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Secured Power Monitoring, Controlling and Theft Identification using IOT

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Abstract ***This paper presents IOT based smart power management system. The system principally monitors and controls an electrical parameters such as voltage and current and subsequently calculates the power consumed. The main goal of this project is to develop a newly equipped well designed prototype for consumers to provide secured power. The innovation of this system is controlling mechanism implementation. For controlling a parameters, it sends a intimation to the user when the parameter exceeds their predefined values. The controlling process of electrical parameters that can be programmed using a ATMEGA32 controller and monitor even via mobile phone or PC from anywhere in the world. . To provide more confidentiality to the consumer, Trust Security Privacy (TSP) algorithm is used.To provide a high degree of security user or authenticator id is given by server to consumers. Due to that users only access their corresponding loads. Also, the proposed system is a user authentication, economical and easily operable. The system is a flexible and low cost and accordingly can save electricity outflow due to that we can save electricity expense of the consumers.To avoid a power theft, Power Theft Detection Algorithm (PTDA) is proposed and simulations are carried out in proteus software. Thus, the real-time monitoring of the electrical parameters can be observed over a website.***

Keywords: IoT, PTDA, TSP, confidentiality, security, sensors, authentication, proteus software.

I. INTRODUCTION

Wireless sensor network

Shao-Lei Zhaia*, Dong-Sheng Zhaob, Zhen Wangc, Yi Zhangc "RESEARCH OF COMMUNICATION TECHNOLOGY ON IOT FOR HIGH-VOLTAGE TRANSMISSION LINE a Yunnan Provincial Electric Power Test & Research Institute (Group) Co., Ltd, Kunming City, China, 650217**.** This paper presents a three layered network construction of Internet of Things (IOT) communication method for high-voltage transmission line which involves the wireless self-organized sensor network (WSN), optical fiber composite overhead ground wire (OPGW), general packet radio service (GPRS) and the Beidou (COMPASS) navigation satellite system (CNSS).

Revathi Cheermalamarri,."ZIGBEE-BASEDCOMMUNICATION SYSTEM FOR DATA TRANSFER WITHINFUTURE MICRO GRIDS" MTech(ES),Assistant Professor, Sagar Institute of Technology, Chevella, Hyderabad**.** By embedding computational capabilities in all kinds ofobjects and living beings, it will be possible to provide aqualitative and quantitative leap in several sectors: healthcare,logistics, domestics, entertainment, and so on.Dueto the drastic changes in technology in the last decade,so many advancements were introduced in electricity departments. In this project electricity consumption by the user i.e. Units consumed in that meter will be sent to PC usingzigbee module and also 16X2 LCD is provided to read units available. Whenever there is a change in count value/ units in the meter gets changed, these values are displayedon LCD. Here we are using zigbee for the purpose of communication. This system uses 5V regulated power supply for the microcontroller unit.

Improvements in power electronics technologies and utilization of renewable energy sources for power generation have given rise to the use of distributed generation and create concept of smart grids and micro grids to overcome rapid increase in the demands for electricity and depletion of conventional energy sources. Monitoring of power system parameters like voltage, current and power at distribution level is crucial for efficient functioning of smart grid. The power exchange between the smart grid and the utility grid happens by switching. This switching needs complete synchronism between the smart grid and the utility grid. An economic & reliable communication backbone along with accurate monitoring system is essential.

2. PROPOSED SYSTEM

Architecture of IOT

The communication architecture of IoT [1] isdivided into three layers, the first layer is called sensor layer, which is composed by sensors, on-line monitoring terminals and wireless routers, the sensors are responsible for sensing the physicalinformation, the on-line monitoring terminals are responsible for gathering the monitoring data from the sensors, and the wireless routers are responsible

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for building the multi hop wireless network, through which the monitoring terminals can exchange data; the second layer is called fiber communication layer,the fibers in the OPGW cable are used as the communication path, the data gathered by monitoring terminals is send to the sink terminal connected to the OPGW by wireless router, and transfer to the datacenter; the third layer is the composed by GPRS network and the Beidou (COMPASS) navigation satellite system (CNSS), it is used in those place where there is no OPGW or the OPGW does not workwell, in this layer the data gathered by monitoring terminals is send to the sink terminal equipped withGPRS module and CNSS module, the GPRS module is the priority choice for data transfer and the CNSS module only work when the GPRS module can't work as normal. module only work when the GPRS module can't work as normal.

