MINI PROJECT REPORT ON

SMART WATER MANAGEMENT SYSTEM USING IOT

Submitted By

B. Veera Goutham	[19BEC010]
D. Witty Elijah	[19BEC011]
G. Chetan Sai	[19BEC013]
JK Naveen	[19BEC018]

Under The Esteemed Guidance Of

Dr. Prakash Pawar,

Assistant Professor, Dept. of E.C.E

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY

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INTRODUCTION

- The idea behind this project is to control the water pumps using our mobiles with the help of internet and radio waves emittied from a SIM card.
- Here, We bring an application to control our System. Also, In the absence of network, cellular network(radio waves) is used to control the system
- A percentage of 40% increase is expected in water demand over the period of next two decades
- Water is an important need of all Human Beings. With the rapid growth in population, the need to preserve water is gaining great importance.
- Many Water Management Systems using different technologies were performed in the past which very expensive. But the IOT based water management system which is relatively much cheaper, helps us conserve water by connecting the pumps, tanks,.... to our mobiles through Internet.
- In our project, we use a free IOT Cloud Platform "Blynk" to upload our data to the cloud and to control the water pump. The Blynk app uses internet to work. Incase of no internet, a GSM module is also connected to control the motor pumps.
- This project can be further developed and be deployed in our college. It helps in unnecessary wastage of water through taps, overflowing of tanks, and in many other ways also

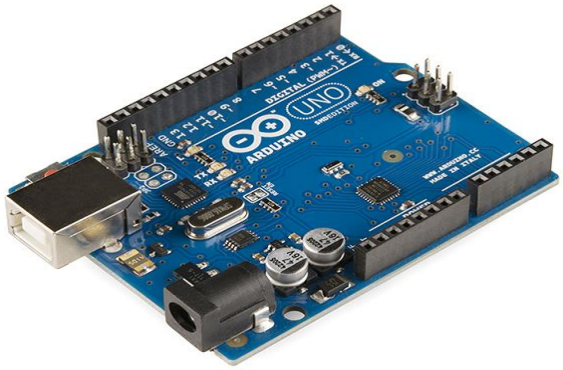
OVERVIEW OF PROPOSED SYSTEM

The idea behind this project **"Smart Water Management System"** is to monitor the water level in the tank and turn on the pumps whenever the tank is about to be emptied.

We are able to establish communication between the micro-controller and pump (relay module) and control it with blynk, a free IoT cloud platform. But the blynk works with Wi-fi. When there is no internet availability, we have connected a GSM module so that we can turn off and on the relay module using our mobile (cellular reception).

