Mobile Agent Based Intelligence Power Distribution Control System

Pratik M. Kumbhani
UG Student
Department of Electronics & Communication Engineering
Dr. Subhash Technical Campus, Junagadh-362001, Gujarat (India)

Vandana H. Gajera
UG Student
Department of Electronics & Communication Engineering
Dr. Subhash Technical Campus, Junagadh-362001, Gujarat (India)

Rahul J. Thummar
Assistant Professor
Department of Electronics & Communication Engineering
Dr. Subhash Technical Campus, Junagadh-362001, Gujarat (India)

Ritesh B. Vaghasiya
Head of Department
Department of Electronics & Communication Engineering
Dr. Subhash Technical Campus, Junagadh-362001, Gujarat (India)

Abstract

Mobile agent based intelligence power distribution control system present a basic model representation of this anti-theft system for electrical lines providing electricity distribution for house and industries. This system is quite not complex while implementing central unit / distribution unit which provides accurate distribution to node at 3-phase or 1-phase electricity. It can calculates over all voltage & current distribution to the node unit and measures differences or you can say losses during line distributions, while if any how there is unwanted high loss or can be possible joint for undesired usage in between the lines, there may be large difference in measuring the overall calculation between distribution & node units. This whole concept can be implemented by wireless technology using GSM. Wireless communication helps giving live reading calculation & measurements of distribution / central unit and node unit power usage. If there is vast change from timeout then this system will let know electricity board warning about this theft or possible huge loss between lines through GSM.

Keywords: Arduino UNO, GSM moduale, Relay board, LCD

I. INTRODUCTION

According to the survey, Indian Power System faces loss of about 30% of its total production of electricity. This loss is very high which takes place because of transmission losses, electricity theft, etc. Major portion of its losses is due to power theft. Power theft is done by taking tapping or hooking from transmission line or by from the meters. Generally, this type of power theft is seen in residential area which can't be easily detected as this type of theft is done during night hours. Moreover, this kind of power theft causes unbalance/overloading of three phases of distribution transformer. Due to unbalance/overloading condition, the transformer is damaged due to heating of the overloaded phase. Power consumption and losses have to be closely monitored so that the generated power is utilized in an efficient manner. This illegal electricity usage may indirectly affect the economic status of a country. Also the planning of national energy may be difficult in case of unrecorded energy usage. This electricity theft is reduced by using wireless electricity theft detection by using system.

II. GSM TECHNOLOGY

GSM is an open and digital cellular technology used for transmitting mobile voice and data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands. GSM system was developed as a digital system using time division multiple access (TDMA) technique for communication purpose. GSM will allow communication anywhere, anytime, and with anyone. The functional architecture of GSM employing intelligent networking principles, and its ideology, which provides the development of GSM is the first step towards a true personal communication system that enough standardization to ensure compatibility. [1]