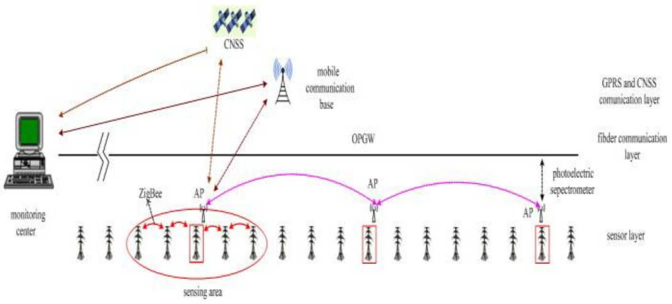


Fig2.1 Layer operation of IOT

Sensor layer

The full perception on the physical world is the basic character of IOT. Because the transmission line extends as far as hundreds, even thousands of kilometers, the topographies are varied and complicated, so the objects need monitoring are of great number, such as the pull and temperature of the transmission line, the temperature and humidity of the microclimate around the transmission line, etc

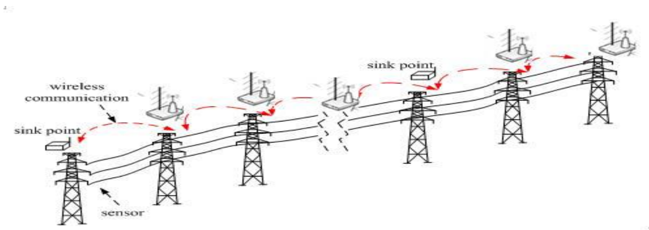


Fig2.2 Architecture of IOT in data transfer

Fiber communication layer

The OPGW is a combination of fiber and overhead ground line, it is an important developmentdirection of special optical cables, and is widely used with the development of power system's opticalfiber communication network. The OPGW is set on the top of the towers like other overhead ground line,can be worked as the communication line and the ground line.

GPRS and CNSS communication layer

In some places, the OPGW does not allowed to access, the breakage of the OPGW cores is often occurred in extreme low temperature, and the fiber communication can't be used, under these situation n,the GPRS module and CNSS module fixed on the monitoring terminals will start working.

Zigbee :

Zigbee Functionality Test Result This process is for checking the functionality and testing how far the Zigbee transmitter can connect with Zigbee receiver. Before that, the Xbee module need to be configured before it can be used as serial communication medium. The X-CTU software has several other functions beside configure the Xbee module. Each main tab has its own function to develop the communication by using the Xbee module.

