Retraction

Retraction: Power theft detection in customer consumption using smart system (*J. Phys.: Conf. Ser.* 1916 012098)

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This article (and all articles in the proceedings volume relating to the same conference) has been retracted by IOP Publishing following an extensive investigation in line with the COPE guidelines. This investigation has uncovered evidence of systematic manipulation of the publication process and considerable citation manipulation.

IOP Publishing respectfully requests that readers consider all work within this volume potentially unreliable, as the volume has not been through a credible peer review process.

IOP Publishing regrets that our usual quality checks did not identify these issues before publication, and have since put additional measures in place to try to prevent these issues from reoccurring. IOP Publishing wishes to credit anonymous whistleblowers and the Problematic Paper Screener [1] for bringing some of the above issues to our attention, prompting us to investigate further.

[1] Cabanac G, Labbé C and Magazinov A 2021 arXiv:2107.06751v1

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Power theft detection in customer consumption using smart system

V S Chandrika¹, S Bhavana¹, P Brindha¹ and R Deepika¹

¹Department of Electrical and Electronics Engineering, KPR Institute of Engineering and Technology, Coimbatore
deeepika97869@gmail.com

Abstract. Power theft is a big issue in developing countries. Stealing electricity is considered as a crime. Power theft in a country hits its GDP hard. So it is very important to prevent power theft for undisturbed supply of good quality power everywhere. This paper aims at designing and implementing a power theft detection system in customer and distribution side. Normally power theft is done by directly tapping power from the lines. This system helps in detecting the power theft and in locating the area in which power is stolen. With the help of sensors placed in respective regions power theft is identified and alert is sent to authorities. The ultimate goal is to prevent power theft and it helps in providing good quality power to legal users.

1. Introduction

Electricity is basic need. Without power world stops. Electricity is generated in power plants and distributed through complex networks and this need lot of money. Therefore Electricity billing system is implemented for the consumers based on their consumption of power. Consuming power illegally without paying bill for the utility company is considered as crime. Stealing electricity is an offence and punishable and it comes under non technical loss of electricity. Power theft is a big issue in developing countries. Power theft effects India’s GDP hard. In India annual economic loss due to power theft is up to INR 3000 crores. It reduces GDP around 1.5 percent. Overloading power distribution systems, power disruption, poor quality of supply, high electricity prices etc... are some of the serious problems caused by power theft.

It is very important need to prevent power theft for undisturbed supply of good quality power everywhere. This project helps in detecting the power theft and in locating the area in which power is stolen. Normally power theft is done by directly tapping power from the lines. This project detects the power theft with the help of various sensors placed in respective regions and alerts the authority using GSM module.

The Arduino UNO controller is used in this system. Data from current sensors placed in various places between the poles are given to Arduino board wirelessly using RF transmitter and receiver. In this paper we are going to discuss the methodology of power theft detection and its implementation. Also future scope of this project also discussed. The main of this system is to detect power theft and to disconnect the load from the power supply.
2. Literature review

[1] "A novel power theft detection algorithm for low voltage distribution network," IECON 2017 – “43rd Annual Conference of the IEEE Industrial Electronics Society, Beijing, 2017, pp. 3603-3608”. This paper deals with power theft identification in low voltage distribution networks. By injecting low magnitude high frequency low interfering signal into the line, it detects the power theft by tapping on the lines.

[2] "Smart Power Theft Detection System," 2019 “Devices for Integrated Circuit (DevIC), Kalyani, India, 2019, pp. 302-305”. This paper deals with detecting power theft by tapping from the lines and communicates the authority through gsm module and locates the area in which power is theft.

[3] "Power Theft Identification System Using Iot," 2019 “5th International Conference on Advanced Computing & Communication Systems (ICACCS), Coimbatore, India, 2019, pp. 825-830”. In this Paper with the help of raspberry pi power theft is identified. With threshold voltage and current fixed, whenever the voltage level get increased power theft is identified.

3. Methods of Power Theft

- Tapping directly from the lines: Power theft is done by tapping directly from the line and consuming power. This is the common method of power theft. This can be identified with the help of current sensors in the lines [4-6].
- Tampering energy meter: There are different methods of tampering energy meter. Placing magnet we could reduce or stop the disc rotation and we don’t get any readings for the power we consume. This method is used in earlier days. Since we have digital meters in every places tampering energy meter is now not possible [7].
- Disconnection of neutral line and short circuiting the phase coil of the current transformer. This method of power theft is identified with the help of sensors placed in phase and neutral lines connected with energy meter [8].