III. BLOCK DIAGRAM

A. Transmitter

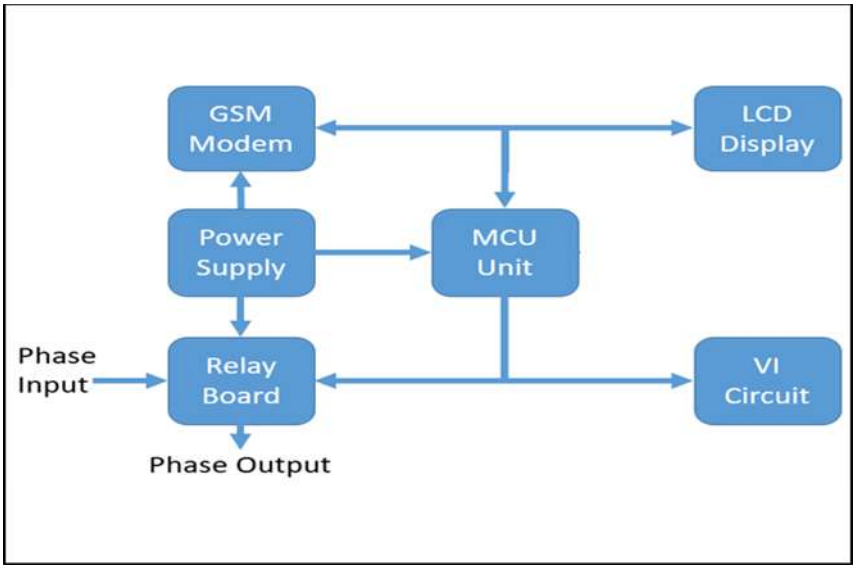


Fig. 1: Transmitter

Figure.1 shows transmitter part of our system. It consists of the basic building blocks such as Microcontroller Unit, LCD Display, ZigBee Module, Relay Board and VI Circuit to measure the voltage and current reading at node. Each module such as Arduino Uno board, LCD module, GSM module, ZigBee module uses certain amount of DC supply voltage which is given externally. GSM requires more power as compared to other modules which is used in receiver section. In addiction there will be a Dummy Load Unit is also placed to implement the system. AT node end, VI Circuit measures the voltage and current ratings continuously. If any Dummy Load is connected by illegal tapping of distribution line, there will be a change in the comparison which shows on the LCD. Microcontroller detects this theft through the VI Circuit and transmits to the receiver of the system by using ZigBee transmitter. GSM sends message to authorized person whom number is stored in GSM and Relay board disconnects the supply from substation.

B. Receiver

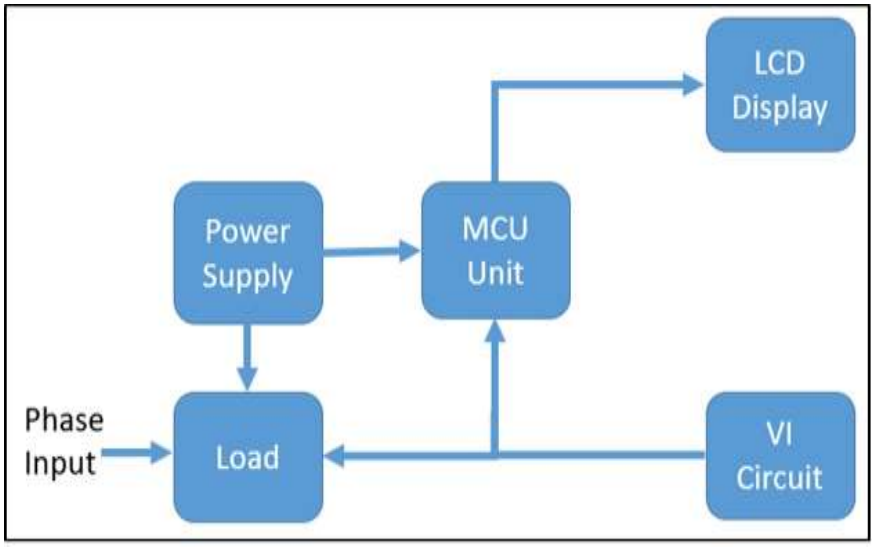


Fig. 2: Receiver

Figure.2 shows Receiver of our system. There are Microcontroller Unit, GSM Modem, ZigBee Module, Official and Dummy Load, LCD Display, Regulated Power Supply Unit and VI Circuit to measure the voltage reading through the distribution line. At receiver side, Microcontroller gets the information about the theft detection through the ZigBee receiver and sends message to the number displayed on the LCD Display and LCD also displays the sent message.

