Introduction:

The advances in the technologies related to wireless communication has led to the emergence of several engineering designs to aid the human requirements. As we all know Agriculture play a significant role in developing country like India and implementing mobile communication for facilitating farmers is the basic idea of our project. Thus with the creeping interests in the wireless and GSM based projects, we came up with this idea of developing a simpler, multipurpose, cost-effective design to control the on-off mechanism of various devices in the field via short message service (sms).

Motor Starter for irrigation in Agricultural Applications encompasses lighting, security, telecommunications, access and safety, information and entertainment systems and thermal comfort systems. Besides self monitoring and regulation the Motor Starter for irrigation in Agricultural Applications system will also give auxiliary control to the user to enable him/her to control any application from a remote place. Such a facility would require a tool that extends access to Motor Starter for irrigation in Agricultural Applications base station controller from his/her premises to anywhere the user might be. This is done through a mobile device making this system truly global.

Commands are sent to Motor Starter for irrigation in Agricultural Applications system through user’ mobile as data through SMS (Short Service Messages) providing a cost effective, reliable far reaching access to the user. The coded SMS is sent to the Motor Starter for irrigation in Agricultural Applications base station controller that receives the messages, decodes the messages, initiates required automation operations and responds to the successful initiations by a reply to the user.

Abstract:

Our project is based on “GSM technology” used for long distant communication. The design portion involves mainly a GSM modem and a control circuitry with microcontroller and Max232N etc…

For doing this project we use some of the software like

- Embedded C for programming the application software to the microcontroller.
- Protel schematic software is used for designing the circuit diagram for this project.
- Express PCB software is used for designing the PCB for this project. (Since PCB making is a big process and involves lot of machineries, which are expensive, we are going to outsource this to the manufacturer.)

In our design we are implementing a Motor Starter for irrigation in Agricultural Applications and security systems using GSM. GSM is one of the latest mobile technologies using smart MODEM which can easily interfaced to embedded microcontrollers.
Now everything is going to be automated using this technology, using this technology we can access the devices remotely. Motor Starter for irrigation in Agricultural Applications encompasses lighting, security, telecommunications, access and safety, information and entertainment systems and thermal comfort systems. Besides self monitoring and regulation the Motor Starter for irrigation in Agricultural Applications system will also give auxiliary control to the user to enable him/her to control any application from a remote place. Such a facility would require a tool that extends access to Motor Starter for irrigation in Agricultural Applications base station controller from his/her premises to anywhere the user might be. This is done through a mobile device making this system truly global.

This project is now developed by us as a multipurpose project which can be used for controlling of lights and other electronic devices in home, offices etc. and for various time saving and manual effort preserving tasks that can be accomplished via sms.

Components used:

- Power Supply 5v DC - 7805
- Microcontroller - 89S52Atmel
- Crystal - 11.0592MHz
- MAX232 - Serial Communication
- Motor Starter
- GSM Transmitter and Receiver (MODEM)

Power supply:
The microcontroller and other devices get power supply from AC to Dc adapter through 7805, 5 volts regulator. The adapter output voltage will be 12V DC non-regulated. The 7805/7812 voltage regulators are used to convert 12 V to 5V/12V DC.

Micro controller-AT89S52:
The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel’s high-density nonvolatile memory technology and is compatible with the industry-standard 80C51 instruction set and pin out.

Features:
- 8K Bytes of In-System Programmable (ISP) Flash Memory
- Endurance: 1000 Write/Erase Cycles
- 4.0V to 5.5V Operating Range
- 256 x 8-bit Internal RAM
- 32 Programmable I/O Lines
- Full Duplex UART Serial Channel
- Fully Static Operation: 0 Hz to 33 MHz

RS 232 CONVERTER (MAX 232N) Serial Port:
This is the device, which is used to convert TTL/RS232 vice versa. RS-232 pin-outs for IBM compatible computers are shown below. There are two configurations that are typically used: one for a 9-pin connector and the other for a 25-pin connector.

The standard voltage range on RS-232 pins is _15V to +15V. This voltage range applies to all RS-232 signal pins. The total voltage swing during signal transmission can be as large as 30V. In many cases, RS-232 ports will operate with voltages as low as _5V to +5V. This wide range of voltages allows for better compatibility between different types of equipment and allows greater noise margin to avoid interference.

Because the voltage swing on RS-232 lines is so large, the RS-232 signal lines generate a significant amount of electrical noise. It is important that this signal does not run close to high impedance microphone lines or audio lines in a system. In cases where you must run these types of signals nearby one another, it is important to make sure that all audio wires are properly shielded.