COMPONENTS REQUIRED

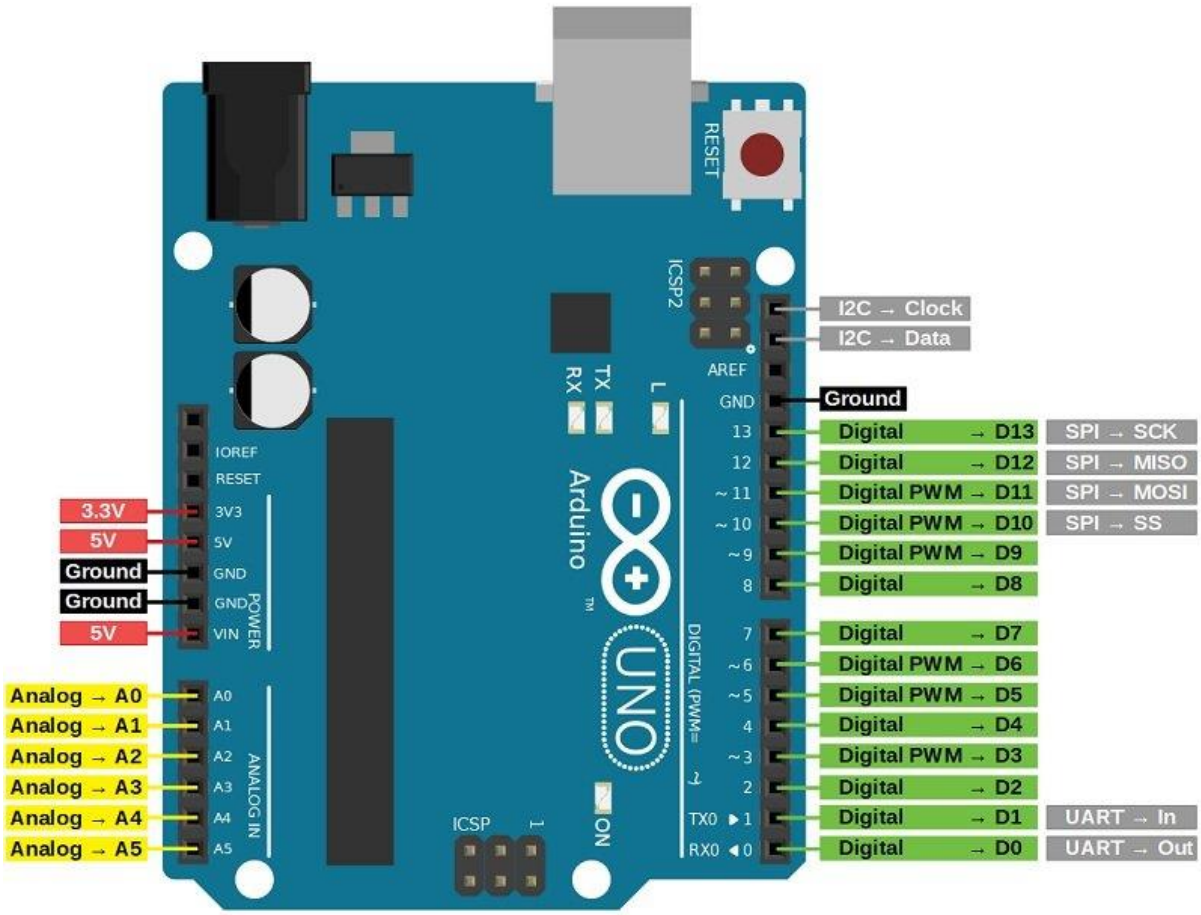
ARDUINO UNO



Arduino UNO

Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), 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 an AC-to-DC adapter or battery to get started. You can tinker with your Uno without worrying too much about doing something wrong, worst-case scenario you can replace the chip for a few dollars and start over again.

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.



Pins in Arduino UNO

Features of Arduino UNO:

- Microcontroller: ATmega328
- Operating Voltage: 5V
- Input Voltage (recommended): 7-12V
- Input Voltage (limits): 6-20V
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- Analog Input Pins: 6
- DC Current per I/O Pin: 40 mA
- DC Current for 3.3V Pin: 50 mA
- Flash Memory: 32 KB of which 0.5 KB used by bootloader
- SRAM: 2 KB (ATmega328)
- EEPROM: 1 KB (ATmega328)
- Clock Speed: 16 MHz

GSM MODULE

GSM 800C

SIM800C is a quad-band GSM/GPRS module that works on frequencies GSM850MHz, EGSM900MHz, DCS1800MHz and PCS1900MHz. SIM800C features GPRS multi-slot class10/class12 (optional) and supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4.

With a tiny configuration of 17.6*15.7*2.3mm, SIM800C can meet almost all the space requirements in customers' applications, such as smart phone, PDA and other mobile devices.

SIM800C is a SMT package with 42 pads, and provides all hardware interfaces between the module and customers' boards.

- One 3 lines serial port and one full modem serial port;
- One USB, the USB interface can debug, download software;
- One audio channel which include a microphone input and a speaker output;
- Programmable general-purpose input and output;
- One SIM card interface;
- Support Bluetooth (need software support).

SIM800C is designed with power saving technique so that the current consumption is as low as 0.6mA in sleep mode.

RELAY MODULE

The Single Relay Board can be used to turn lights, fans and other devices on /off while keeping them isolated from your microcontroller. The Single Relay Board allows you to control high-power devices (up to 10 A) via the on-board relay. Control of the relay is provided via a 1 x 3 header – friendly to servo cables and convenient to connect to many development boards.

Relay Module

Specifications:

- Supply Voltage -5V
- Control high-power devices up to 10 A with a simple high/low signal
- Provides isolation between the microcontroller and device being controlled
- Screw terminals for relay connections
- 3-pin servo-style header for power/signal interface
- Equipped with a high-current relay (10A @ 28VDC)
- 2xLED's that show the current state of the relay

Interface:

The output contacts of a relay (including NO, NC, and the common port) works as a SPDT – Single Pole Double Throw switch. Its operating principle is as follow: VCC----5V, GND----for ground IN1 connects to the control valve which output 3V 5V Output contacts: connect to applications.