IV. ARDUINO BOARD

The 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 (A0 & A5), 4 UARTs, 16 MHz crystal oscillator, 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. [2]

V. GSM MODUALE

GSM/GPRS Modem-RS232 is built with Dual Band GSM/GPRS engine- SIM900A, works on frequencies 900/ 1800 MHz the Modem is coming with RS232 interface, which allows you connect PC as well as microcontroller with RS232 Chip (MAX232). The baud rate is configurable from 9600-115200 through AT command. The GSM/GPRS Modem is having internal TCP/IP stack to enable you to connect with internet via GPRS. It is suitable for SMS, Voice as well as DATA transfer application in M2M interface. The onboard Regulated Power supply allows you to connect wide range unregulated power supply. Using this modem, you can make audio calls, SMS, Read SMS; attend the incoming calls and internet act through simple AT commands. [3]

A. Flow of Design:

Flow of design illustrates the all design process of our system. It shown in below figure 3.

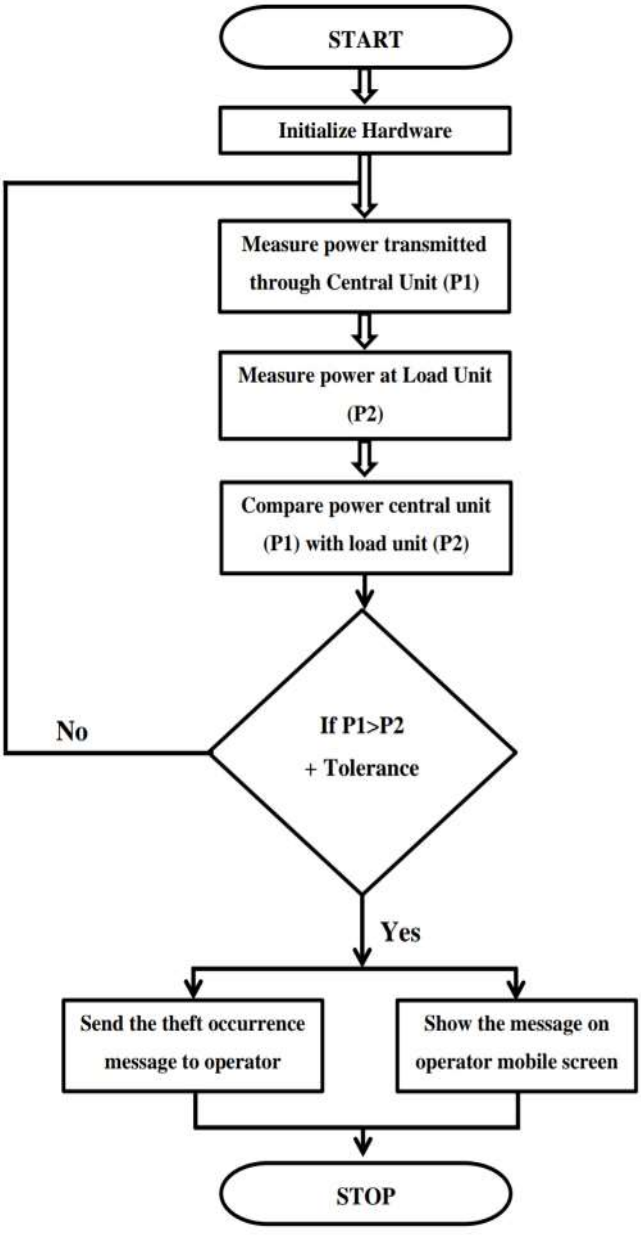


Fig. 3: Flow of Design

VI. SOFTEARE SIMULATION RESULT

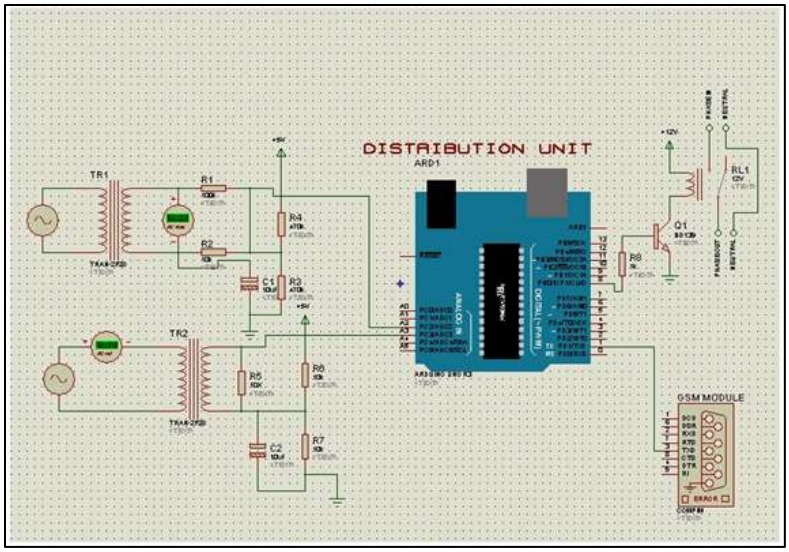


Fig. 4: Distribution side unit

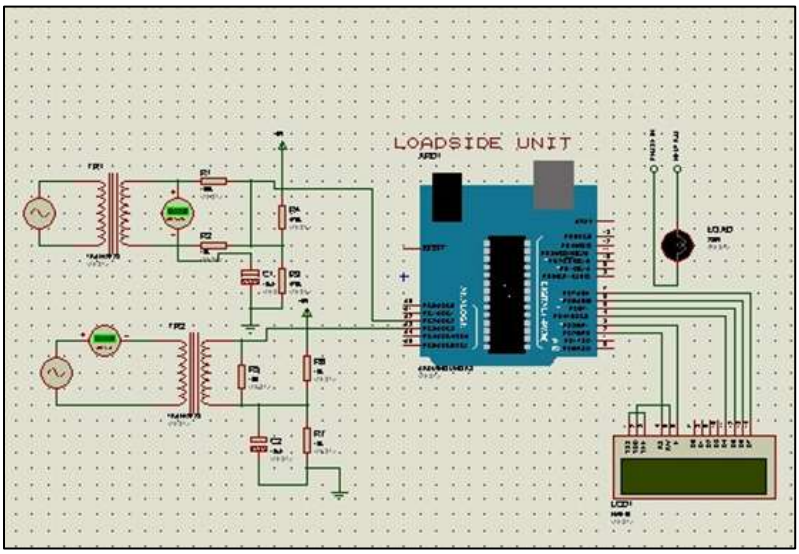


Fig. 5: Load side unit

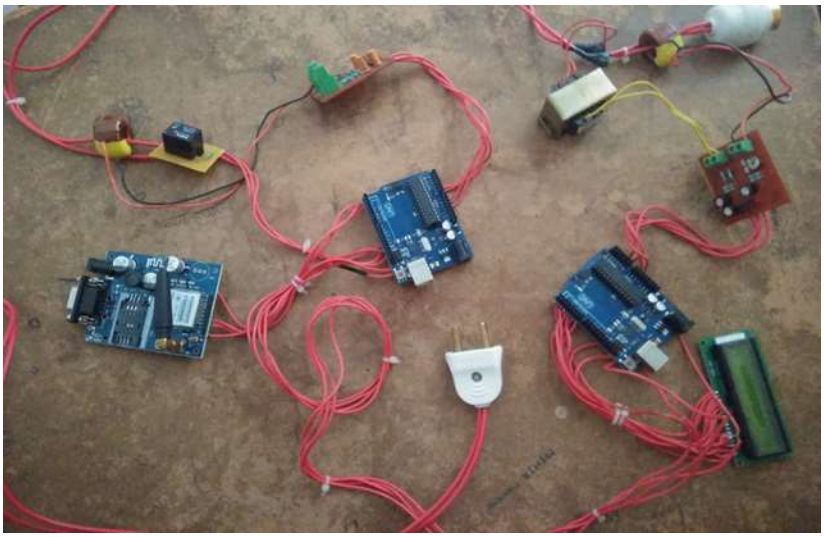
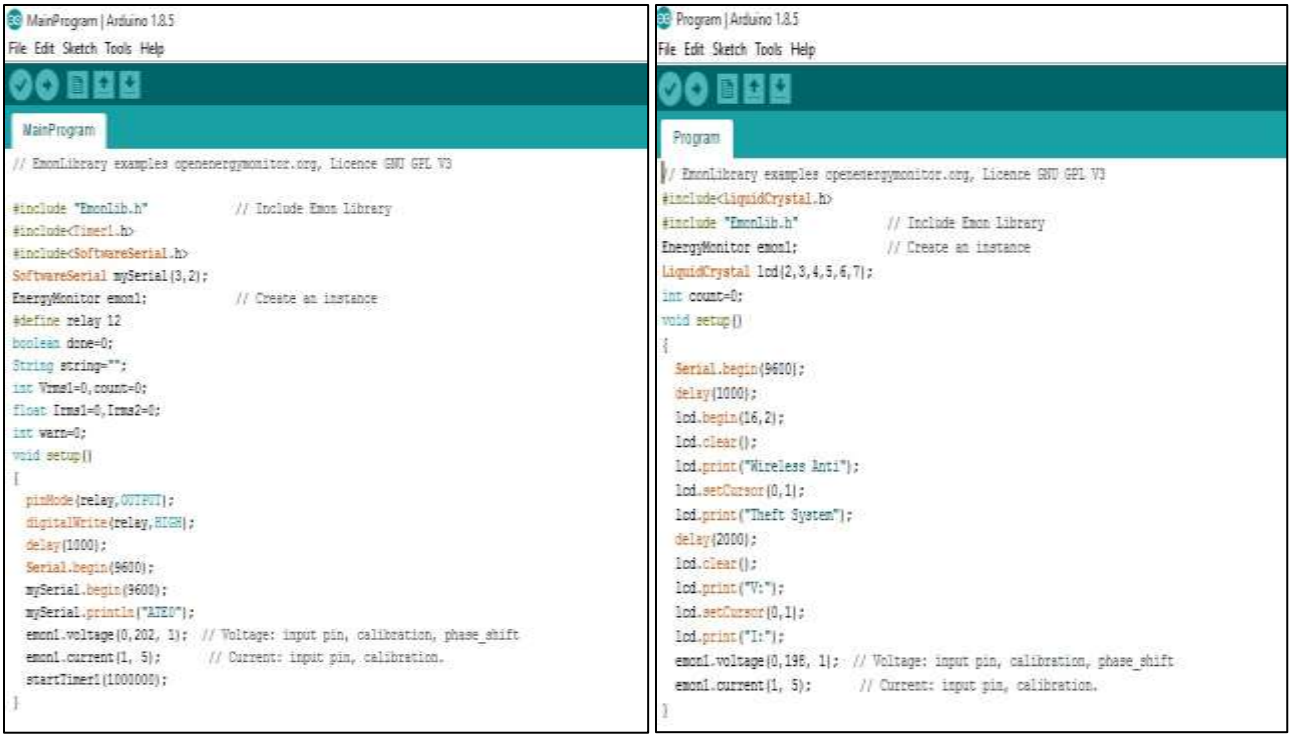