Block diagram for simulation

Transmitter

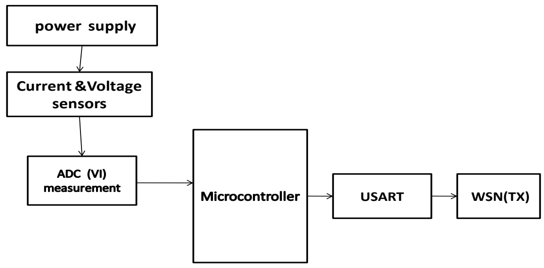


Fig2.3 Transmitter section

Receiver

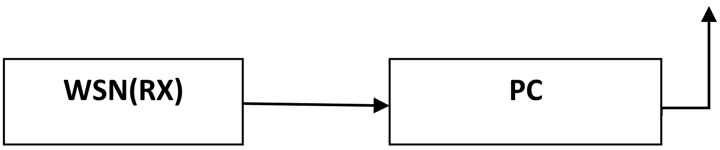


Fig2.4 Receiver section

Hardware block diagram

Transmitter

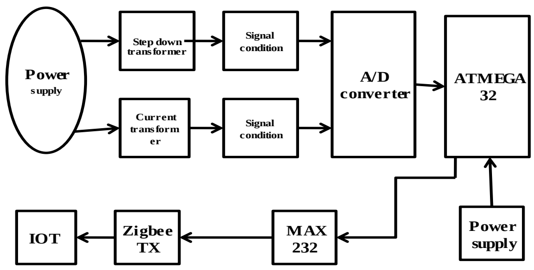


Fig2.5 Transmitter section

Receiver

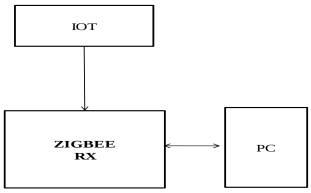


Fig2.6 Receiver section

Trust, security and privacy

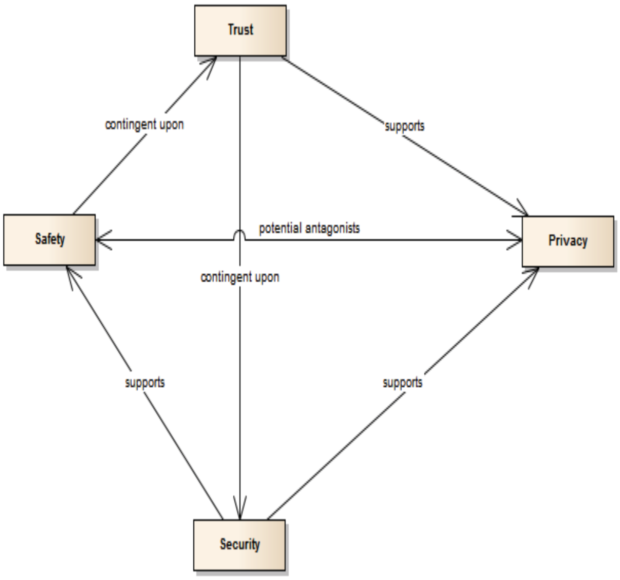
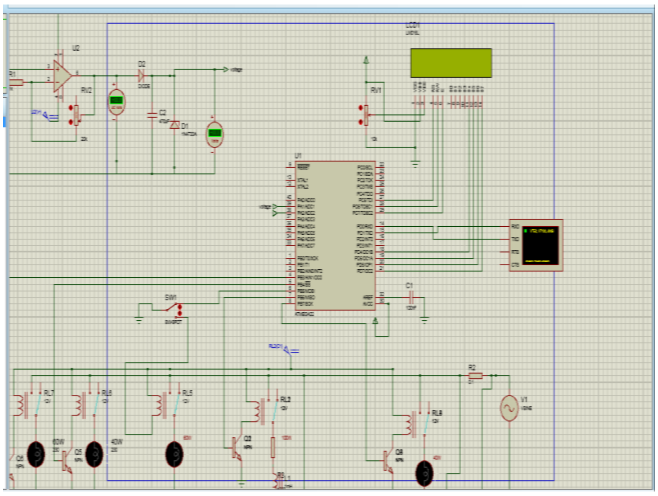


Fig2.7 Flow Chart for Security

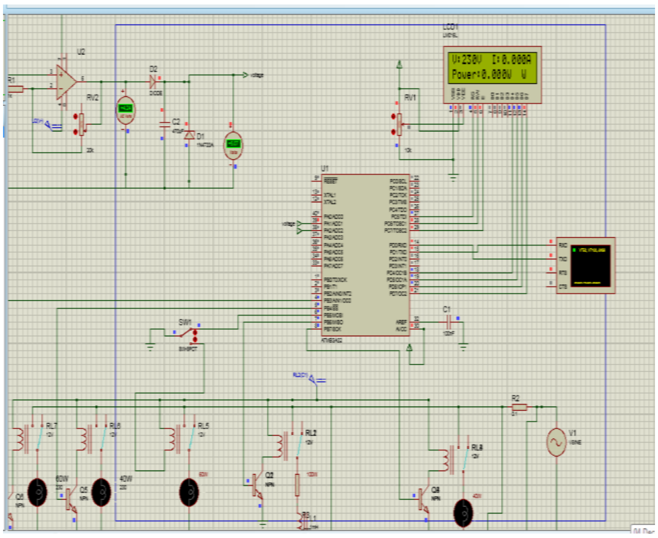
Confidentiality, personal rights to privacy, data security and integrity come at a cost. The question is: what is the cost benefit ratio when looking at the benefit the solution provides. The individual willing to forfeit his or her rights in order to gain the benefit Google and Apple have been able to take great liberties with personal data in return for costly and reduce the benefits or increase costs of mandatory IoT solutions.