The main role of the RS232 chip is to convert the data coming for the 12-volt logic to 5 volt logic and from 5 volt logic to 12 volt logic.

GSM modem (900/1800 MHz)
Semën’s GSM/GPRS Smart Modem is a multi-functional, ready to use, rugged unit that can be embedded or plugged into any application. The Smart Modem can be controlled and customized to various levels by using the standard AT commands. The modem is fully type-approved, it can speed up the operational time with full range of Voice, Data, Fax and Short Messages (Point to Point and Cell Broadcast), the modem also supports GPRS (Class 2*) for spontaneous data transfer.

Description of the interfaces
The modem comprises several interfaces:
- LED Function including operating Status
- External antenna ( via SMA)
- Serial and control link
- Power Supply ( Via 2 pin Phoenix tm contact )
- SIM card holder

LED Status Indicator
The LED will indicate different status of the modem:
- OFF Modem Switched off
- ON Modem is connecting to the network
- Flashing Slowly Modem is in idle mode
Flashing rapidly Modem is in transmission/communication (GSM only)

SIM300 AT Command Set
In application, controlling device controls the GSM engine by sending AT Command via its serial interface. The controlling device at the other end of the serial line is referred to as following term:
1) TE (Terminal Equipment);
2) DTE (Data Terminal Equipment)

AT Command syntax
The "AT" or "at" prefix must be set at the beginning of each command line. To terminate a command line enter <CR>.
Commands are usually followed by a response that includes.”<CR><LF><response><CR><LF>”

The AT command set implemented by SIM300 is a combination of GSM07.05, GSM07.07 and ITU-T recommendation V.25ter and the AT commands developed by SIMCOM.
Note: Only enter AT command through serial port after SIM300 is power on and Unsolicited Result Code “RDY” is received from serial port. And if unsolicited result code”SCKS: 0” returned it indicates SIM card isn’t present. If aut bauding is enabled, the Unsolicited Result Codes “RDY” and so on are not indicated when you start up

Types of AT commands and responses

Test command AT+<x>=? The mobile equipment returns the list of parameters and value ranges set with the corresponding Write command or by internal processes.
Read command AT+<x>=? This command returns the currently set value of the parameter or parameters.
Write command AT+<x>=<…> This command sets the user-definable parameter values.
Execution command AT+<x> The execution command reads non-variable parameters affected by internal processes in the GSM engine
Flow control is very important for correct communication between the GSM engine and DTE. For in the case such as a data or fax call, the sending device is transferring data faster than the receiving side is ready to accept. When the receiving buffer reaches its capacity, the receiving device should be capable to cause the sending device to pause until it catches up. There are basically two approaches to achieve data flow control: software flow control and hardware flow control. SIM300 support both two kinds of flow control.

Product concept

Designed for global market, SIM300 is a Tri-band GSM/GPRS engine that works on frequencies EGSM 900 MHz, DCS 1800 MHz and PCS 1900 MHz. SIM300 features GPRS multi-slot class 10/ class 8 (optional) and supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4.

SIM card interface

You can use AT Command to get information in SIM card. The SIM interface supports the functionality of the GSM Phase 1 specification and also supports the functionality of the new GSM Phase 2+ specification for FAST 64 kbps SIM (intended for use with a SIM application Tool-kit). Both 1.8V and 3.0V SIM Cards are supported. The SIM interface is powered from an internal regulator in the module having nominal voltage 2.8V. All pins reset as outputs driving low. Logic levels are as described in table below.

Network status indication LED lamp

State SIM300 function
Off - SIM300 is not running
64ms On/ 0.8 sec Off - SIM300 does not find the network
64ms On/ 3 Sec Off - SIM300 find the network
64ms On/ 0.3 sec Off - GPRS communication

Block diagram:

WORKING PRINCIPLE:

The device consists of GSM modem, microcontroller, Motor Starter, relays, memory and display. If the user wants to control some devices in his house he/she have to send the SMS indicating the operation of the device and then the system password, while the MODEM embedded with the system microcontroller receives SMS. The microcontroller will read SMS and check for the password the user had sent with the SMS.
If the password is correct then it will check whether the message is for switch ON or OFF the Motor. According to the received message the controller will switch on / off the relays. The device is password controlled, therefore only the people who know the device password is capable to control the device.

Relay and buzzer is controlled by the microcontroller using single pins, i.e. giving high means device will switch on and vice versa. Sometimes it may be interchange according to the transistor used to drive the device.