Fig. 6: Hardware connection

VII. SOFTWARE PROGRAMING



```
// EmonLibrary examples openenergymonitor.org, Licence GNU GPL V3

#include "EmonLib.h"             // Include Emon library
#include<Timer1.h>
#include<SoftwareSerial.h>
SoftwareSerial mySerial(3,2);
EnergyMonitor emon1;             // Create an instance
#define relay 12
boolean done=0;
String string="";
int Vrms1=0,count=0;
float Irms1=0,Irms2=0;
int warn=0;
void setup()
{
  pinMode(relay,OUTPUT);
  digitalWrite(relay,HIGH);
  delay(1000);
  Serial.begin(9600);
  mySerial.begin(9600);
  mySerial.println("ATE0");
  emon1.voltage(0,202, 1);  // Voltage: input pin, calibration, phase_shift
  emon1.current(1, 5);      // Current: input pin, calibration.
  startTimer1(1000000);
}
```

```
// EmonLibrary examples openenergymonitor.org, Licence GNU GPL V3
#include<LiquidCrystal.h>
#include "EmonLib.h"             // Include Emon library
EnergyMonitor emon1;             // Create an instance
LiquidCrystal lcd(2,3,4,5,6,7);
int count=0;
void setup()
{
  Serial.begin(9600);
  delay(1000);
  lcd.begin(16,2);
  lcd.clear();
  lcd.print("Wireless Anti");
  lcd.setCursor(0,1);
  lcd.print("Theft System");
  delay(2000);
  lcd.clear();
  lcd.print("V:");
  lcd.setCursor(0,1);
  lcd.print("I:");
  emon1.voltage(0,198, 1);  // Voltage: input pin, calibration, phase_shift
  emon1.current(1, 5);      // Current: input pin, calibration.
}
```

Fig. 7: Programming done using Arduino software

VIII. CONCLUSION

After worked on this system we can conclude that the project is to detect the technical and non-technical losses of power that occur during the transmission of power from substation to node. This system detects illegal tapping in distribution control lines. From the observation that has been made, it clearly shows that its working is precise, accurate and is easy to control and user friendly to use. The power theft detection system has been developed successfully as the fault and theft in distribution lines can be identified precisely. This theft detection of electricity is expected to overcome the problem of power loss due to non-technical losses in a very fast and easy manner.

ACKNOWLEDGMENT

We take an opportunity to acknowledge and extend my heartfelt gratitude to my guide and the pivot of this enterprise, Prof. H. S. PARMAR who is most responsible for help to over complete this work. He showed to different ways to approach the problems and the need to be persistent to accomplish over goal. His discernment in the choice of topic, his confidence in over when we doubted over self and his admirable guidance are some cogent reasons that make me aver that without his support this thesis would be a chimera. We all are also thankful to Director, Head of Department of Electronics and Communication Engineering for co-operation and support to complete this work. We can also like to express thanks to DSTC, JUNAGADH providing necessary facilities. We can also convey my thanks to HOD, staff members and lab technicians of Department of Electronics and Communication Engineering for their continuous support.

REFERENCES

[1] https://www.elprocus.com/gsm-architecture-features-working
[2] https://store.arduino.cc/usa/arduino-uno-rev3
[3] https://researchdesignlab.com/gsm-sim-900.html
[4] Wireless power meter monitoring with power theft detection and intimation system Ver. I (Nov - Dec. 2014), PP 04-08 www.iosrjournals.org using GSM and Zigbee networks
[5] Electrical Power Line Theft Detection International Journal on Recent and Innovation Trends in Computing and Communication ISSN: 2321-8169
[6] THREE PHASE DISTRIBUTION PROTECTION AND THEFT DETECTION SYSTEM USING ZIGBEE ISSN: 2347-6982 Volume-4, Issue-4, Apr.-2016
[7] RECOGNITION OF FAULT LOCATION AND POWER THEFT IN DISTRIBUTION SYSTEM USING GSM Volume 114 No. 9 2017, 485-493 ISSN: 1311-8080 ISSN: 1314-3395 (on-line version) url: http://www.ijpam.eu
[8] DISTRIBUTION LINE FAULT DETECTION AND INTIMATION USING GSM Volume 02, Issue 04; April - 2016 [ISSN: 2455-1457]
[9] Wireless Electricity Theft Detection System Using Zigbee Technology ISSN 2321 – 8169 Volume: 1 Issue: 4 364 – 367
[10] Wireless power meter monitoring with power theft detection and intimation system using GSM and Zigbee networks Ver. I (Nov - Dec. 2014), PP 04-08 www.iosrjournals.org