INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.542

Power Theft Detection Using Arduino & GSM

Prof. Ajay H C, Apil Sharma, Sameena khanum, Amreen begum, Yesra Aymen,

Dept. of CSE, SJCIT, Bangalore, India

UG Student, Dept. of CSE., Dept. of CSE, SJCIT, India

UG Student, Dept. of CSE., Dept. of CSE, SJCIT, India

UG Student, Dept. of CSE., Dept. of CSE, SJCIT, India

UG Student, Dept. of CSE., Dept. of CSE, SJCIT, India

ABSTRACT: The Internet of Things (IoT) is a newly emerging field with a vision of connecting 'things', human and machines to get her making the man integral part of the internet. Electrical energy has been considered as an essential form of energy. This project presents a way to detect power theft, alert the consumer, and cut off the supply accordingly. When unauthorized actions are detected, and a separate message is sent back to the microcontroller to remove the illegal supply, an SMS is sent automatically to the user via the GSM module. The GSM is interspersed with a unique system energy meter with a relay to handle the non-technical losses, problems with billing, and variations in voltage fluctuations. Whenever there will be any disturbance in power or tampering of energy meter an alert message will be conveyed to the authorities and the power will be tripped off. The system comprises of current transformers connected between the poles, lines and houses to detect the power flow disturbance and various relay modules are also connected to the line to cut-off the supply when the thievery is detected.

I. INTRODUCTION

Over the last few decades, communications technology has improved through connectivity and boundaries. The use of the "Embedded Program in Communication" provides various interesting applications. Electricity is now more than necessary. The demand for electricity is increasing continuously. With increasing electricity demand, power theft is also on the rise. Power theft is a concerning issue even in the most efficient power systems like in USA and a moderately efficient system like in Malaysia. It has become important to improve the system performance and to avoid Theft. The purpose of this project is to design a system to monitor any power consumed before the power meter, and that is power pilferage. If some power theft is detected, that results in penalty or disconnection of energy supply to the respective consumer, and simultaneously an SMS is sent to the control unit.

In the past, numerous nontechnical and scientific methods for detecting electricity pilfering have been suggested. Non-technical procedures may involve customer inspection with a suspect load profile. Although regular inspections can help reduce theft, such action calls for the massive labour force and enormous effort. In most situations, this attempt always fails due to employee dishonesty. "The use of the main observer meter at the secondary distribution terminals are some of the technological ways to detect pilferage, harmonic generator, genetic support vector machines, extreme learning machine, power line impedance technique.

II. RELATED WORK

PAPER 1: Electricity theft: a comparative analysis
Authors: Thomas B Smith

Electricity theft can be in the form of fraud (meter tampering), stealing (illegal connections), billing irregularities, and unpaid bills. Estimates of the extent of electricity theft in a sample of 102 countries for 1980 and 2000 are undertaken. The evidence shows that theft is increasing in most regions of the world. The financial impacts of theft are reduced income from the sale of electricity and the necessity to charge more to consumers. Electricity theft is closely related to governance indicators, with higher levels of theft in countries without effective accountability, political instability, low government effectiveness and high levels of corruption. Electricity theft can be reduced by applying technical solutions such as tamper-proof meters, managerial methods such as inspection and monitoring, and in some cases restructuring power systems ownership and regulation.
Disadvantages
• Statistical analysis of power theft

PAPER 2: Development of ARM Processor based Electricity Theft Control System using GSM Network
Authors: K. Dineshkumar Prabhu Ramanathan Sudha Ramasamy

Electricity theft is a common practice in developing countries which cannot be controlled by the governments due to lack of technology. Emerging trends such as Automatic Meter Reading (AMR) eliminate the need of person visiting each house but this advancement further increases Non-Technical losses (NTL) because of no regular inspection at the residence. However traditional meter reading by human operator is inefficient to meet the future residential development needs. This paper proposes a new system based on ARM-Cortex M3 processor to protect the energy meter from phase line bypassing, neutral line disconnection, whole meter bypassing and meter tampering. A SMS automatically send to utility server through Global System for Mobile (GSM) network when these measures detected.
Disadvantages
•   Integrating this new feature into smart meters provides a robust metering solution

