A
Project Report
on

"Smart Agriculture Control System"

Submitted By

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ABSTRACT

India is basically an agricultural country, and all its resources depend on the agricultural output. Today the Agriculture is becoming Smart by using automatic techniques. But in India, Many Farmers are not being acquainted to it. It is being noticed that in most of cases the crop-fields are located far away from farmer's residence. Farmers have to travel significant distances to go to their fields. We know that irrigation and water management is essential part of agriculture. Our main motive is to make it Smart! We are building Arduino based Smart Agriculture Motor System using GSM Module. It aims to be very convenient and affordable for the people of rural areas. The purpose behind building such projects is that the smart devices tend to decrease waste and increase efficiency which maximizes capabilities while minimizing cost.

ACKNOWLEDGEMENT

We wish to express our profound and deep sense of gratitude to Mr. B. G. Patil sir,Project Guide, Department of Electronics Engineering for sparing his valuable time to extend help in every step of our project work. We are mainly indebted to the authors of many references and articles which were usedas the reference. Last but not the least we would like to thank our friends and family for their help inevery way for the success of this project report.

CHAPTER 1

1. Introduction

Agriculture is the backbone of the Indian economy. It is a crucial sector that employs a large population and provides food for the entire country. To achieve better agricultural production and efficiency, the use of technology in agriculture is becoming increasingly popular. One such technology is GSM based agricultural motor control using Arduino. The main objective of this project is to remotely control the agricultural motor using a GSM module and Arduino microcontroller. This system can be used by farmers to operate the motor pump from a remote location using their mobile phones. It eliminates the need for manual switching and reduces the time and effort required to control the motor.

1.1. Background

As technology becomes increasingly important in today's world, it is invaluable to not only learn how to use technology, but also to understand how to create it. Since being an engineer, one should have sound knowledge of the other discipline. Most of the projects have limited scope to only specific disciplines. This would limit one's innovation and creativity. This project inspires to make connections across several disciplines rather than learning topics in isolation as it combines mechanical, electronic, electrical and programming skills.

1.2. Motivation

Following are reasons due to which we find this project important:

- Remote control of motor pumps via GSM leads to increased **convenience and efficiency** in agricultural operations.
- The use of this technology can lead to **cost savings for farmers** by reducing labor, travel, and energy expenses.
- Ensuring adequate and timely water supply leads **to increased agricultural productivity and yield**.
- This technology promotes **sustainable farming practices** by conserving water resources and reducing energy consumption.

1.3. Problem Description

The traditional method of controlling motor pumps used in agriculture involves manual switching which is a time-consuming process and requires physical presence near the motor, making it difficult in remote or large farms. In addition, the use of traditional methods for controlling motor pumps requires significant energy usage, which can be costly and environmentally unfriendly. The inaccurate monitoring of water supply can also lead to under or over-irrigation, which can affect crop yield and quality. The limited access to water resources can lead to water scarcity, affecting crop productivity and the livelihood of farmers. Furthermore, the lack of automation in agriculture can limit the efficiency of operations and restrict the adoption of sustainable farming practices.

1.4. Objectives

The objectives of the project are:

- To design and implement a GSM based agricultural motor control system using Arduino.
- To develop a low-cost and efficient system that can be easily installed and maintained.
- To optimize the use of resources and reduce water wastage by controlling the water supply to the crops based on their actual requirements.
- To increase crop yield and quality by providing adequate water and reducing stress due to under or over-watering.

CHAPTER 2

2. Technology and Literature Survey

1. **"GSM-Based Smart Irrigation Control System" by K. Lalitha and D. Durga Prasad.**

In past few years, automatic irrigation system has seen a rapid growth in terms of technology. At present cost-saving technology, labour-saving is the addressing key issues in irrigation. This paper gives a review of these systems based on existing technologies and also proposes an economical and generic automatic irrigation system based on wireless sensors with GSM

2. **"A smart farming concept based on smart embedded electronics, internet of things and wireless sensor network" by Mobasshir Mahbub**

Our farmers are depending on the traditional strategies like the manual circulation of seeds and furrowing, two harvests in a year method, unscientific frameworks of cultivation. Advanced farming methods are much needed to approach the necessity of foods of this growing number of people. In the recent few years, smart farming systems based on embedded systems and the Internet of Things (IoT) getting attraction and popularity among people to enhance food production for people. This paper has prescribed farming systems based on the embedded systems, IoT and wireless sensor networks.

