HOME AUTOMATION

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Abstract— Due to the proliferation of modern technology, these days, the world is increasingly experienced the use of wireless devices. The devices such as remote control and GSM phone could provide means for monitoring and controlling home appliances in a more convenient way. This project has explored the concept of home automation. A home automated system based on Arduino and GSM Modular developed which is tried to be integrated with Android application through Home Gateway for network interoperability. To show the effectiveness and feasibility of this proposed system, a remote control, indoor control and outdoor control systems have been developed and evaluated. However, integrating the system with android application remains unsuccessful.

Key words — GSM Modular; Arduino; Home appliances; mobile and remote control.

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1. Introduction

"Home Automation" is a prototype on how to save electricity. Electricity is a resource which is wasted on a large scale. Whether it is at home or office or hotel or any huge auditorium, people always forget to switch off electrical appliances when not in use. It may also happen that a person is travelling out of station and he actually forgot to switch off some appliance. This will result in huge wastage of electricity. In a hotel or office, where there are so many lights, it may happen that one of the lights is forgotten to be switched off. This again results in a huge drain of electricity. Often the street lights are on during the day. A bigger problem arises when say a person is out of the house and cannot remember whether or not a heavy duty appliance is switched on or off. Would not it be great if the electronic appliances could be operated just by dropping a SMS from a mobile phone? All the above mentioned problems could easily be solved. Also would not it be great if the status of all electrical appliances could be received by sitting in any part of the world. Then the manager of the bank can drop a message to a specific number and get the status of all the appliances switched on or off in the hotel. Then if he does not want something to remain switched on he can switch it off instantly by dropping another SMS. And that too from any part of the world. This is exactly what this prototype does.

2. Aim of the prototype

The main objective/aim of this prototype is to save electricity by controlling electrical appliances using cell phone from any part of the world. Also the status of the electrical appliances can be received in the cell phone itself. This data can be used in many ways to save electricity.

3. The Need to save electricity

Electricity is not a naturally occurring energy phenomenon like oil from the ground, but it must be created and refined at electrical power plants using other energy sources. The natural resources that create electric energy are mostly non-renewable and hence the need to save electricity.

4. Requirements

1) *Arduino Microcontroller:* A microcontroller is like a mini computer. It can process data just like a computer. In this project the microcontroller is programmed to interpret the SMS and turn off or on the specific electrical appliance. Arduino is a popular open-source single-board microcontroller, descendant of the open source

Wiring platform, designed to make the process of using electronics in multidisciplinary projects more accessible. The hardware consists of a simple open hardware design for the Arduino board with an Atmel AVR processor and onboard input/output support. The software consists of a standard programming language compiler and the boot loader that runs on the board. Arduino hardware is programmed using a Wiring-based language (syntax and libraries), similar to C++ with some slight simplifications and modifications, and a Processing based integrated development environment.

2) *GSM Module:* This is a shield which makes it possible to receive SMS. This module is present inside every cell phone. It is the heart of communication. It has a SIM attached underneath it. The SMS needs to be dropped at this number to operate the required appliances. GSM module comes in a range of frequencies. This prototype makes use of 900-1800 MHz, which means most of the world can access it. The GSM module receives the SMS and trans-

fers it to the microcontroller for further processing.

3) *Relay:* A relay is an electrical device, typically incorporating an electromagnet, which is activated by a low current in one circuit to open or close another circuit. The microcontroller is going to control the relay ports to switch on or off the connected appliance.

The following code needs to be uploaded to the Arduino Board to make the prototype function.