8051 CODING

```c
#include <P89V51R2.x>H
#include<string.h>

void init (void); // prototype declaration
void Uart_gsm (void);

void delay(unsigned char);
void Recievedata();
void gsminit(void);
void gsmcmdsend(unsigned char *);
unsigned char Rx_data(void);

sbit device1=P0^0;
sbit device2=P0^1;

unsigned char message[11];
unsigned char count;
unsigned char code password1[10]="device1 on"; // Commands for controlling devices
unsigned char code password2[11]="device1 off";
unsigned char code password3[10]="device2 on";
unsigned char code password4[11]="device2 off";

void main()
{
    init(); // port initialization
    Uart_gsm(); // serial port initialization
    gsminit();
    Recievedata(); // for recieving the data from modem
}

void init(void)
{
```
P0=0x00;


void Uart_gsm(void)
{
    TMOD = 0x20;
    TH1  = -3;
    SCON = 0X50;
    TR1  = 1;
}

void Recievedata()
{

    while(1)
    {

        while(Rx_data()!='+'); // checking message format

            while(Rx_data()!='C');
            while(Rx_data()!='M');
            while(Rx_data()!='T');
            while(Rx_data()!=':');
            while(Rx_data()!='"');
            while(Rx_data()!='\n');

        for(count=0;count<11;count++) // storing msg in a buffer
        {
            message[count]=Rx_data();
            if(message[count]==\r'
                break;
        }
        message[count]=\0';

        if(strncmp(message,password1,10)==0) // comparing message with password to make a action on device
        {
            device1=1;
        }

        if(strncmp(message,password2,11)==0)
        {

device1=0;
{}
if(strncmp(message,password3,10)==0)
{
    device2=1;
}

if(strncmp(message,password4,11)==0)
{
    device2=0;
}

// TO RECIEVE SERIAL DATA
unsigned char Rx_data(void)
{
    RI=0;
    while(RI==0);
    return(SBUF);
}

void delay(unsigned char x)
{
    unsigned int i,j;
    for(i=0;i<x;i++)
        for(j=0;j<2000;j++);
}

void gsminit(void)
{
    // AT COMMANDS
    unsigned char gsm_cmd1[]="AT";
unsigned char gsm_cmd2[]="ATE0";
unsigned char gsm_cmd3[]="AT&W";
unsigned char gsm_cmd4[]="AT+CMGF=1";
unsigned char gsm_cmd5[]="AT+CNMI=2,2,0,0,0";
gsmcmdsend(gsm_cmd1);
gsmcmdsend(gsm_cmd2);
gsmcmdsend(gsm_cmd3);
gsmcmdsend(gsm_cmd4);
gsmcmdsend(gsm_cmd5);
}

void gsmcmdsend(unsigned char *cmd)
// FUCNTON TO ININITILIZE AT COMMANDS FOR MSG
{
    unsigned char i;
    for(i=0;*cmd!='\0';i++)
    {
        SBUF=*cmd;
        while(TI==0);
        TI=0;
        cmd++;
    }
    delay(2);
    SBUF=0x0A;
    while(TI==0);
    TI=0;
    SBUF=0x0D;
    while(TI==0);
    TI=0;
    while(RI==0);
    RI=0;
}

Justification of our proposed idea

The project is a clear indication of a multi purpose control done via sms reducing the manual efforts and time required while paying individual attention for controlling each device.
For farmers who need to switch on the water motors at night due to water supply problems with most of the Indian villages this system will surely be very helpful and reduces the risk of night visit to the farm, saves time and energy of the individual. The system requires less design and implementation cost.
For handicapped people it may be really not entertaining to involve much in manual work and this system helps them to locate themselves in a place and operate the lights of their room, switch on the fan etc… Farmers can make use of this system for controlling motor, sprinklers, tanks and also several other devices necessarily operated in the agricultural lands. This is clearly presented in our video as how farmers will make use of our system. As our project turned out into a multipurpose project, we found many device control operations and applications existing out of it.

Survey of Alternate Solutions

There are many alternatives for controlling devices individually but the proposed system is a multiple device control which really saves the time, energy and cost of the farmer being more reliable and effective.

Alternatives:
• Timing device for monitoring of Tank filling
• Zigbee based water motor control

APPLICATIONS OF THIS PROJECT:

• Home automation
• Office automation.
• In Industrial automation.
• In Agricultural Application

Advantages:

• It is very safe and secure to use.
• Fast, effective and flawless service.
• We can control any appliances remotely.
• Highly-reliable and efficient to use.

Disadvantage:

If network busy the delivery of SMS may fail, so it’s difficult to control the appliances.