2.1. Block Diagram

The smart agriculture control system project is divided in to following blocks:

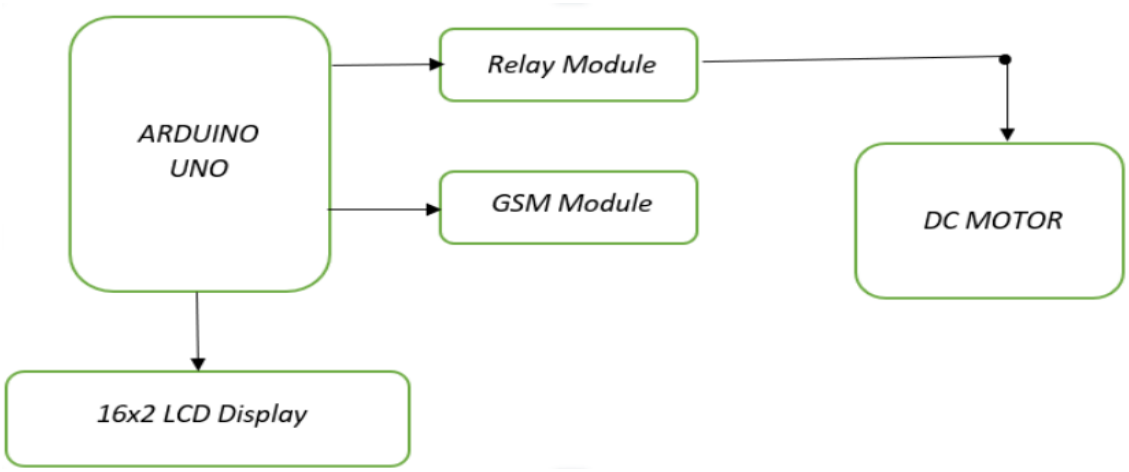


Figure 2.1: Block Diagram of Smart Agriculture control system

2.2. Hardware Required

2.3.1. Arduino UNO

Arduino is an open-source platform used for building electronics projects. Arduinoconsists of both a physical programmable circuit board and IDE that runs on your computer, usedto write and upload computer code to the physical board. The Arduino IDE uses a simplified version of C++, making it easier to learn to program.

- Processor: 16 MHz ATmega328
- Flash memory: 32 KB
- Ram: 2kb
- Operating Voltage: 5V
- Input Voltage: 7-12 V
- Number of analog inputs: 6
- Number of digital I/O: 14 (6 of them pwm)