5. Code

```
#include <SoftwareSerial.h>//using the library
for the communication through wires also
known as serial communication
boolean led13=false;
boolean led12=false;
SoftwareSerial SIM900(7, 8);//these are the
pins through which the arduino board com-
municates with the gsm module. pin 7 of the
arduino board sends commands to the gsm
module and pin 8
//recieves the sms from the gsm module.
String s="";//stores the incoming sms in this
string.
char incoming_char=0;//stores the incoming
character of the sms in this variable
int flag=0;
void setup()//this function runs only once. the
very first time the arduino board is powered up
this function gets runned.
{
  pinMode(13,OUTPUT);//configures pin 13 to
be an output pin
  pinMode(12,OUTPUT);//configures pin 12 to
be an output pin
  Serial.begin(9600); // for serial monitor
  SIM900.begin(9600); // for GSM shield
  delay(2000);  // give time to log on to net-
work.

  SIM900.print("AT+CMGF=1\r");  // set SMS
mode to text
  delay(100);
  SIM900.print("AT+CNMI=2,2,0,0,0\r");
  // sends the command to the gsm module to
prepare it to recieve sms.
```

```
delay(100); //give the arduino board time to process.
}
void loop()//this function keeps on running so long as the microcontroller is powered on.
{

if(SIM900.available() >0)//the available() function checks if the gsm module is sending any data.
{
incoming_char=SIM900.read(); //Get the character from the pin 8
s=s+incoming_char; //Stores the incoming character to the string s
int l=s.lastIndexOf('"');//finds the last occurence of " as this marks the end of metadata and from the next character the sms message starts
s=s.substring(l+1);//filters the string s to contain only the sms sent
if(s.indexOf("ON 13")>-1)//according to the sms recieved the appropriate digital pins are commanded to supply current or not to supply
```

```
current. indexOf()checks whether ON 13 is present
//in the string s which contains the sms sent
{
digitalWrite(13,HIGH);//the digitalWrite() allows us to supply current or not to supply current in the mentioned pin
led13=true;//it is a variable which keeps track of the current state of the appliance. this will be very helpful to get the status of the appliance later in the code
}
if(s.indexOf("OFF 13")>-1)
{
digitalWrite(13,LOW);
led13=false;
}
if(s.indexOf("ON 12")>-1)
{
digitalWrite(12,HIGH);
led12=true;
}
if(s.indexOf("OFF 12")>-1)
{
digitalWrite(12,LOW);
```

```
led12=false;

}

if(s.indexOf("ON ALL")>-1)

{

 digitalWrite(13,HIGH);

 led13=true;

 digitalWrite(12,HIGH);

 led12=true;

}

if(s.indexOf("OFF ALL")>-1)

{

 digitalWrite(13,LOW);

 led13=false;

 digitalWrite(12,LOW);

 led12=false;

}
```

if(s.indexOf("GET")>-1)//if the sms sent contains GET it means the user wants to get the status of the appliances.

```
{

 String x="";//stores the sms to be sent back
```
to the user

if(led12==false)//checks the status of the particular appliance. true indicates the appli-ance is switched on and false indicates the appliance is switched off.

```
 x=x+"12 is OFF ; ";

 else if(led12==true)

 x=x+"12 is ON ; ";

 if(led13==false)

 x=x+"13 is OFF ; ";

 else

 x=x+"13 is ON ; ";

 SIM900.println("AT+CMGF=1");//sends
```
command to the gsm module through pin 7. this AT command asks the module to be prepared to send an sms.

```
 delay(1000);

SIM900.println("AT+CMGS=\"9734975245\"
```
");//this command sent to the gsm module tells the module the sim no. to which the sms has to be sent to.

```
 delay(1000);

 SIM900.println(x);//sends the string x to
```
the the gsm module.this string as mentioned earlier contains the sms to be sent i.e the status of all the appliances

SIM900.write(26);//sends the value 26 to

the gsm module . this asks the module to send

the sms to the number
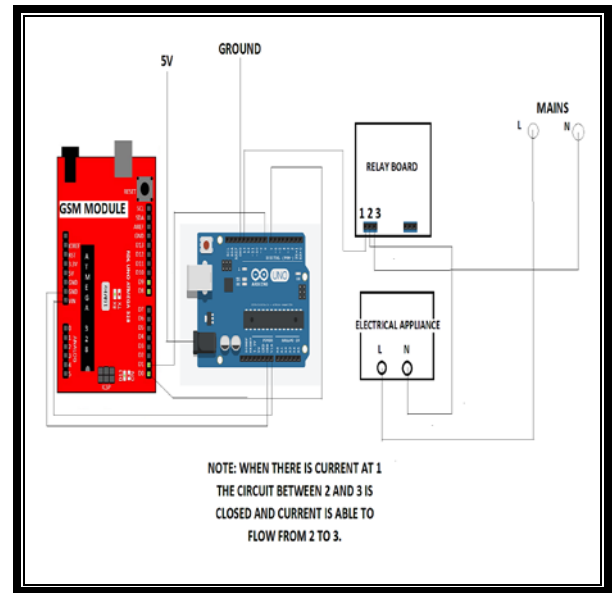
```
    delay(1000);

    s="";

  }

 }

}
```


