Detection of Power Thefting and Wire Breakage

CH. Seshu Bhavani[1], J. Umamaheshwari[2], V.Sandhya[3], CH.Sridevi[4]
Assistant Professor [2, 3], Associate professor[4]
Department of Electronics & Communication Engineering
BVC Engineering College, Odalarevu, India

Abstract:
Electric power is very important for every day life and it plays a vital role in industries. Electricity is indispline to our daily life with increasing needs of electricity. And also we read in newspapers, power industries suffer with financial losses. The main reason of financial loss is power thefting. And also some human and animals die due to the electrical shocks in remote areas or agriculture areas as contact with broken and hanging power supply wires. Power wastage is also occurred due to the unauthorized connections. The main aim of this project is to describe method of detection of power losses and wire breakages by using energy meters and arduino uno micro controller. Power differences are identified by using ardino uno micro controller. It collects the data from energy meters and compare supplied power and consumed power. If supplied power is more than the consumed power in load (home), then it consider as power thefting is occurred, prevent the power in load side by using relay and send sms to a substation. And detects the wire breakages in poles and prevents the power in unsafe electrical wires and send sms to substation for further repairs. Here we also use current sensor for sensing the power in wire breakages and heat sensor is used for finding the heat in source side.

Keywords: Ardunio uno nano 328p, GSM Sim800L, Energymeter, Connecting wires, Current sensors, Heat sersor, Relay, 16*2Lcd.

I. INTRODUCTION:

Generation, transmission and distribution of electrical energy involve many operational losses. Whereas losses implicated in generation can be technically defined, but transmission and distribution losses cannot be precisely quantified with the sending end information. This illustrates the involvement of nontechnical parameter in transmission and distribution of electricity. Overall technical losses occur naturally and are caused because of power dissipation in transmission lines, transformers, and other power system components. Technical losses in T&D are computed with the information about total load and the total energy bill. While technology in on the raising slopes, we should also note the increasing immoral activities. With a technical view, Power Theft is a non ignorable crime and at the same time it directly affected the economy of a nation. Electricity theft a social evil, so it has to be completely eliminated. Power consumption and losses have to be closely monitored so that the generated power is utilized in a most efficient manner. The system prevents the illegal usage of electricity. At this point of technological development the problem of illegal usage of electricity can be solved electronically without any human control. The implementation of this system will save large amount of electricity.

II. PREVIOUS METHOD:

In the previous methods wireless communication system of energy meter used with Zigbee, relay control and GPRS. The cryptographic method is used to secure the communication channel and Zigbee for the transmission of data in a serial process. In previous method they detect the power thefting only.

PROPOSED WORK:
Block diagram: The below diagram represents the block diagram of power thefting and wire breakages.

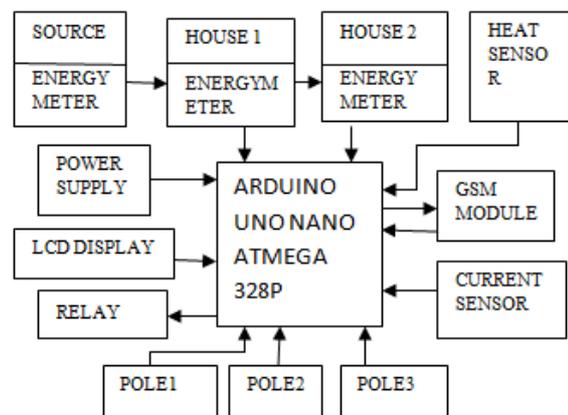Energy meters and relay play a vital role in this project.