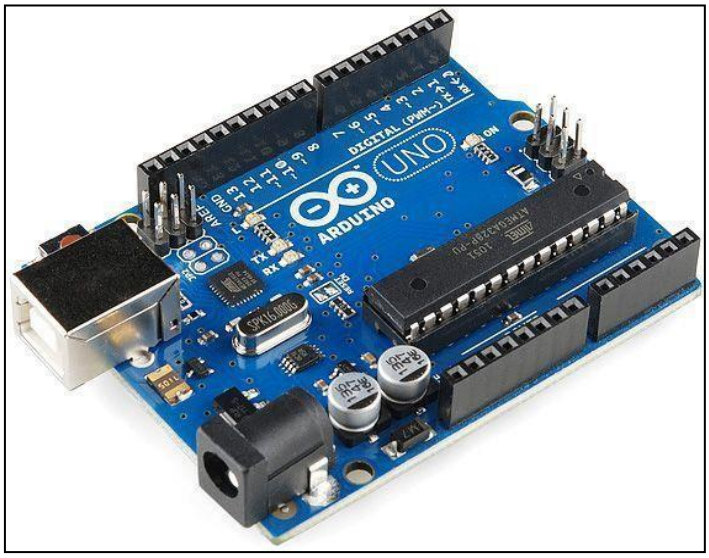


Figure 2.2: Arduino UNO

2.3.1. DC Motor Pump

DC motor pumps are commonly used in smart agriculture systems due to their efficiency, reliability, and low power consumption. These pumps operate using direct current (DC) electricity and convert it into mechanical energy, which is used to pump water or other fluids. In a smart agriculture control system, the DC motor pump can be controlled using an Arduino microcontroller and a GSM module.

Figure 2.3: DC Motor Pump

2.3.2. GSM-Module

The main purpose of our smartphone/cellular phone is to receive and make calls and send SMS, this task is achieved by GSM/GPRS module integrated into the device. GSM module is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. It can be handled with multiple AT commands to perform various tasks**.** In our project the GMS module is connected to Arduino. When the farmer shoots a message to turn ON the motor, it will be received by the GSM module. Then GSM module forwards this message as a signal to the Arduino board.

Figure 2.4: GSM Module

2.3.3 Relay

A relay is an electrical device that is used to control the flow of electric current in a circuit. It is essentially an electromechanical switch that is operated by an electric current. Relays are used in a wide range of applications, including controlling high voltage circuits, switching power to devices, and providing isolation between circuits. They are commonly used in automation systems, automotive applications, and industrial control systems, among others. The main purpose of a relay is to allow low power circuits to control high power circuits without the need for direct electrical connections between them. In our project we are using relay for turning on/off motor pump.