DC Mini Submersible Water Pump:

Micro dc 3-6v micro submersible pump mini water pump for fountain garden mini water circulation system diy project dc 3v to 6v submersible pump micro mini submersible water pump 3v to 6vdc water pump for diy dc pump for hobby kit mini submersible pump motor this is a low cost, small size submersible pump motor which can be operated from a 2.5 ~ 6V power supply. It can take up to 120 liters per hour with very low current consumption of 220ma. Just connect tube pipe to the motor outlet, submerge it in water and power it. Make sure that the water level is always higher than the motor. The dry run may damage the motor due to heating and it will also produce noise.

FEATURES:

- Voltage: 2.5-6V
- Maximum lift: 40-110cm / 15.75"-43.4"
- Flow rate: 80-120L/H
- Outside diameter: 7.5mm / 0.3"
- Inside diameter: 5mm / 0.2"
- Diameter: Approx. 24mm / 0.95"
- Length: Approx. 45mm / 1.8"
- Height: Approx. 30mm / 1.2"
- Material: Engineering plastic
- Driving mode: DC design, magnetic driving

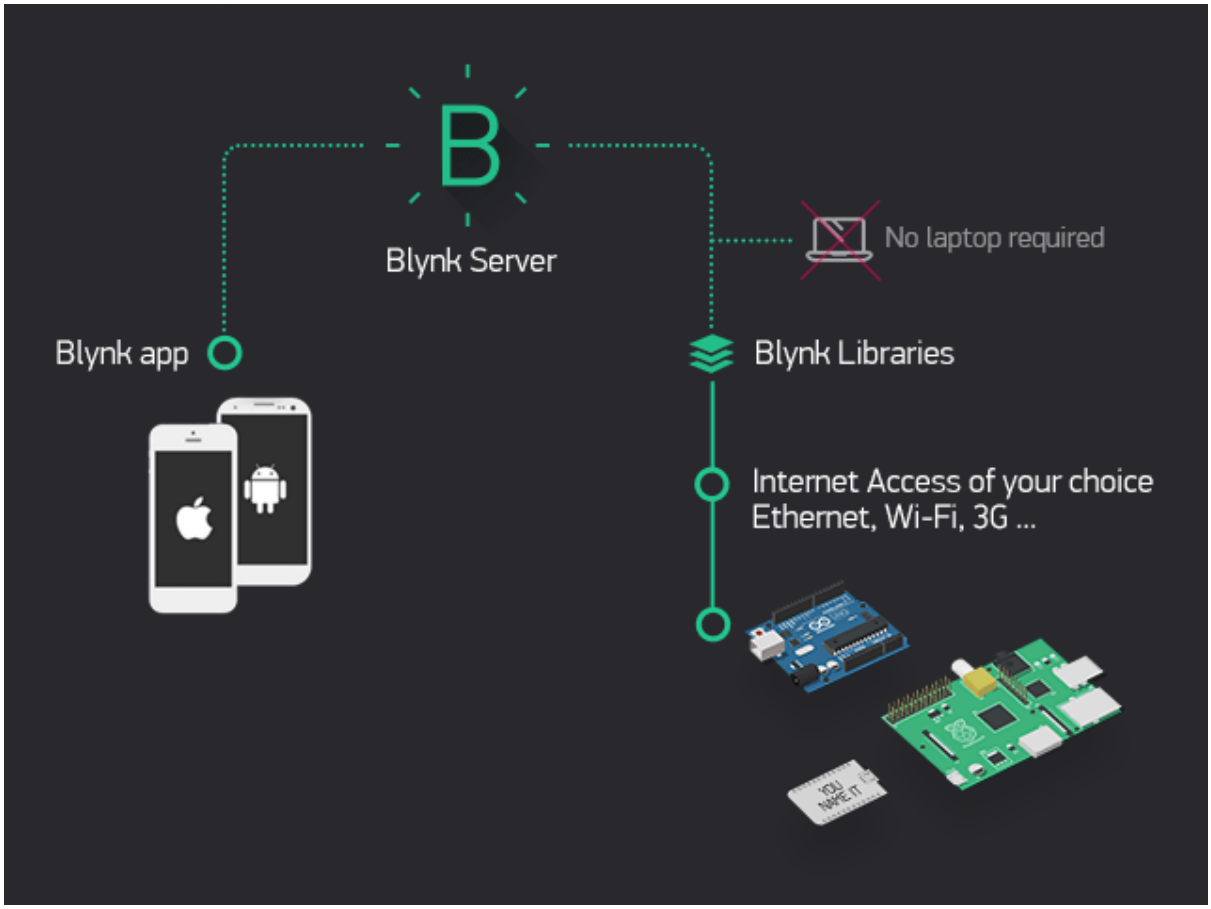
APPLICATIONS:

- Controlled fountain water flow
- Controlled Garden watering systems

• Hydroponic Systems
• Fresh water intake or exhaust systems for fish aquarium

BLYNK APP

Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, vizualize it and do many other cool things.
Every time we press a Button in the Blynk app, the message travels to the Blynk Cloud, where it magically finds its way to your hardware. It works the same in the opposite direction and everything happens in a blynk of an eye.



INTERNET of THINGS

The IoT allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit. The Internet of Things is the network of physical objects devices, vehicles, buildings and other items embedded with electronics, software, sensors, and network connectivity that enable these objects to collect and exchange data.

The concept of the Internet of Things shown in fig2.13(a) first became popular in 1999, through at MIT related market analysis publication. Integration with the internet implies that devices will use the IP address as a unique identifier. Due to the limited address space of IPv4 (which allows for 4.3 billion unique addresses), objects in the IOT will have to use IPv6 to accommodate the extremely large address space required.

Internet of Things

Internet of Things (lot) is extension of current internet to provide communication, connection, and internetworking between various devices or physical objects also known as "Things". IOT term represents a general concept for the ability of network devices to sense and collect data from the world around us, and then share that data across the Internet where it can be processed and utilized for various interesting purposes.

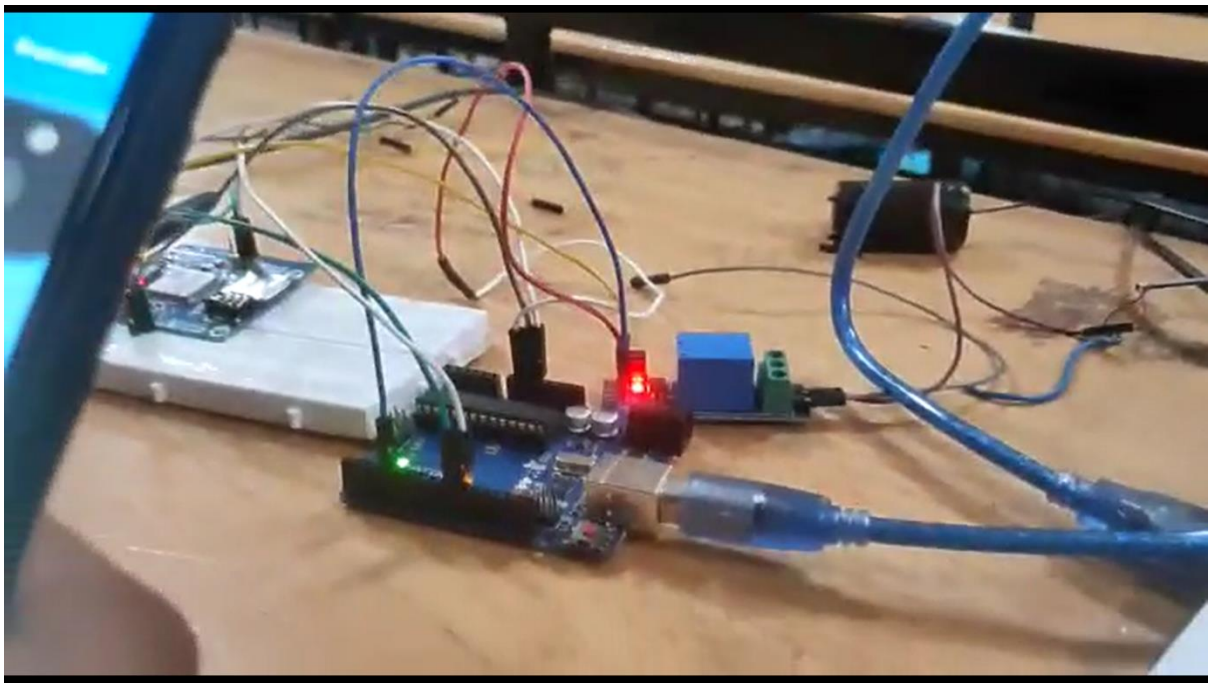
The IoT is comprised of smart machines interacting and communicating with other machines, objects, environments and infrastructures. Now a day's every person is connected to each other using lots of communication way, where most popular communication way is internet so in another word, we can say internet which connect peoples can connect things too.