PAPER 3: A Smart Prepaid Energy Metering System to Control Electricity Theft

Authors: Nabil Mohammad, AnomadarshiBarua,Muhammad Abdullah Arafat

Power utilities in different countries especially in the developing ones are incurring huge losses due to electricity theft. This paper proposes a prepaid energy metering system to control electricity theft. In this system a smart energy meter is installed in every consumer unit and a server is maintained at the service provider side. Both the meter and the server are equipped with GSM module which facilitates bidirectional communication between the two ends using the existing GSM infrastructure. Consumers can easily recharge their energy meter by sending a PIN number hidden in a scratch card to the server using SMS. This paper presents some measures to control meter bypassing and tampering. The bidirectional GSM communication using SMS ensures the effectiveness of these measures. Pilferage of electricity can be substantially reduced by incorporating the proposed measures along with the prepaid metering scheme.
Disadvantages
•   Legal actions against dishonest consumers can also be taken in this system.

PAPER 4: Smart Power Theft Detection System

Authors: Nitin K Mucheli, Umakanta Nanda, D Nayak

Power theft is normally done by two methods that is bypassing or hooking. So to detect it, a system (current measuring and comparing) is proposed in which the household distribution of current is done indirectly from the electric pole to an intermediate distributor box and then to the individual houses. The current is measured periodically in the distributor box and is posted to the server database for each house using GSM/GPRS module. Similarly, for each house electric meter is designed which can measure the value of the current and post the same to the server database periodically using GSM/GPRS module. At the time of the installation of the electric meter the details of the users are stored in the database through a user friendly mobile application including the address, latitude, longitude using mobile GPS and the photograph of the user's house/area.

III. PROPOSED SYSTEM

In this paper, the energy stealing system is proposed to send the SMS using a GSM Network. The most common methods of electricity theft are to bypass the phase line, cut off the neutral line, bypass the entire meter, and distort the energy meter. The current transformer is blinded to zero current, By passing the phase line. The voltage transformer shows zero potential by disconnecting the neutral line and giving the local ground. The entire meter is bypassed, and the energy meter is measured at zero. Faulty readings are triggered by tampering the energy meter with unauthorized modification. Many named and unnamed manners for theft of electricity are also available. The use of a single household meter cannot detect and control these types of theft. An observation meter is used in the proposed system to identify such unrecounted theft. Measure the overall household energy consumption at agreed time.

IV. SIMULATION RESULTS

In summary, the load consumption differs in both magnitude and time of use and is dependent on lifestyle, seasons, weather, and many other uncontrollable factors. Therefore, consumer load profiles are affected not only by weather and conditions but also by the types of consumers and other factors.