3. SIMULATION RESULTS

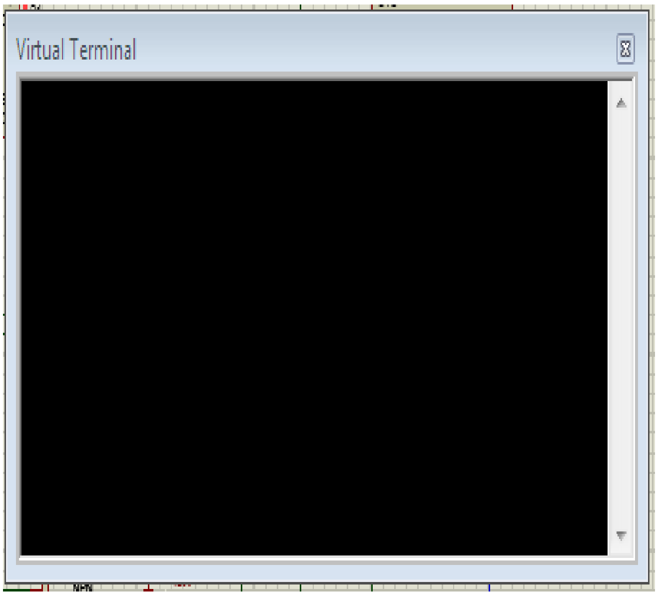
Circuit diagram for simulation



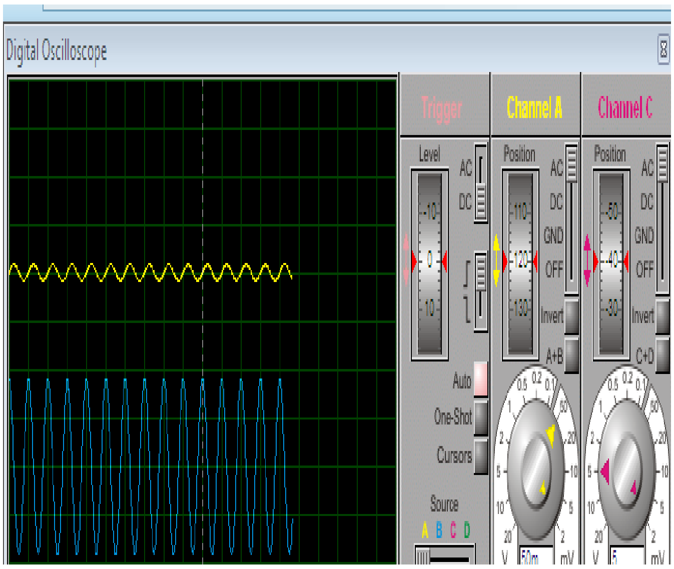
Initial state



For initial state

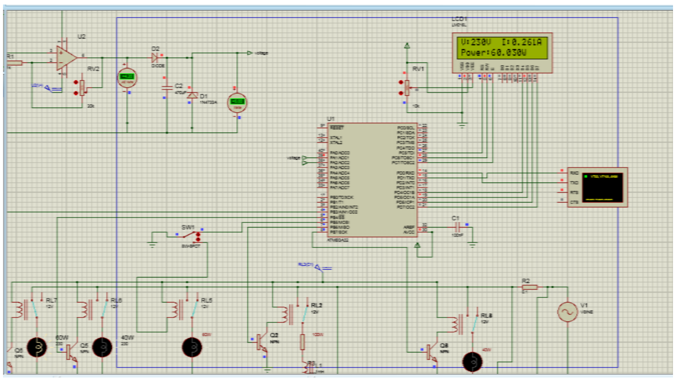


Waveform for initial state



Load A

For load A



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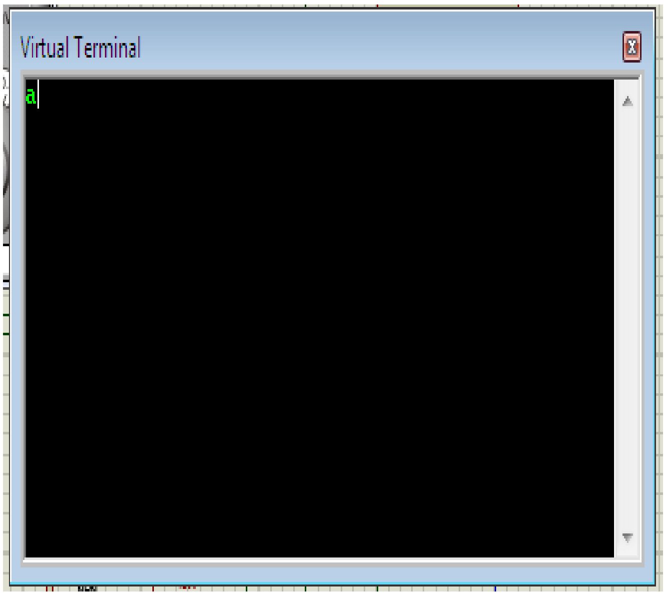