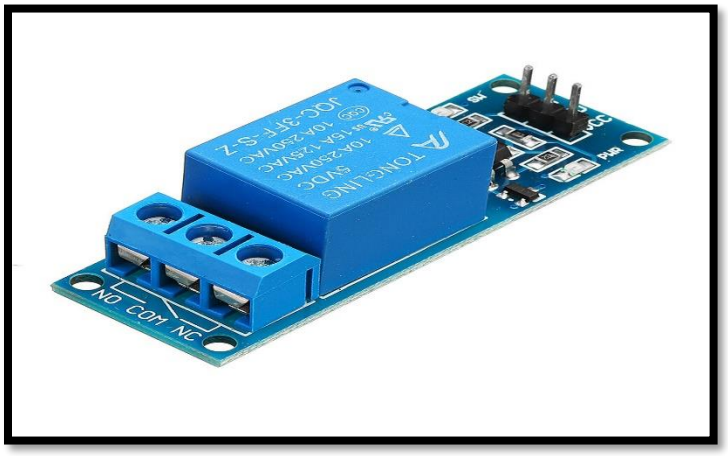
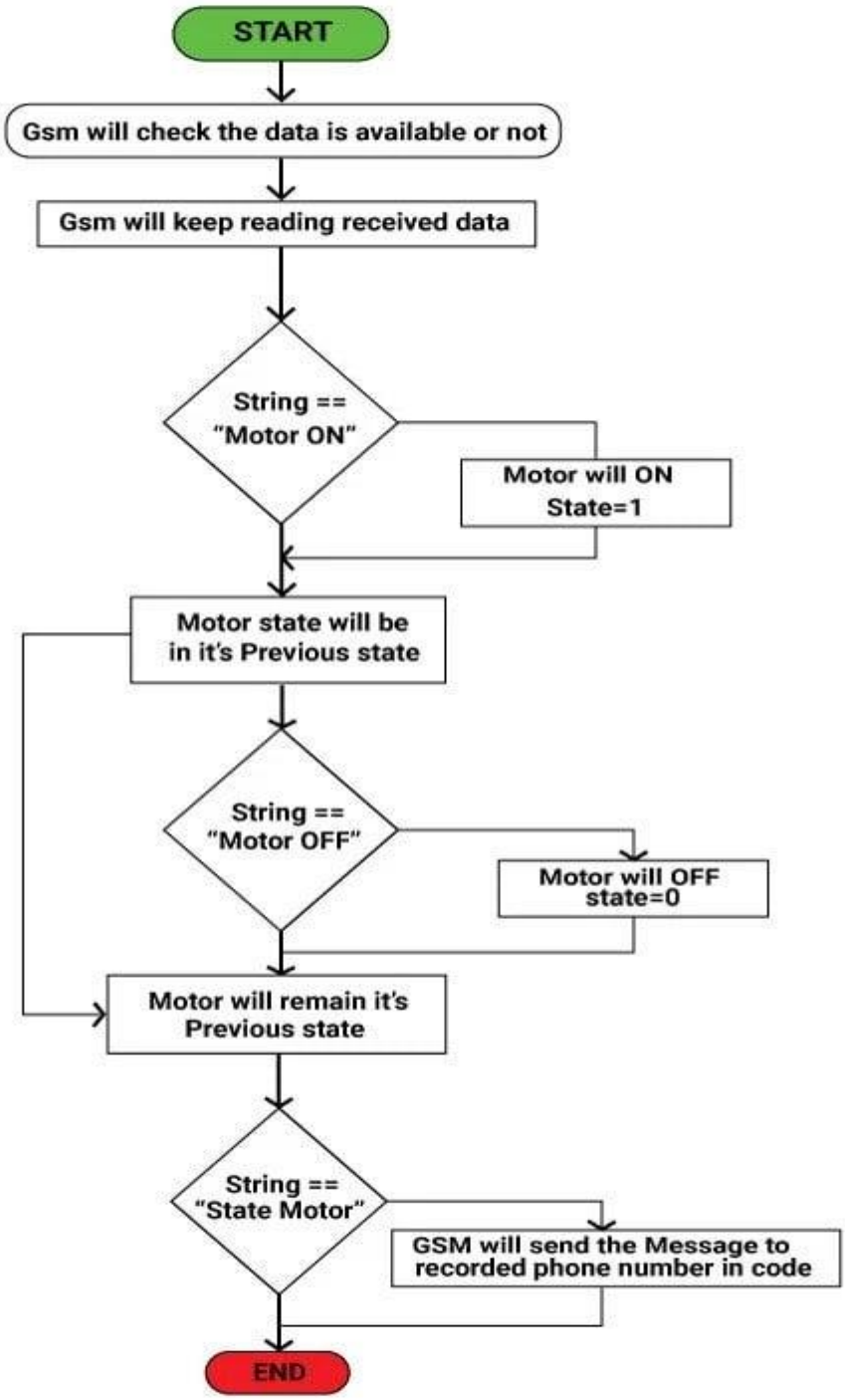


Figure 2.5: Relay

2.3. Software Required

For the simulation of the circuit, Proteus software is used. For coding and uploading thesketch, the Arduino IDE is used.

2.4. Flow Chart



CHAPTER 3

3. Design and Implementation

3.1. Schematic

The schematic of the "Smart Agriculture control system" is shown in the figure. The main component is the Arduino Uno. Schematic is drawn by using Proteus. The main features incorporated into the hardware are given below:

- Arduino Uno.
- GSM Module
- LCD 16X2Display
- DC Motor
- Relay
- Connectors to join the different boards to form one functional device. Each of the hardware is dissected and was designed/implemented separately for their functional and later incorporated as one whole application. This helped in the debugging processes.

