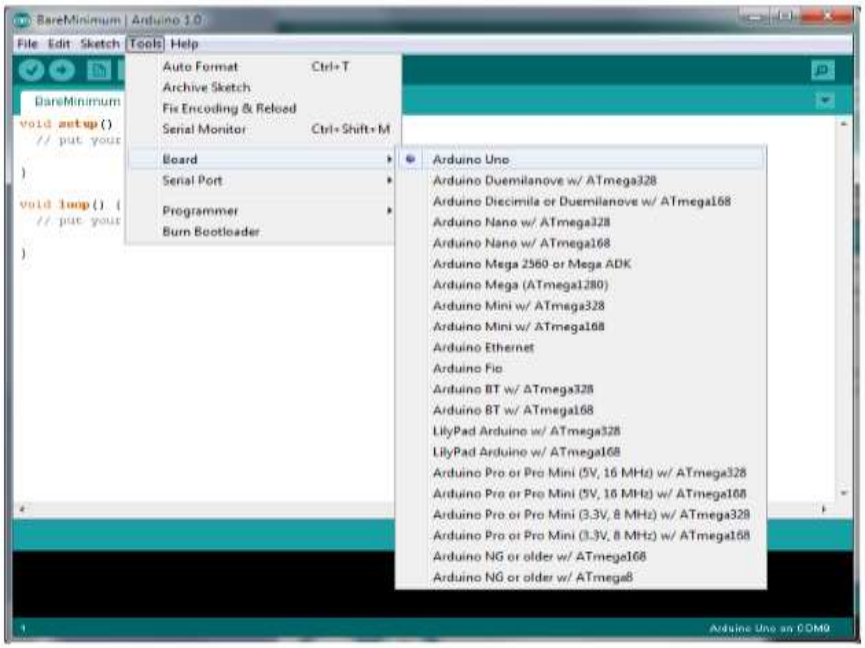


Figure 3.13: Program installation process

b) We have to choose the right "Serial-Port", to let the Computer know to which port the board has been connected. That is only possible if the USB driver has been installed correctly. It can be checked this way At the moment the Arduino wasn't connected to the PC. If we now choose "Port", under the field "Tool", we will already see one or more ports here (COM1/ COM2/ COM3…).

3.13 Programming

The development cycle is divided into 4 phases:

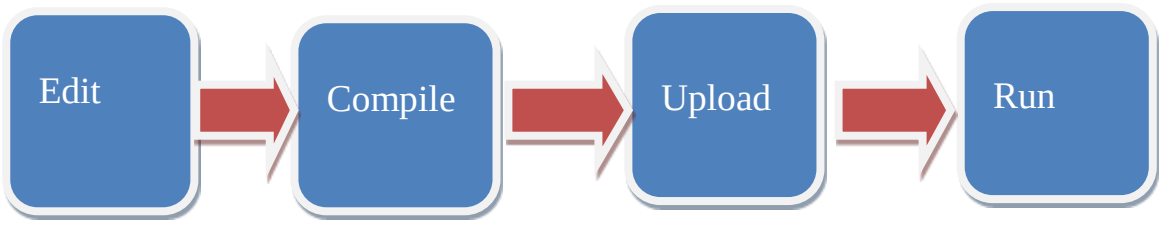


Figure 3.14: Flowchart of the compiling process

Compile: Compile means to translate the sketch into machine language, also known as object.

Code Run: Arduino sketch is executed as soon as terminates the step of uploading on the board.

3.13.1 Arduino Program Development

• Based on C++ without 80% of the instructions.

• A handful of new commands.

• Programs are called 'sketches'.

• Sketches need two functions:

• void setup ( )

• Void loop ( )

• Setup ( ) runs first and once.

3.14 Blynk Android App

Blynk is a new organization who developed a platform name blynk. Which is also a free server to store some data. And it's for monitoring IoT based hardware projects from iOS and Android device. After downloading the Blynk app, we had to create a project dashboard and arrange buttons, onto the screen. And the buttons are the controlling switches for our home appliances.



Figure 3.15: Blynk App

Chapter 4: Result & Discussion

4.1 Introduction

In recent years, the integration of Internet of Things (IoT) technology into various aspects of daily life has revolutionized the way we interact with our surroundings. One such application is the development of a sophisticated home security system that leverages IoT principles, NodeMCU, and Blynk platform to enhance the safety and surveillance of residential spaces.

4.2 Result

Finally we can see our output of the project. We can see that if any gas leak or fire incident is happening then our system notify using GSM and open a fire hydrant pump and an exhaust fan at the time. Also if temperature goes over then the system notify us and able to monitor it from mobile app.