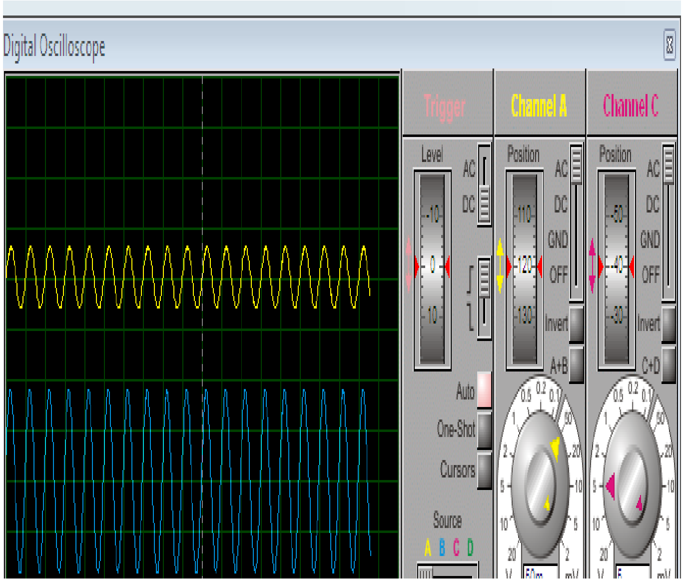
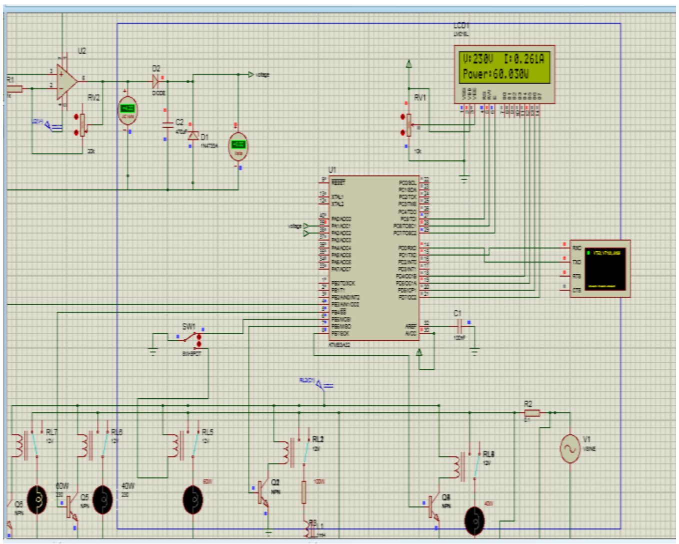


Waveform for load A



Load B

For load-B



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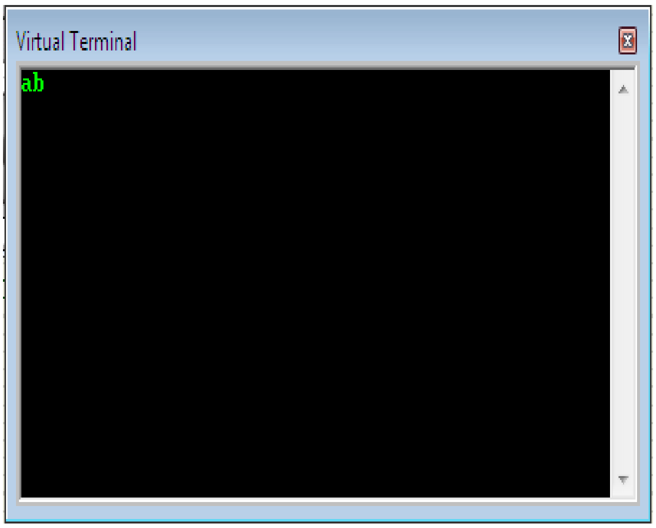
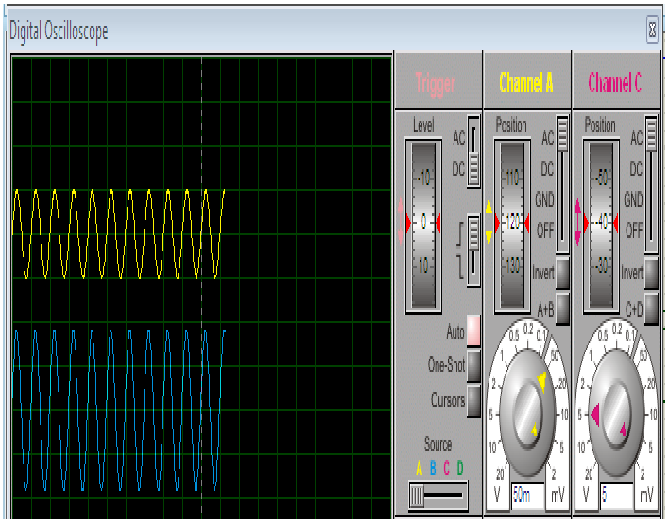
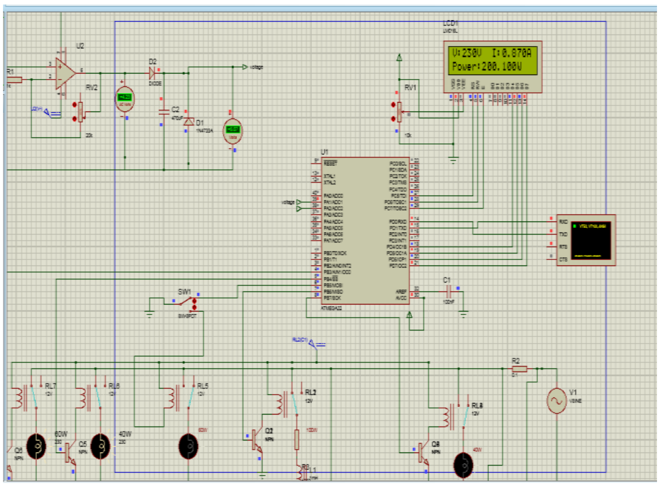