Why Is IoT Important?

Before we can begin to see the importance of IOT, it is first necessary to understand the differences between the Internet and the World Wide Web (or web) terms that are often used interchangeably. The Internet is the physical layer or network made up of switches, routers, and other equipment. Its primary function is to transport information from one point to another quickly, reliably, and securely. The web, on the other hand, is an application layer that operates on top of the Internet. Its primary role is to provide an interface that makes the information flowing across the Internet usable.

When we crossed the threshold of connecting more objects than people to the Internet, a huge window of opportunity opened for the creation of applications in the areas of automation, sensing, and machine-to-machine communication. In fact, the possibilities are almost endless. The following examples highlight some of the ways IOT is changing people's lives for the better.

CIRCUIT DIAGRAM



Circuit Diagram

Working

First, we will install the necessary GSM and Arduino libraries in Arduino IDE, then we write the code to establish the connection between Arduino, GSM, Relay module.

Click on it and Arduino will upload the files under the data Directory to your system Include the libraries Programming part of this project plays a very important role to perform all the operations. First of all, we include required libraries and initialize variables.

Set up code

The auth token and sent from the BLYNK cloud platform is set in the program and then the mobile number installed in GSM module are defined Put set up code in void set up loop

Main code

put the main code to run repeatedly in BLYNK cloud platform when temperature changes enter the read and write statements and ppm values are

displayed in the think speak cloud platform and a delay of 8s is given to read the readings continuously if air is good or not.

SET UP BLYNK APPLICATION

- Create a New Project in BLYNK app as shown in the fig 2.3
- Write Project Name and Select Arduino UNO from dropdown.
- An AUTH token will be sent to your registered email, note this down.
- Tap on the screen and add a Gauge
- Tap on the Widget and select the respective Virtual pin for switching on the motor on/off. (V1 here)

MODEL-2:

First, we will install the necessary GSM and Arduino libraries in Arduino IDE, then we write the code to establish the connection between Arduino, GSM, Relay module.

Click on it and Arduino will upload the files under the data Directory to your system Include the libraries Programming part of this project plays a very important role to perform all the operations. First of all, we include required libraries and initialize variables.

After establishing connection between GSM module and Arduino, we make a call for the registered mobile number in the GSM module.

If the phone is ringing means, it is ready to send the data or status off the motor through message to the calling number, that the motor is on /off.

Again, we make a call to the to the GSM module, whether to know the status of motor or switch of the motor.

So, by using a simple phone call we can control the motor pump and we can also upload it to the cloud and see the status of the motor pump.

APPLICATIONS

The major applications of air quality monitoring are

1)Industrial perimeter monitoring 2) Indoor air quality monitoring.
3) Site selection for reference monitoring stations. 4)Making data available to users.

In the mining, power, petrochemical, construction and bulk handling industries our customers are under increasing pressure to mitigate their impact on the surrounding environment. Air quality regulation is shifting the burden from publicly funded monitoring to monitoring funded by industry (with public oversight). Indoor air quality (IAQ) broadly refers to the indoor environmental characteristics inside that may affect human health, comfort, or work performance. Unlike outdoor air, indoor air does not recycle continuously causing it to trap and build up pollutants. Poor IAQ contributes to both short- and long-term health issues which can lead to low productivity, absenteeism and impaired decision making in the office environment. Indeed, it is very important to monitor the air in your premises.

Real-time monitors can be used for detection of pollutant sources and provide information on the variation of pollutant levels throughout the day. An air monitoring device called Laser Egg, a half egg shaped sleek digital device, is indeed one of the best indoor air quality monitors to detect the bad air in your premises in real time. Maintaining good indoor air quality in a building is critical for ensuring a safe and comfortable working environment. Poor indoor air quality can lead to what is known as “sick building syndrome” or SBS, of which symptoms include loss of concentration, fatigue, headaches, breathing difficulties and nausea. This can lead to lack of productivity and even lead to staff having to take time off to recover, especially those with existing medical conditions such as asthma.

CONCLUSION AND RESULT

- Hence, we can conclude that we use this project to monitor the Water Management system in the surroundings around us. At the end of the project, we will be able to operate the water motor with a phone call i.e., whenever I call to a number, the motor starts working and whenever I call the same number again the motor stops working/is turned off.
- We have tried using GSM 800L, but the results were not as expected i.e., the turning off and turning on of the motor didn't work out, because it may be a faulty equipment.