4. Block Diagram

![Block diagram of the proposed system](image)

Figure 1. Block diagram of the proposed system
Arduino UNO controller is used here Figure 1. It is an open source electronics platform based on easy to use hardware and software. It's a simple and easy to use development board that is relying on a microcontroller in it. The programming of an Arduino Uno R3 can be done using IDE software. Current sensor senses the current from the loads connected and sends the measured data to RF transmitter and it send to receiver connected to Arduino [9].

Power theft is done by tapping directly from the line and consuming power. This can be detected by comparing the power distributed and the power consumed by the load. Using current sensor the values are measured and if there is any difference then it means that there is power theft and coding the Arduino we could identify the difference and send signal to the GSM, relay to send information to the authority and to turn off the load [10].

Also placing current sensors at certain places between the poles we could able to whether power is stolen and we could able to locate the pole. By feeding pole and consumer data base we can locate the place where the theft is happened. After the detection of power theft relay is used to disconnect the load from the supply. LCD and buzzer are used for the indication of the power theft.

4.1 Current sensor

ACS712 current sensor module is used in this system. There are two types in this sensor used for DC and AC power respectively. Since we are using commonly alternative power, hall effect sensor is used. The working principle of the sensor is based on hall effect. It operates from 5V and gives output analog voltage which is proportional to current measured on the sensing terminals. The analog data from the sensor is given to transmitter and it is transmitted to receiver connected with arduino. By programming the arduino we are converting the analog value to digital and it is compared. Difference in corresponding sensor values indicates the power theft.

4.2 GSM Module

A GSM (Global System for Mobile Communication) modem is a specialized type of modem that uses mobile telephone technology to provide a data link to a remote network. It need a SIM to identify itself to a network. It just acts like a mobile phone. GSM operates on the mobile communication bands 900 MHz and 1800 MHz. Here, we are gsm module for communication purpose. When power theft is detected alert message is sent to respective authority through gsm. Since it acts like mobile phone indicating message is sent to the TNEB authority. Thus without manual interruption power theft is identified and alert message is sent.

4.3 RF Transmitter and Receiver

We are using the 433MHz transmitter receiver pair. The RF transmitter transmits serial data wirelessly through its RF antenna. RF receiver receives the data. The operating frequency of receiver is same as that of transmitter. This helps in collecting data from sensor and sending to arduino wirelessly. We can easily transmit the current sensor data wirelessly to the controller placed within the area of 100 meter. For long distances we can use high frequency RF modules.

4.4 Relay
Relay is an electrically operated switch. It is used for making and breaking of circuit connections. Here we are using the relay to automatically disconnect the load when power theft is identified. When operating voltage is given to the relay by electromechanical principle it automatically opens the circuit in which it is connected. When power theft is identified arduino provides the operating voltage of 5V to the relay and it disconnects the load from supply and prevents power theft to happen further. Thus this system automatically alerts and disconnects the supply from the load and prevents the theft detection it is a smart system.

5. Simulation

![Simulation of the proposed system](image)

**Figure 2.** Simulation of the proposed system

Simulation of the system is done in proteus software. Two bulbs are considered as load. One as normal load and other as theft load Figure 2. Two current sensors are placed before the tapping and after the tapping. Current sensors are interfaced with Arduino Figure 3. Analog output from the current sensors is converted to digital in arduino code. A virtual terminal is connected in the output side of arduinoc. It shows whether the power theft occurred or not Figure 4.
When one bulb is switched on that is only normal load is on then there is no difference between the data from two current sensors. No power theft occurred is displayed in the virtual terminal. When another bulb is also switched on then there will be difference in data measured in two current sensors. Then virtual terminal shows power theft is happened. Thus power theft is identified. For real time implementation current sensors can be placed between the poles. If any power theft occurred in between the lines by tapping then there will be difference in the current sensors and arduino identifies the difference and operates the relay and gsm module to indicate the power theft and relay disconnects the load from the supply.

6. Conclusion

This project is developed to reduce the power distortions, economic problems like revenue losses caused by electricity consumers who don’t pay for what they consume. By minimizing theft of power good quality power can be distributed even for rural areas. Without the manual work it detects the power theft and disconnects the load in a smart way. This system can be further improved in the area of implementation. Machine learning methods are used for analysis of data from the sensors. It can be implemented using the concept of machine learning and deep learning and it helps in detecting power in bulk area networks.

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