Waveform for load B



Load C

For load-C



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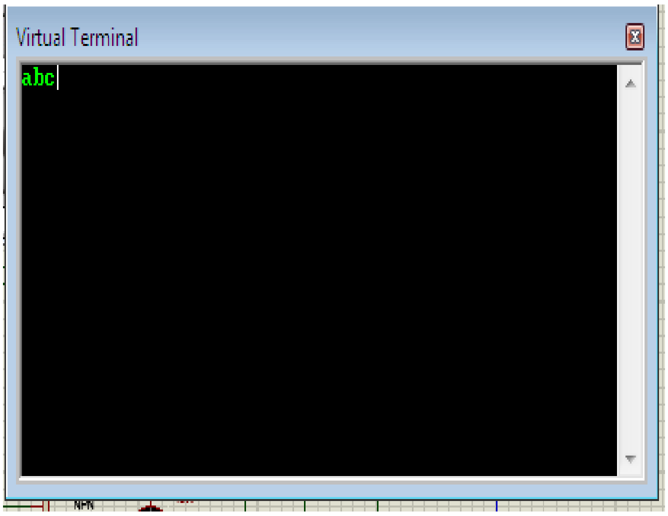
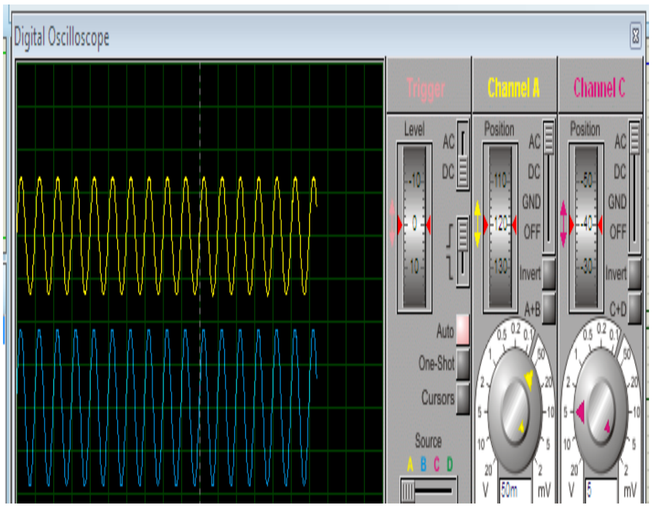
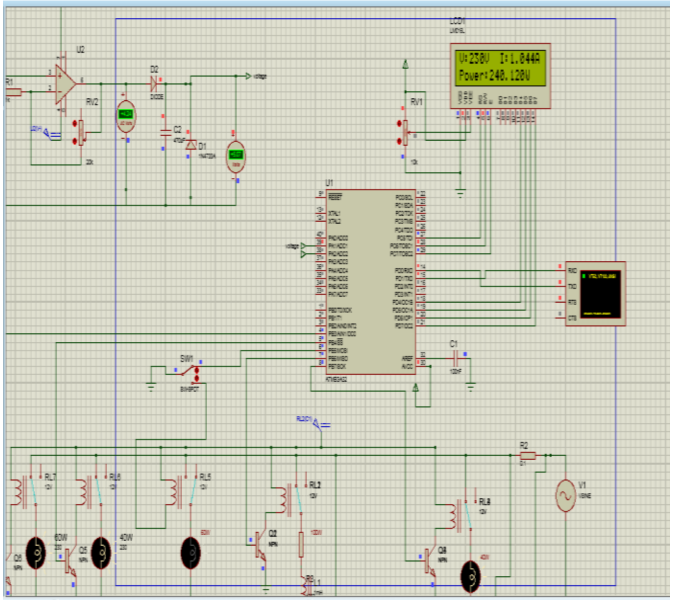