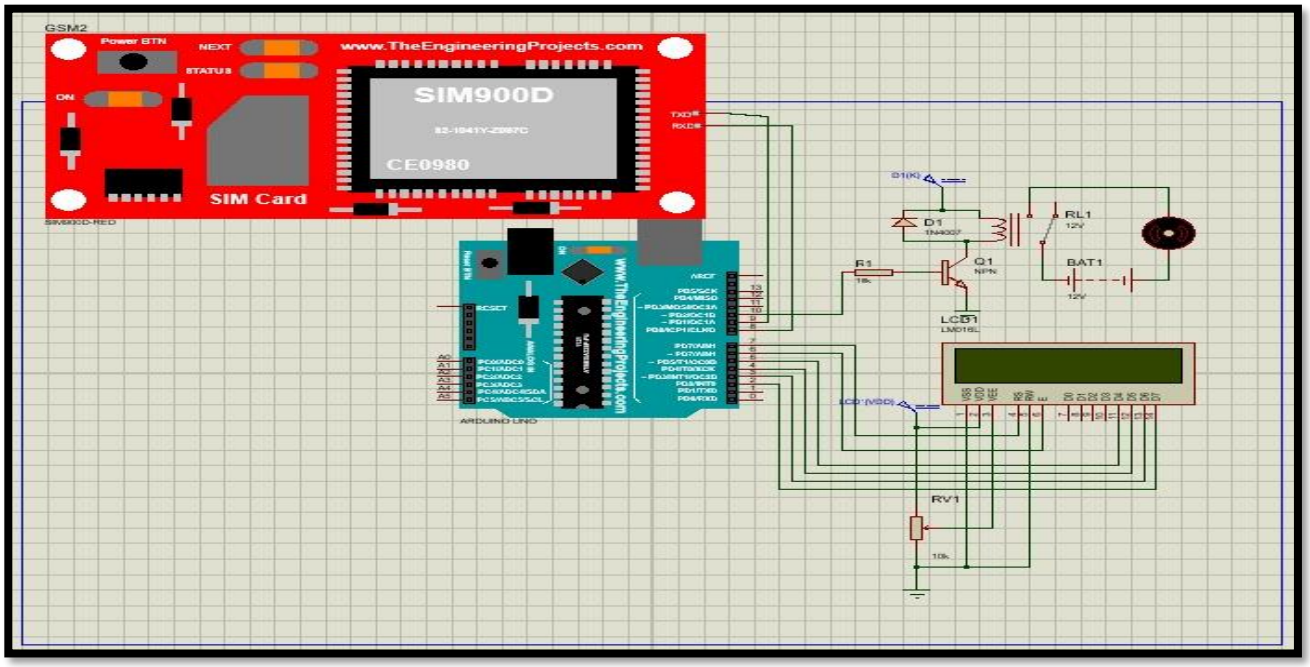


Figure 3.1: Circuit Diagram

3.2. Working of Smart Agriculture control system

- The system uses a GSM module and an Arduino board for its functioning.
- The farmer sends a message to the GSM module to turn ON the motor.
- The GSM module forwards this message to the Arduino board.
- The Arduino board receives the message and makes the relay input HIGH.
- This action turns ON the motor pump, and the smart irrigation system starts supplying water to the crops.
- Similarly, when the farmer sends a message to turn OFF the motor, the relay output is made LOW. This shuts down the water pump and stops the irrigation process.