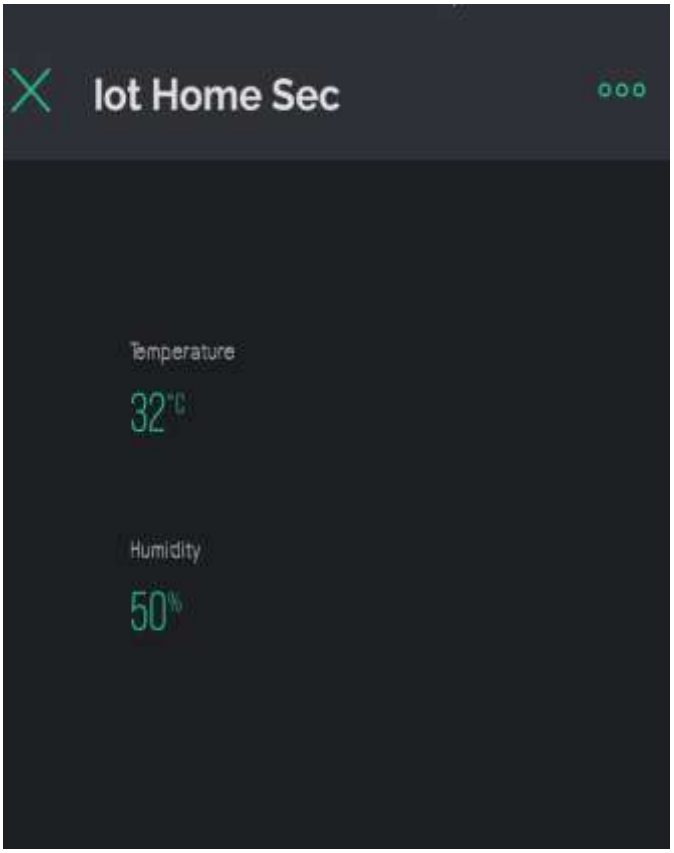


Figure 4.1: App UI

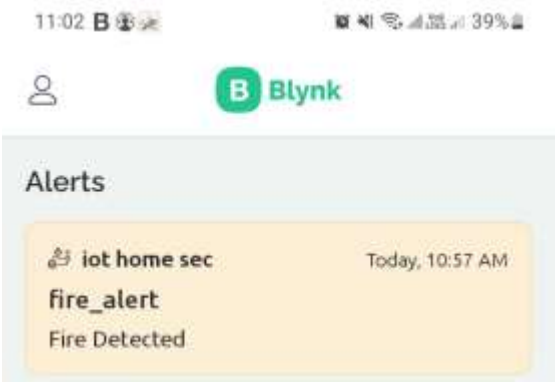


Figure: 4.2 Fire detection SMS

Result 1: Here is our first result which gives us fire accident notification. When the sensor detect fire then the sensor give a signal to microcontroller and the microcontroller gives a notification to mobile app through internet server.

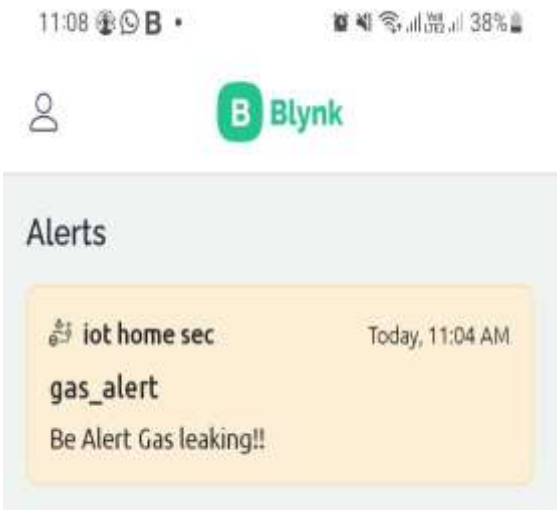


Figure 4.3: Gas Leakage SMS

Result 2: Here is our second result which gives us gas leakage notification. When the sensor detect gas leakage then the sensor give a signal to microcontroller and the microcontroller gives a notification to mobile app through internet server.



Figure 4.4: Automatic Watering to fire

Result 3: Here is our third result when the fire sensor sense any fire then the microcontroller gives a signal to relay for open that and open a fire hydrant pump until the fire goes off.



Figure 4.5: IP Camera Monitoring

Result 4: Here is our IP camera output. Our camera have an IP address for accessing the camera through anywhere over internet. And then we can see this web page where we can see the output of camera and some button for camera controlling.