Waveform for load C

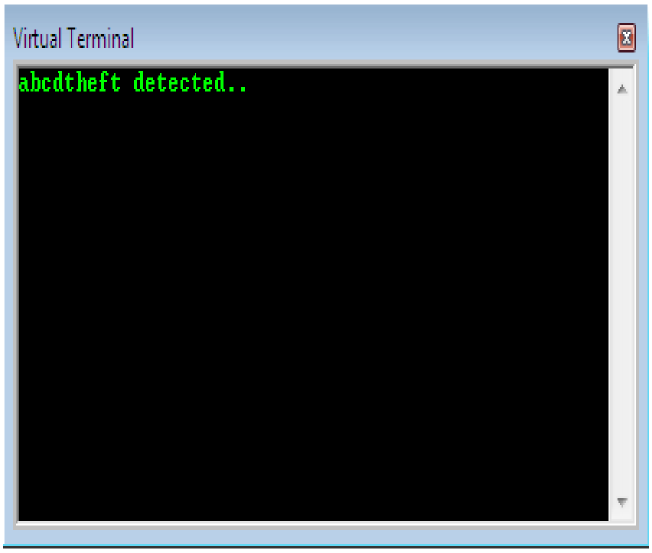


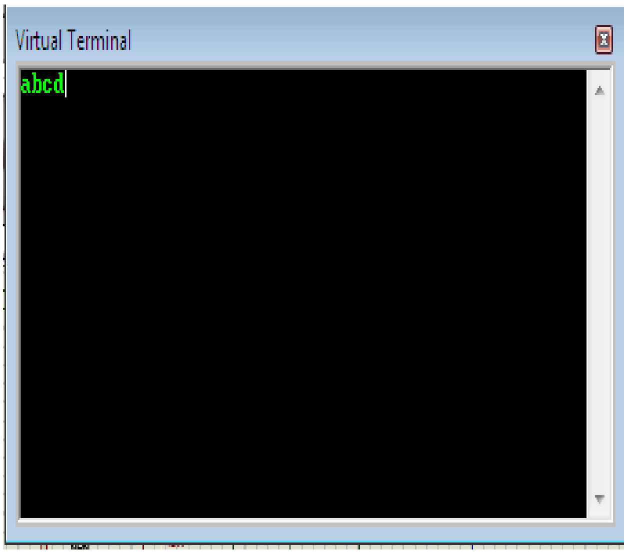
Load D

For load-D

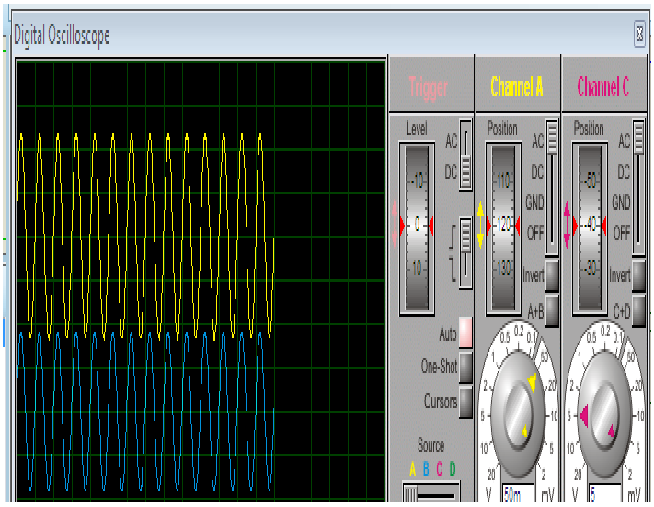


For load D

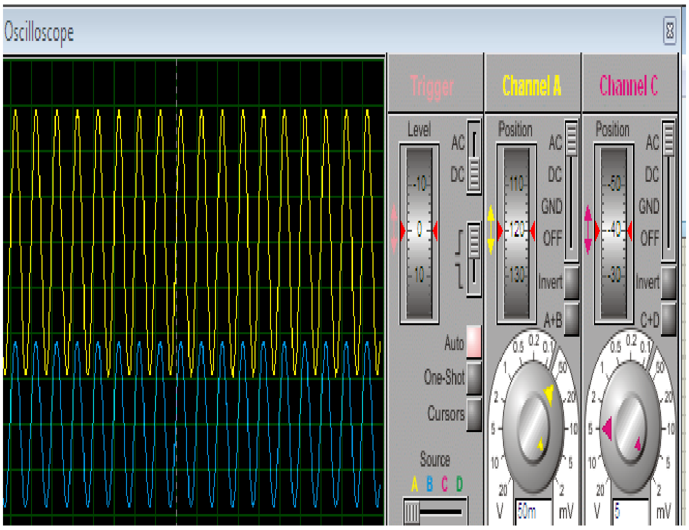




Waveform for load D



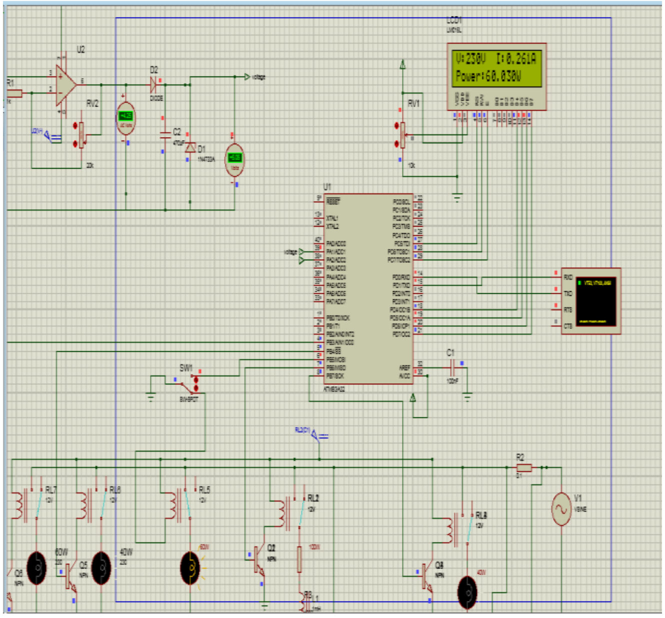
Waveform for theft detection



Tabulation

Theft Detection

For theft detection



For theft detection

S. No	Load	Current (Ampere)	Voltage (volts)	Power (Watts)
1	A	0.26	230	60.030
2	B	0.435	230	100.050
3	C	0.870	230	200.00
4	D	1.040	230	240.120
5	Theft	0.522	230	120.060

The values for current, voltage and power are tabulated for corresponding loads.

4. CONCLUSION

The real-time monitoring of the electrical appliances can be viewed through a website. The processed voltage, current values are displayed on LCD screen, Which can be controlled through application A Proteus is software for microprocessor simulation, schematic capture, and printed circuit board design. It is developed by Lab center Electronics. The sensor networks are programmed with various user interfaces suitable for users of varying ability and for expert users such that the system can be maintained easily. The current and voltage of a transformer is monitored continuously using wireless sensors. When the hacker tries to theft a load it sent a message notification to a customer. The simulation is carried out in Proteus software and simulations are showed.

4.1 Applications

It is widely used for military applications .
It can also applicable to power plants.
It secures the system from malicious attacks

4.2 Advantages

The sensing module is calibrated and tested for the accuracy.
It is clear from the experimentations that the wireless sensor networks may be successfully employed to smart grids for monitoring purpose.
Reliable and low cost WSN.
Less labourios..

REFERENCES

[1] “RESEARCH OF COMMUNICATION TECHNOLOGY ON IOT FOR HIGH-VOLTAGE TRANSMISSION LINE” Shao-Lei Zhaia*, Dong-Sheng Zhaob, Zhen Wangc, Yi Zhangc a Yunnan Provincial Electric Power Test & Research Institute (Group) Co., Ltd, Kunming City, China, 650217

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