Figure.1. Block Diagram Of Power Thefting And Wire Breakage Detection

When power is supplied from source to destination with out any other unauthorized connection. A supplied power from source is equal to the power consumed in load (home). when any other unauthorized connection is connected at load side (home). Then source supplied power is not equal to the cosumed power of load side (home), the measured values of energy meters send to arduino uno then it identifies the power differenes and conisder as power thefting is occurred and it transmitt the information to relay for preventing the power in load. Arduino uno give command to gsm for sending sms about the power thefting. Here heat sensor is used for identifing the heat in source surroundings then prevent fire accidents due to over heat. When a wire is cut on the pole, send the information about measured values of power to ardino uno, it identifies the power cut in particular pole. Here current sensor is used for sensing power in wire breakages. Then arduino uno send singal to the relay and gsm. Relay is used for preventing the power in breakaged wires for reducing the

accidents. And gsm send sms to substation about the wire breakage in particular pole for further repairs.
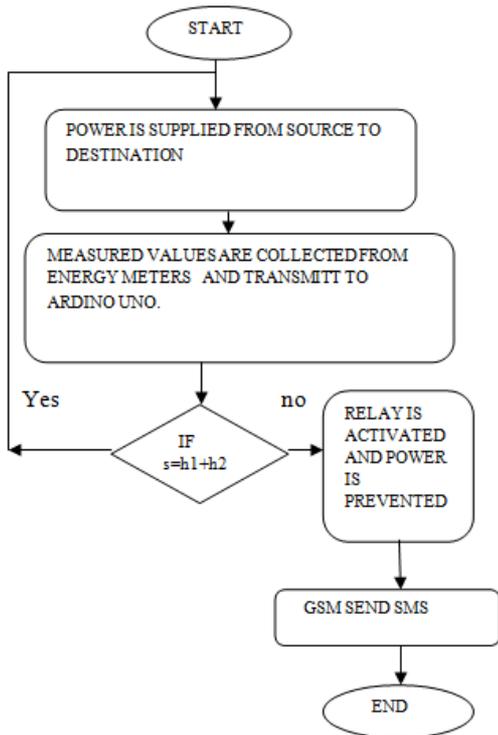
FLOW CHART 1:

Figure.2. Flow Chart for Power Thefting

ALGORITHM:
STEP 1: Start.
STEP 2: Power is supplied form source to destination.
STEP 3: When an unauthorized load is connected then power differences is occurred.
Step 4: power differences is detected by ardino uno micro controller.
STEP 5: Relay is activated and power is prevented in load.
Step 5: Ardino uno send command to gsm for sending sms.
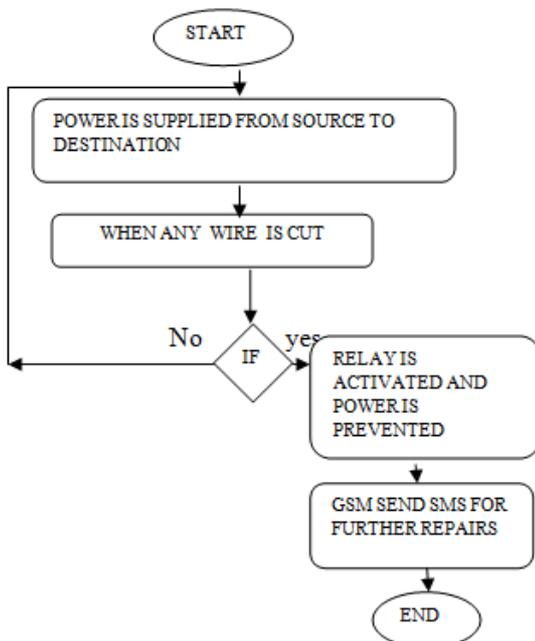Step 6: End.

FLOW CHART 2:

Figure.3. Flow Chart for Wire Breakage

ALGORITHM:
Step 1: Start.
Step 2: Power is supplied from source to destination.
Step 3: When any wire is cut. It detects by arduino uno.
Step 4: Relay is activated and power is prevented from unsafe wire.
Step 5: Arduino uno send command to gsm send sms for further repairs.
Step 6: End.

ENERGY METER:
An electricity meter, electric meter, electrical meter, watt hour meter or energy meter is an instrument which measures amount of electrical energy used by the consumers. Utilities install these instruments at every place like homes, industries, organizations to charge the electricity consumption by loads such as lights, fans and other appliances. Most interesting type is used as prepaid electricity meters.