4.3 Project Outlook

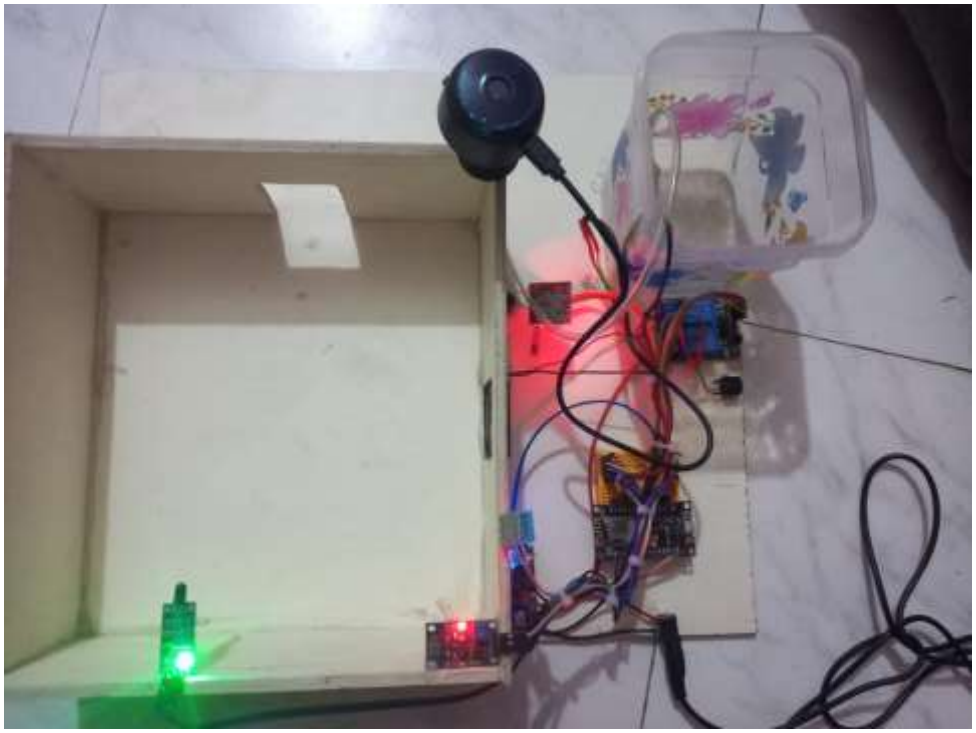


Figure 4.6: Project Outlook

4.4 Discussion

The IoT-based home security system presented here demonstrates the potential of combining NodeMCU and Blynk to create a robust and user-friendly solution. The integration of smart technologies not only enhances security but also provides users with greater control and accessibility over their home environment. As IoT continues to evolve, such innovative systems pave the way for a safer and more connected future.

Chapter 5: Conclusion and Recommendation

5.1 Introduction

After completed the project we learnt so many things about IoT, home security system, fire and gas leakage system. Also we knew about hardware based programming in C. Also knew about microcontroller which is the most important for us and it's the current advanced technology which run so many automation industry and it's also the heart of the smart security system.

5.2 Advantages

- Everything is automated so it is easy to use.
- It saves our electricity.
- It is control by mobile application so no extra devices.
- We can change controlling system as our requirement.
- It works on NodeMcu based system so we can easily understand how it works.
- It saves our time.
- Every home appliance can control by one android application.
- Easy installation and user friendly
- Prevent electrical accident due to long time run.

5.3 Limitations

- As it's a prototype project so we can't give surety about the output.
- Internet speed is a big issue for the system.
- Sometimes our gas sensor gives false output due to its poor construction.

5.4 Future Work

- This is an IoT based Home Security System.
- We are going to plane to make IoT based Industrial security and controlling system
- We will solve our security issue in our next update.

5.5 Cost Analysis

SL No	Equipment Name	Price
1	NodeMCU	490
2	Fire Sensor	180
3	Gas Sensor	200
4	DHT 11	250
5	Relay Module	180
6	Mini Exhaust Fan	80
7	Mini Water Pump	140
8	DC Power Supply	280
9	Bread Board	55
10	PVC Board	200
11	IP Camera	900
12	Buzzer	30
13	Buck Converter	130
`4	GSM Module	550
11	Others	1000
	Total	4665 Taka

5.6 Conclusion

The IOT based home security system has been experimentally proven to work satisfactorily by connecting sample appliances to it and the appliances were successfully controlled from a wireless mobile device from anywhere of the world. We learned many skills such as soldering, wiring the circuit and other tools that we use for this project and was able to work together as a team during this project. We also learnt Programming in C better through our project journey. The IoT based home automation system has been experimentally proven to work satisfactorily by connecting sample appliances to it and the appliances were successfully controlled from a wireless mobile device from anywhere of the world. We learned many skills such as soldering, wiring the circuit and other tools that we use for this project and was able to work together as a team during this project. We also learnt Programming in C better through our project journey.