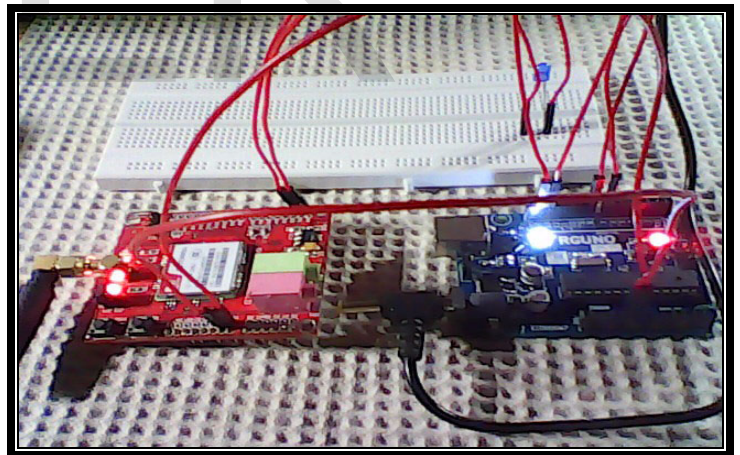**Figure 1; Circuit Diagram of Home Automation.**

6. Circuit Diagram
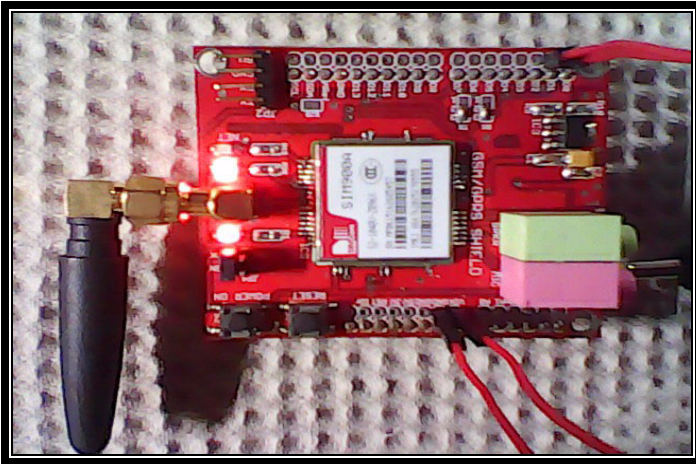

Figure 2: Working Model of Home Automation Step

1.

Figure 5: Data Representation on the Mobile.

Figure 3: Working Model of Home Automation Step 2.
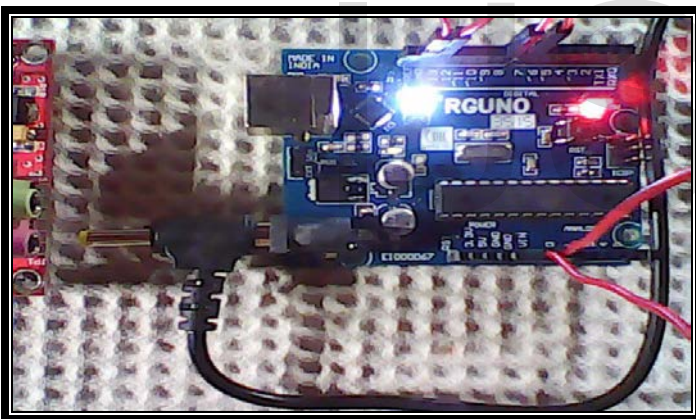
7. Future Aspect

Figure 4: Working Model of Home Automation Step 3.

The implemented system has been evaluated. To show the feasibility and effectiveness of the proposed system; four devices were developed but the forth one is partially developed: first is a remote control with four switches and LCD; second is an inner control system connected to the lights of four rooms; third is an outside control system connected to servo gate and outside light and the fourth is an android application integrated to act as GSM remote control for the home automation system. The system was subjected to the thorough testing in which some amount of delays has been observed especially between switch off press and its response. However, the system does as expected. Due to the time limitations as well as unavailability of appropriate materials for developing and integrating

android phone to control the developed home automation system.

8. Conclusions

These days, there were increasing used of wireless devices. The devices such as remote control and GSM phone provide means for monitoring and controlling home appliances (for example doors, lights and the rest). Integrating mobile phone to control and monitor home devices provide a more convenient way to alert users of the possible intrusion as well as avoiding user to be moving with additional equipment as almost every person use mobile phone. The home automation developed for this project remote control device, inner control device and outer control device communicated with some delay issues. But integrating it with android application has turned unsuccessful. Therefore, this remains the great limitation for further work.

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