Figure.4. Energy Meter

CURRENT SENSOR:
Current measurement is very important in many power and instrumentation systems. Current sensors primarily used for circuit protection and control. However with the advancement in technology, current sensing has emerged as a method to monitor and enhance performance. Current sensor is a device that detects electric current ac or dc in a wire, and generates a signal proportional to it. Halleffect current sensor, can measure all types of current sgnals i.e. ac, dc or pulsating current.transformer or current clamp meter suitable for ac current only. Flux gate transformer is suitable for ac or dc current. Resistor, whose voltage is directly proportional to the current through it. Fiber optic current sensor, using an interferometer to measure the phase change in the light produced by a magnetic field.these sensors are currently being used widely in almost all the industries because of thir vast applications and the type of output they provide, which can be manipulated and can be used for various applications. In this project current sensor is used for sensing the power in wires. If any wire is cut from pole. Then current sensors sensing the current in wires and send to arduino. Arduino finds wire breakage is occurred and consider till power is supplied from wires.

Figure.5. Current Sensor

HEAT SENSOR:

The main property of a heat sensor is to sense the heat, which is present around the sensor. When the set value of the temperature is high, then it is indicated with the help of a glowing LED. The usage of heat sensor circuit is inside your PC or in your kitchen. Due to overheating, the expensive components present in the PC or kitchen appliances could be damaged. When the temperature around the heat sensor increases above its set value, then it senses the heat and gives an indication, so that we can protect the devices from damage. Heat sensor circuit senses the heat from various electronic devices like amplifiers, computer etc, and thus generates the warning alarm. It has no effect on the medium, more accurate, it has an easy conditioned output, it re sponds instantly.
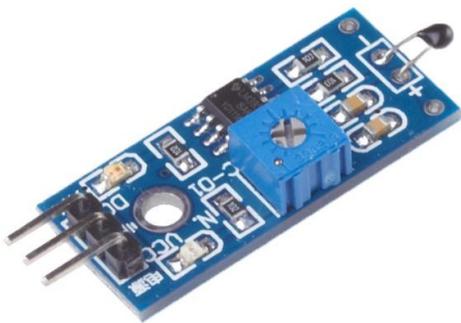

Figure.6. Heat Sensor

RELAY:

Relay is an electrically operated switch, which is used to isolate one electrical circuit from another. It allows a low current control circuit to made or break an electrically isolated high current circuit path.latching, reed, mercurywetted, machine tool, soild state are different types of relays. The basic relay consists of a coil and a set of contacts. The most common relay coil is a length of magnet wire wrapped around a metal core. When voltage is appled to the coil, the current passes through the wire and creates a magnetic field. This magnetic field pulls the contacts together and holds them there untill the current flows in the coil has stopped.   In this project it is used for preventing the power in load side. After detecting the

power thefting arduino uno give signal to relay for prevent the power. And it also prevents the power in breakaged wires.

Figure.7. Relay

ARDUINO UNO NANO ATMEGA 328P:
Arduino/Genuino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, 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 a AC-to-DC adapter or battery to get started. Each of the 14 digital pins on the Uno can be used as an input or output, using pin Mode(), digital Write(), and digital Read() functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 kOhms. In addition, some pins have specialized functions: The Arduino Uno can be powered via the USB connection or with an external power supply.The power source is selected automatically.   we can write programs and create interface circuits to read switches and other sensors, and to control motors and lights with very little effort.
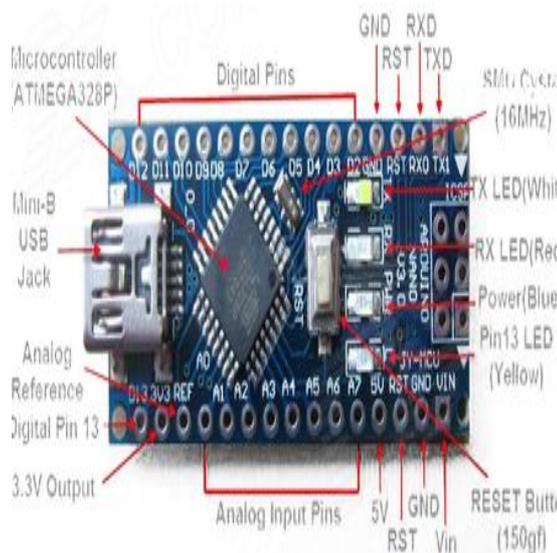

Figure.8.Arduino Uno Nano Atmega328p

Arduino uno is the main heart of this project. It is used for detecting the differences of power consumption between source and load. Arduino uno collects the values of power consumption and then identify the power thefting is occurred or not. It is also used for giving commands to other components for particular tasks. It gives information to gsm for sending sms. Arduino give the values of power differences to LCD for displaying.