References

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[7] David J. Brooks (2011). Intruder alarm systems: Is the security industry installing and maintaining alarm systems incompliance to Australian Standard AS2201. Security Research Centre (SECAU), Edith Cowan University, 100 Joondalup Drive, Joondalup, WA 6027, Australia.

Appendix

A. Programming Code for the Project

```
#define BLYNK_PRINT Serial

 #include <DHT.h>

#include <ESP8266WiFi.h>

#include <BlynkSimpleEsp8266.h>

#include <SoftwareSerial.h>

SoftwareSerial sim(D10, D9);


String number = "+8801851497649"; // +880 is the country code


#define DHTTYPE DHT11

#define DHTPIN D4



DHT dht(DHTPIN, DHTTYPE);


BlynkTimer timer;

int smoke = A0;

int fire=D5;

int pump= D0;

int fan=D6;

int bz=D7;
```

```
int fire1=0;
int smoke1=0;



char auth[] = "LD4WPwJe32uMQb_l8P754UUYcWeiTQ7A";


// Your WiFi credentials.
// Set password to "" for open networks.
char ssid[] = "iot";
char pass[] = "iot12345";


void sendSensor()
{
 float h= dht.readHumidity();
  float t = dht.readTemperature(); // or dht.readTemperature(true) for Fahrenheit



  if (isnan(h) || isnan(t))
    {
    Serial.println("Failed to read Data from sensors!");
    return;
    }
    else
    {
       Serial.print(t);
```

```
      Serial.println("ºC");
      Serial.println("---------------------------------");

    }
 Blynk.virtualWrite(V1, h);
  Blynk.virtualWrite(V0, t); // Virtual Pin V5 for Temprature
if(t>32){digitalWrite(fan,LOW);
Blynk.logEvent("temp_alert","Over Temperature ");

 sim.println("AT+CMGF=1");
  delay(1000);
  sim.println("AT+CMGS=\"" + number + "\"\r");
  delay(1000);
  String SMS = "Be Alert over temperature.";
  sim.println(SMS);
  delay(100);
  sim.println((char)26);
  delay(2000);

sim.print (F("ATD"));
  sim.print (number);
  sim.print (F(";\r\n"));

 digitalWrite(bz,HIGH);
  delay(1000);
```

```
  digitalWrite(bz,LOW);
  delay(1000);
}
else{digitalWrite(fan,HIGH);}
}

void setup()
{
   Serial.begin(9600);

pinMode(fan, OUTPUT);
pinMode(pump, OUTPUT);
pinMode(bz, OUTPUT);
  pinMode(fire,INPUT);
  pinMode(smoke,INPUT);
Blynk.begin(auth, ssid, pass, "blynk.cloud", 80);
dht.begin();
  timer.setInterval(1000L, sendSensor);
Serial.println("Wait few seconds...");
  delay(5000);
  sim.begin(9600);
  delay(1000);}

void loop()
{ Blynk.run();
```

```
timer.run();
    {
  if (sim.available() > 0)
    Serial.write(sim.read());
}


  fire1= digitalRead(fire);
  smoke1= analogRead(smoke);
  Serial.println("Ga:");
  Serial.println(smoke1);
  delay(500);
   if(fire1==LOW)
   {
   Serial.println("Fi HI");
   Blynk.logEvent("fire_alert","Fire Detected");
 sim.println("AT+CMGF=1");
  delay(1000);
  sim.println("AT+CMGS=\"" + number + "\"\r");
  delay(1000);
  String SMS = "Be Alert Fire Detected";
  sim.println(SMS);
  delay(100);
  sim.println((char)26);
  delay(2000);
```

```
  sim.print (F("ATD"));
  sim.print (number);
  sim.print (F(";\r\n"));

  digitalWrite(bz,HIGH);
  delay(1000);
  digitalWrite(bz,LOW);
  delay(1000);
digitalWrite(pump,LOW);

}
else{digitalWrite(pump,HIGH);}


    if(smoke1<400)
    {
      Serial.println("GA HI");
      Blynk.logEvent("gas_alert","Be Alert Gas leaking!!");
 sim.println("AT+CMGF=1");
  delay(1000);
  sim.println("AT+CMGS=\"" + number + "\"\r");
  delay(1000);
  String SMS = "Be Alert Gas leaking.";
  sim.println(SMS);
  delay(100);
```

```
  sim.println((char)26);
  delay(2000);

  sim.print (F("ATD"));
  sim.print (number);
  sim.print (F(";\r\n"));

   digitalWrite(bz,HIGH);
  delay(1000);
  digitalWrite(bz,LOW);
  delay(1000);
}

}
```