Based on the above analysis, extracting features from smart meter data based on experience is difficult. However, feature extraction is a key factor in the success of the detection system. Conventionally, manual feature extraction requires elaborately designed features for a specific problem that make it uneasy to adapt to other domains. In the CNN, the successive alternating convolutional and pooling layers are designed to learn progressively higher-level features (e.g., trend indicators, sequence standard deviation, and linear slope) with 2D historical electricity consumption data. In addition, highly nonlinear correlations exist between electricity consumption and these influencing factors. Since activation function has been designed on convolutional and fully connected layers, the CNN is able to model highly nonlinear correlations. In this paper, activation function named "rectified linear unit" (ReLU) is used because of its sparsity and minimizing gradient vanishing problem in the proposed CNN-RF model.
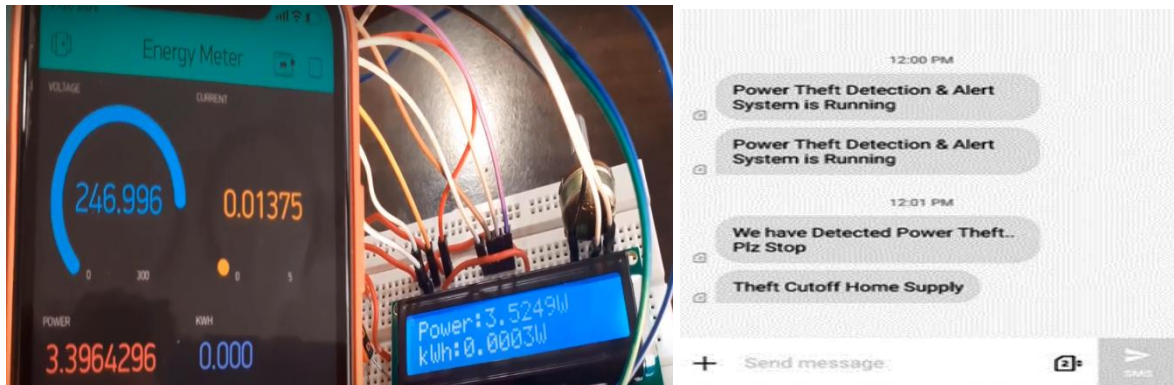

Figure 1: PROJECT OUTPUT

V. CONCLUSION AND FUTURE WORK

The proposed method of power theft minimizes the heavy power and revenue loss that results from the theft of power by customers. With the completion of the project, it isconcluded that power theft can be effectively reduced by detecting when does the power theft occurs and simultaneously informing the authorities to disconnect the power to the house or customer trying to steal the power supply by an integrated automatic breaker that is attached to the unit. The system is used to send or communicate data to the consumer domain as well through a GSM wireless network. The proposed system will reduce energy waste and save more for future use.

VI. FUTURE ENHANCEMENT

This project enhanced by using the components which can measure the current more than 230 V of power. And also this power theft detection can incorporated to factories and industries where there is huge consumption of the power so that we can measure the current and detect theft.

REFERENCES

[1] T. B. Smith, "Electricity theft: a comparative analysis," Elsevier Journal Energy Policy, vol. 32, no. 18, pp. 2067-2076, Dec. 2004.

[2] K. Dineshkumar, Prabhu Ramanathan, Sudha Ramasamy. "Development of ARM processor based electricity theft control system using GSM network", 2015 International Conference on Circuits, Power and Computing Technologies [ICCPCT- 2015], 2015

[3] N Mohammad,ABarua and M Arafat,"A smart prepaid energy metering system to control electricity theft", in proceedings of International Conference on Power, Energy and Control (ICPEC), vol.562, no.565, pp.6-8, Feb.2013.

[4] Nitin K Mucheli, Umakanta Nanda, D Nayak, P K Rout, S K Swain, S K Das, S M Biswal. "Smart Power Theft Detection system", 2019 Devices for Integrated Circuit (DevIC), 2019

[5] M. Saad, M. F. Tariq, A. Nawaz and M. Y. Jamal, "Theft detection based GSM prepaid electricity system", IEEE International Conference on Control Science and Systems Engineering (ICCSSE), pp. 435-438, 2017.

[6] S.S.S.R. Depuru, L. Wang, and V. Devabhaktuni, "A conceptual designusing harmonics to reduce pilfering of electricity," in proceedings of IEEE Power and Energy Society General Meeting, pp. 1-7, Jul. 2010.

[7] J. Nagi, K.S. Yap, S.K. Tiong, S.K. Ahmed, and A.M. Mohammad,"Detection of abnormalities and electricity theft using genetic Support Vector Machines," in proceedings of IEEE Region 10 Conference, pp. 1-6, Nov. 2008.

[8] A.Pasdar and S.Mirzakuchaki, "A solution to remote detecting of illegalelectricity usage based on smart metering," proceedings of 2nd International Workshop on Soft Computing Applications, pp. 163-167, Aug. 2007.ATMEL website.

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

📱 9940 572 462 📞 6381 907 438 ✉ ijircce@gmail.com

Scan to save the contact details