GSM MODULE:

The gsm library contains many methods of communication with the shield. This gsm modem can work with any gsm network operator sim card just like a mobile phone with its unique number. Advantage of using this modem will be that its rs 232 port can be used to communicate card develop embedded applications like sms control, data transfer, remote control and logging can be developed easily using this sms based remote control and alerts, security application, sensor monitoring, gprs mode remote data logging. Here gsm module plays a vital role in this project. It is used for sending sms to a particular mobile number. In this project we need interface gsm module to arduino uno for transfering signals. After detecting the power thefting or wire breakages arduino uno send signal to gsm for sending sms to other mobile. Then gsm receives signal and send signal to arduino for particular mobile number address. Then arduino uno gives information about mobile number. Gsm send sms to a particular mobile number about power thefting or wire breakages for further repairs.
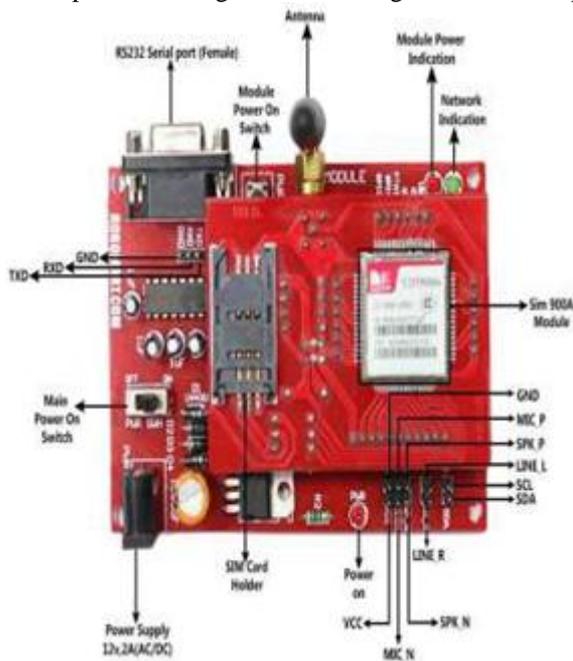

Figure.9. Gsm Module

ARDUINO UNO INTERFACING WITH GSM:

With the arduino gsm shield, libraries enables an ardino board to do most of the operations you can do with gsm phone.that is place and receive voice calls, send and receive sms, and connect to the internet over a gprs network.The gsm shield has a modem that transfers data from a serial port to the gsm network. The modem executes operations via a series of at commands. The library abstracts low level communications between the modem and sim card. It relies on the software serial library for communication between the modem and ardino.
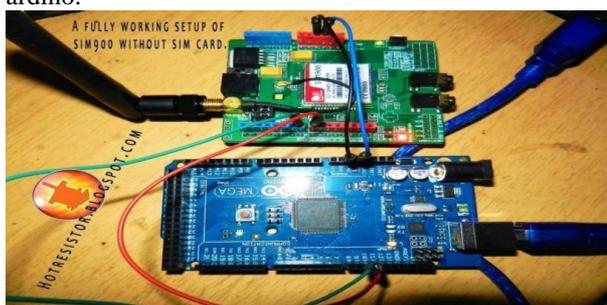

Figure.10. GSM Sim Interfacing With   Arduino Uno

LCD DISPLAY:

16×2 character LCD display is a very basic LCD module which is commonly used in electronic projects. 16×2 means it can display 2 rows of 16 characters (columns). Its other variants such as 16×1, 16×4 etc are also available. These LCDs are usually made using HD44870 compatible controllers.In a 16×2 character LCD display, there are 16 pins. First two pins VSS and VDD are for providing power to the display. Connect these pins to the GND and 5V supply pins in the Arduino Uno. 3rd pin of the LCD is named as Vo which is used for adjusting display contrast. We can use a 10KΩ preset for that, connect variable end to Vo and fixed ends to VSS and VDD. 4th pin RS is the Register Select pin which is used to multiplex the data and command information send to the LCD module. Data information is the ASCII value of the information to be displayed on the LCD and the command information will contain instructions such as the position in which the data is to be displayed etc.   These two information will be multiplexed using pin RS and will send through DB0 – DB7 pins of LCD.If RS is high, then DB0 – DB7 will contain data information and when it is LOW then these lines will contain command information. 5th pin R/W is Read or Write pin which will determine whether the data is to be written or it is to be read from the LCD display. HIGH value of this pin will indicate the data is read from the display and LOW value indicates writing information to the display. Normally we need only writing values to the display, so we usually tie RW to GND. 6th pin E is the Enable pin of LCD. High value on E will indicate valid information on DB0 – DB7 pins. We can power the LCD's back-light LED using last two pins. The interface between this LCD and Arduino can be 8 bit or 4 bit and the difference between them is in how the data or commands are send to LCD. In the 8 bit mode, 8 bit data and commands are send through the data lines DB0 – DB7 and data strobe is given through E input of the LCD. But 4 bit mode uses only 4 data lines. In this 8 bit data and commands are splitted into 2 parts (4 bits each) and are sent sequentially through data lines DB4 – DB7 with its own data strobe through input.
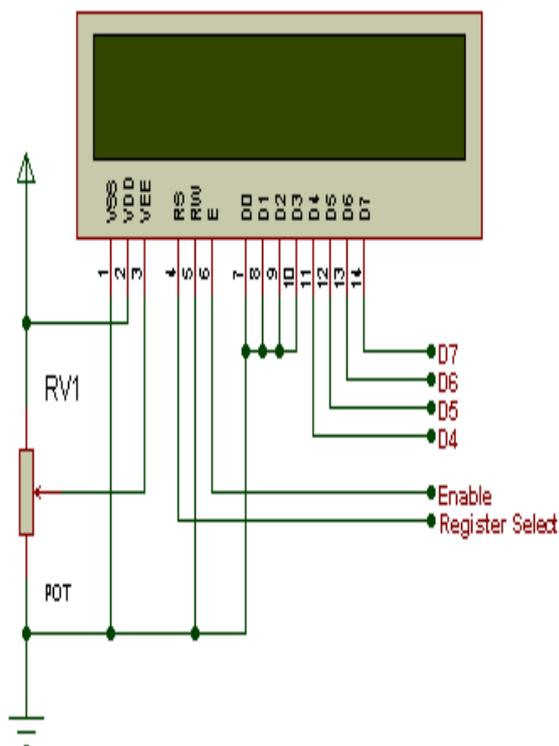

Figure.11. LCD Display

III. RESULT:

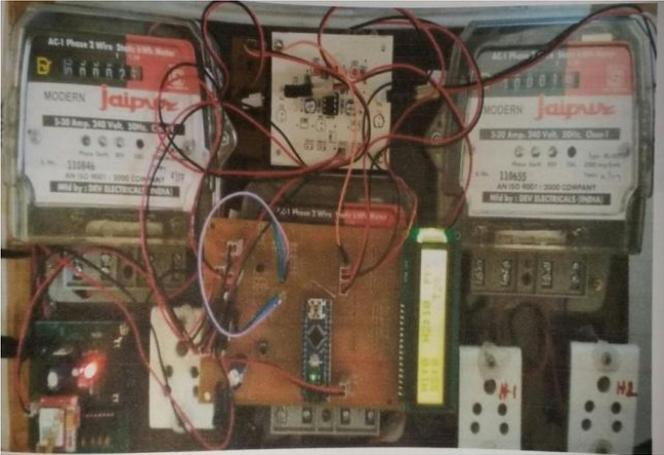Whenever switch on the kit it takes some time for initilization.