3.3. Hardware of The Project

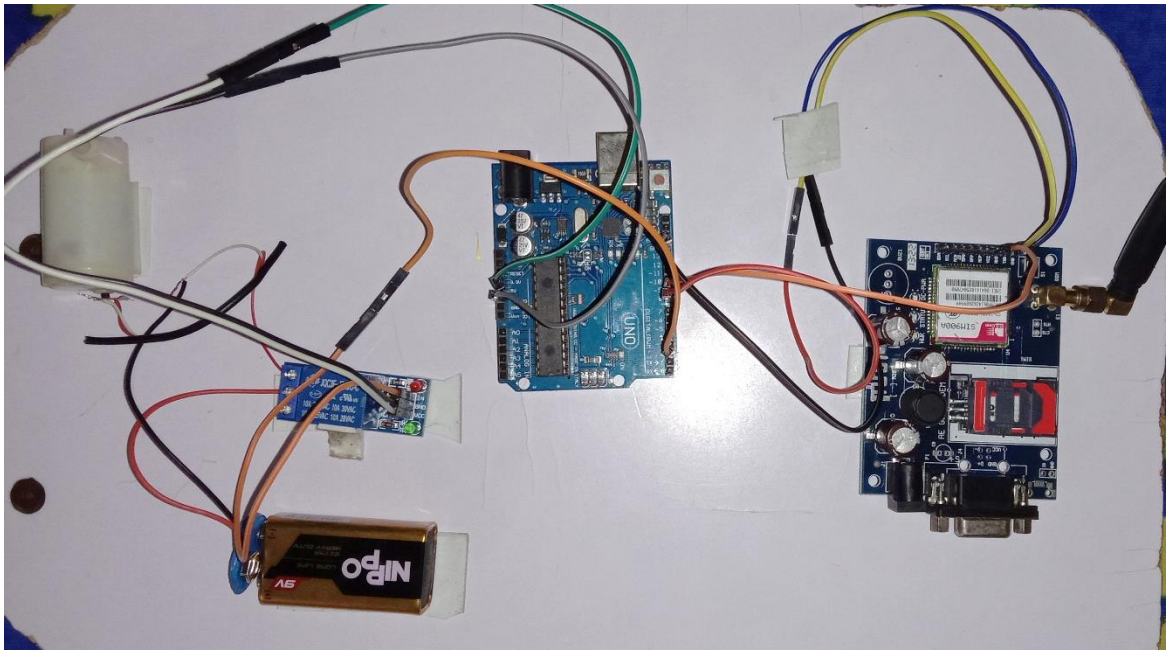


Fig 3.2 Hardware of Project

CHAPTER 4

4.1. Applications

1. **Agriculture**: GSM based agricultural motor control can be used to remotely control irrigation systems and motor pumps, ensuring that crops receive adequate and timely water supply.
2. **Industrial Automation:** This technology can be applied in industrial automation for controlling various machines and equipment remotely using GSM technology.
3. **Security:** GSM based systems can be used for remote surveillance and control of security systems such as cameras, alarms, and door locks, providing a secure and safe environment.
4. **Transportation:** The technology can be used in transportation systems for remote monitoring and control of vehicles, helping in improving safety and reducing maintenance costs.
5. **Healthcare**: This technology can be used in healthcare for remote patient monitoring and management, enabling patients to receive medical care remotely.

4.2. Advantages

1. **Remote Access:** The ability to remotely control the motor pumps from a mobile phone or computer allows farmers to operate their pumps from a distance and saves time and effort.
2. **Cost Savings:** The use of this technology reduces labor, travel, and energy expenses, making it a cost-effective solution for agricultural operations.
3. **Improved Efficiency:** Automation of the motor pump control process leads to improved efficiency in agricultural operations, reducing the need for manual intervention.
4. **Timely Water Supply:** The accurate monitoring and control of water supply ensure that crops receive adequate and timely water supply, leading to increased agricultural productivity and yield.
5. **Sustainability:** The use of this technology contributes to sustainable farming practices by conserving water resources and reducing energy consumption, promoting environmental conservation.

4.3. Disadvantages

1. **Limited Network Coverage:** The effectiveness of the technology depends on the network coverage, which can be limited in some remote areas, affecting the reliability of the system.
2. **Dependence on Technology:** The reliance on technology can pose a risk of system failure or malfunction, which can be difficult to fix in remote areas.

4.4. Conclusion

GSM-based agricultural motor control using Arduino provides an efficient, cost-effective, and sustainable solution for controlling motor pumps remotely. This technology helps farmers to save time, reduce costs, increase productivity, and promote sustainable farming practices. Despite some disadvantages such as network coverage limitations, security risks, the benefits of this technology outweigh the drawbacks. Overall, this project has the potential to significantly impact the agricultural sector by enabling farmers to optimize their irrigation systems and improve their agricultural yield while promoting environmental conservation.