- So, we have implemented the project with another GSM module which is, GSM 800C.
- We tried implementing the project with LORA modules, but was not successful since, we have very limited knowledge regarding LORA modules.
- We have also integrated the project with the cloud platform, The Blynk, through which we were able to control the motor function (on/off) and we were also able to count the data regarding the time which the motor is on/Off and upload the data over cloud.
- This project could be our first implementation towards a bigger and better Smart Water Management system with many other sensors.

FUTURE SCOPE

- Regardless of the IoT application developed, when using the ESP8266, we must set the Wi-Fi credentials into the ESP8266's firmware to establish the required connections and be able to send data to the cloud. This is one way to connect, but we can also build our own access point into the board making a universal firmware which will establish a connection in any network available just by pressing a button.
- As we know that this project has a tremendous work that can be done on in future, if we try implementing the same project on large scale this might be a remarkable project.
- We can improve the communication between the pumps by implementing LORA modules instead of GSM modules so that the communication can be done over long ranges and with very low latency.
- We can also improve the amount of Information that is being transmitted i.e., implementing more sensors like water level sensor and water purity checking sensors etc... and also the data that is being uploaded into cloud.
- We can also try implementing this project in our Institute itself by improving all the components by providing better range and low latency connections and a better communicating module than GSM.

Arduino Code for Blynk app

```
#define BLYNK_PRINT Serial
#include <TinyGsmClient.h>
#include <BlynkSimpleTinyGSM.h>
char auth[] = "1v94y8QnWqGPv-j4HBkIZYH5M2_MTta6";


char apn[]  = "airtelgprs.com";
char user[] = "";
char pass[] = "";


#include <SoftwareSerial.h>
SoftwareSerial SerialAT(10, 11);
// RX, TX
TinyGsm modem(SerialAT);
void setup()
{
  // Debug console
  Serial.begin(9600);
  delay(10);
  // Set GSM module baud rate
  SerialAT.begin(9600);
  delay(3000);
  Serial.println("Initializing modem...");
  modem.restart();
  Blynk.begin(auth, modem, apn, user, pass);
```

```
}

void loop()

{

  Blynk.run();

}
```

Arduino code for GSM Module:

```
#include <SoftwareSerial.h>

int relayPin=4;

bool relayStatus=1;

const String phone= "+919849819199";  // white list phone include +91 or your country code

SoftwareSerial gsmSerial(10,11 );


String responseData;

String senderNumber;

void setup(){

  responseData.reserve(200);

  phone.reserve(20);

  pinMode(relayPin,OUTPUT);

  digitalWrite(relayPin,HIGH);

  Serial.begin(9600);
```

```
  gsmSerial.begin(9600);
  delay(100);
  gsmSerial.write("AT\r");// because of SIM800L autobounding mode
  delay(100);
  gsmSerial.write("AT+IPR=9600\r");
  delay(100);
  gsmSerial.write("AT+CMGF=1\r");
  delay(500);
  gsmSerial.write("AT+CNMI=2,2,0,0,0\r");
  delay(100);
  Serial.print(gsmSerial.readString());
  gsmSerial.write("AT+CLIP=1\r\n");
  delay(100);
}
void loop(){
  if (gsmSerial.available()>0) {
    responseData = gsmSerial.readStringUntil('\n');
    Serial.println(responseData);
    parse();
    delay(1000);
  }
}

void parse(){
  if (responseData.indexOf("CLIP:")>0){
```

```
  senderNumber=responseData.substring(responseData.indexOf("+CLIP: ")
+8,responseData.indexOf("+CLIP: ") +21); //PARSE CALLER ID
  Serial.println("Caller number   :");
  Serial.println(senderNumber);
   if (senderNumber == phone){
    Serial.println("Sender number White list : ok");
    relayStatus=!relayStatus;
    digitalWrite(relayPin,relayStatus);
    gsmSerial.write("ATH\r");  // disconnect call & then send SMS
    gsmSerial.print("AT+CMGS=\""+phone+"\"\r");
    delay(1000);
    gsmSerial.print("Relay status 1:off 0:on  ");
    gsmSerial.print(relayStatus);
    delay(200);
    gsmSerial.write(0x1A); //  ctrl+z to send message
    delay(100);
     }
    gsmSerial.write("ATH\r");
    delay(500);
  }
}
```