Figure.12. Kit Initilization

Whenever unauthorized load is connected, the power difference between source power and power consumption in home (1&2) is detected. Relay prevents the power and gsm send sms to the predefined mobile number and it is display in lcd.
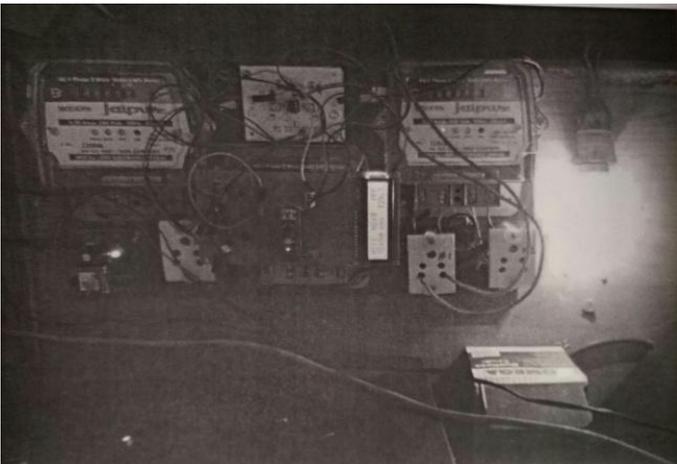

Figure.13. Result Of Power Thefting

When a wire breakdown occurs then power will stop and information sends in the form of sms to the predefined number and to the subsystem.
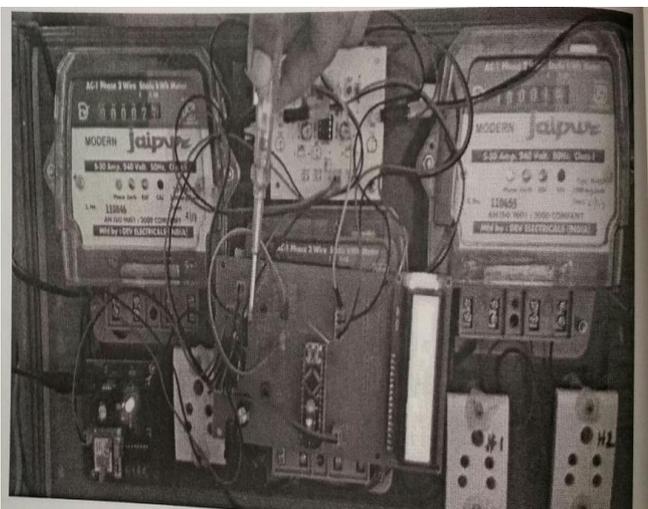

Figure.14. Result of Wire Breakage

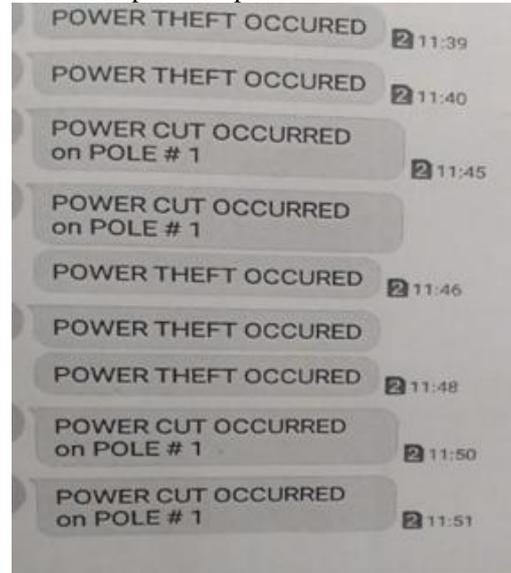The below picture represents the sms alerts send from gsm.

Figure.15. Gsm Send Sms

IV. CONCLUSION &FUTURESCOPE:

The implemented system is very useful for power industries. By using this system, they detect the power thefting and wire breakages. Here sensors provide information about overloads and sensing of current in wires. In future it is used for 3-phase or 330/11kv. To cutoff the power only unauthorized load.

V. REFERENCE:

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