COST ESTIMATION

Sr. No.	Name of Component	Quantity	Price Rs.
1)	Arduino	1	**325**
2)	GSM Module	1	**849**
3)	Motor Pump	1	**96**
4)	Relay	1	**75**
		Total Rs.	**1345/-**

Table 2: Cost of Project

APPENDICES

Program:

```
#include <EEPROM.h>
#include <SoftwareSerial.h>
SoftwareSerial GSM(8, 9);


String phone_no1 = "+91XXXXXXXXXX";

String        RxString  = "";
char          RxChar    = ' ';
int           Counter   = 0;
String        GSM_Nr    = "";
String        GSM_Msg   = "";

#define motor 2
int load1;
void setup()
{

      pinMode(motor, OUTPUT); digitalWrite(motor, 1);
      Serial.begin(9600);
      GSM.begin(9600);

      Serial.println("Initializing....");
      initModule("AT","OK",1000);
      initModule("AT+CPIN?","READY",1000);
      initModule("AT+CMGF=1","OK",1000);
      initModule("AT+CNMI=2,2,0,0,0","OK",1000);
      Serial.println("Initialized Successfully");

      load1 = EEPROM.read(1);
      relays();
      delay(100);
}

void loop()
{
      RxString = "";
      Counter = 0;
      while(GSM.available())
      {
            delay(1);
            RxChar = char(GSM.read());
            if (Counter < 200)
            {
                  RxString.concat(RxChar);
                  Counter = Counter + 1;
```

```
            }
        }

        if (Received(F("CMT:")))
            GetSMS();

        if(GSM_Nr==phone_no1)
        {

            if(GSM_Msg=="motoron")
            {
                load1=0;
                sendSMS(GSM_Nr,"Motor is ON");
            }
            if(GSM_Msg=="motoroff")
            {
                load1=1;
                sendSMS(GSM_Nr,"Motor is OFF");
            }



            if(GSM_Msg=="status")
            {
                String loadst = "";

                if(load1==0)
                {
                    loadst="motor On\r\n";
                }
                else
                {
                    loadst="motor Off\r\n";
                }
                sendSMS(GSM_Nr,loadst);
            }
            eeprom_write();
            relays();
}


GSM_Nr="";
GSM_Msg="";
}

void eeprom_write(){
EEPROM.write(1,load1);

}

void relays(){
digitalWrite(motor, load1);
```

```
}

void sendSMS(String number, String msg)
{
      GSM.print("AT+CMGS=\"");
      GSM.print(number);
      GSM.println("\"\r\n");
      delay(500);
      GSM.println(msg);
      delay(500);
      GSM.write(byte(26));
      delay(5000);
}

void GetSMS()
{
      GSM_Nr  = RxString;
      int t1 = GSM_Nr.indexOf('"');
      GSM_Nr.remove(0,t1 + 1);
      t1 = GSM_Nr.indexOf('"');
      GSM_Nr.remove(t1);
      GSM_Msg = RxString;
      t1 = GSM_Msg.indexOf('"');
      GSM_Msg.remove(0,t1 + 1);
      t1 = GSM_Msg.indexOf('"');
      GSM_Msg.remove(0,t1 + 1);
      t1 = GSM_Msg.indexOf('"');
      GSM_Msg.remove(0,t1 + 1);
      t1 = GSM_Msg.indexOf('"');
      GSM_Msg.remove(0,t1 + 1);
      t1 = GSM_Msg.indexOf('"');
      GSM_Msg.remove(0,t1 + 1);
      t1 = GSM_Msg.indexOf('"');
      GSM_Msg.remove(0,t1 + 1);
      GSM_Msg.remove(0,1);
      GSM_Msg.trim();

      Serial.print("Number:"); Serial.println(GSM_Nr);
      Serial.print("SMS:"); Serial.println(GSM_Msg);
}

// Search for specific characters inside RxString
boolean Received(String S)
{
      if(RxString.indexOf(S) >= 0)
            return true;
      else
            return false;
}
```

```
void initModule(String cmd, char *res, int t)
{
      while(1)
      {
          Serial.println(cmd);
          GSM.println(cmd);
          delay(100);
          while(GSM.available()>0)
          {
            if(GSM.find(res))
            {
              Serial.println(res);
              delay(t);
              return;
            }
            else
            {
                  Serial.println("Error");
            }
          }
          delay(t);
        }
}
```

References

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