Power Theft Detection and Alert System using IOT

K.Kumaran[a], N.Ananthi[b], G.Saranya[c], S.Priyadharshini[d], T.Thiviyabala[e] and K.Vaishnavi[f]
[a] Assistant Professor, Department of Information Technology, Easwari Engineering College, Chennai, India
[b]Associate Professor, Depertment of Information Technology, Easwari Engineering College, Chennai, India.
[c]Assistant Professor, Department of Computer science and Engineering, SRM institute of science and technology, Chennai, India
[d]UG scholar, Depertment of Information Technology, Easwari Engineering College, Tamil nadu, India
[e]UG scholar, Depertment of Information Technology, Easwari Engineering College, Chennai, India
[f]UG scholar, Depertment of Information Technology, Easwari Engineering College, Chennai, India

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Abstract: Presently smart home, smart meters and Internet of Things are being included hugely to supplant the conventional analog meters. This helps in digitaizing the collected data and the reading in the meters. This data can be transmitted through wireless medium and minimizes the manual work. However, this also involves the risk of theft. These theft are not detected accurately due to the lack of certain methods in the existing solution. The objective of the proposed project is to architect a system to track the electricity spent per load and to trace, banish the theft of electricity in current line and meter. This project also involves informing the Electricity Board officials about the theft occurred by using IOT. A network of devices such as sensors are connected together which helps in transmitting transmit real-time data over the Net. Here, the Arduino Uno is used to recogonise energy theft and pass the information to the GSM module which in turn passes the information of the theft to the EB. The practical usage of this project,saves a lot of electricity thus improving the country's economic conditions.

Keywords: Power theft detection, IOT, Electricity Board, GSM , Arduino Uno, Buzzer

1. Introduction

Theft of electricity is considered one of the major issues in India . Frequent power shutdowns are also a result of electricity theft. The power theft is increasing every day. Every year the country faces numerous national thefts of electricity and also energy thefts in industries which cause the dropping of energy dispersed to the provider. As a result of these thefts, the country faces power outages in both rural and urban areas. Due to theft alone our country losses about 12 billion dollars annually resulting to a great economic loss. Our projects aids to minimize and banish these recurring problems faced by our country . The layout of an power theft monitoring system saves time and maximizes the profit of the utility company working on an electrical distribution network. There are many ways to steal electricity and there is no solution to this problem in existing systems. Our projects are designed to automatically detect when a power cable or meter is bypassed. Here,the overall energy consumed by the load is tracked by transformers. If there have been knocks on the power cable or if an extra device is launced , the sensor is drawing energy. This causes the analog readings to increase from the threshold value and sends an alert via GSM to the electrical panel.

2. Related Works

Efficient electricity generation is crucial today, as wasted energy is problem to be noted. The power factor measures the energy efficiency of a system and how important it is to improve the standard of the supply.

[1] Effective age of power at present is significant as wastage of power is a worldwide concern. Power factor estimates a framework's power proficiency and is a significant perspective in improving the nature of supply. In most power frameworks, a helpless power factor coming about because of an expanding utilization of inductive burdens is regularly neglected. A power factor adjustment unit would permit the framework to re-establish its power factor near solidarity for efficient activity. The upsides of amending power factor incorporate decreased power framework misfortunes, expanded burden conveying capacities, improved voltages and considerably more.

[2] As of late, the nature of power provided to the purchaser gadgets by an air conditioner framework has become an issue of incredible worry because of the quickly expanding inductive burdens, electronic types of gear, power electronic gadgets and high framework voltage. Power factor remedy (PFC) is a strategy of limiting the unwanted impacts of electric loads that make helpless power factor conditions. Amendment of power factor might be affected either by transmission utility which improves the strength and effectiveness of the transmission organization or by people clients.

[3] Power Quality observing is vital particularly for high recurrence nonlinear burdens, rapid movable drivers. Precise estimation of electric boundaries is needed to decide the nature of power which includes gathering, dissecting and preparing of voltage and flow tests throughout some undefined time frame. So tending to this a power meter is necessitated that actions electric boundaries with high precision and calculation speed for various burdens.

[4] Advancement in the field of electrical designing is fast and excellent. Despite the fact that the nonlinear power electronic types of gear present power quality issues, their utilization is unavoidable. The vast majority of the clinical types of gear utilize power electronic gadgets. Major issues incorporate low information power factor and expanded waves in the information current. Numerous bridgeless geographies have been acquainted with relieve the previously mentioned issues. Regular geographies utilize buck, lift, Cuk and epic converters. In this paper bridgeless zeta converter with one cycle control for show screens in emergency clinics has been proposed.

[5] Checking of power supply is needed in power frameworks to build the presentation, management and authority over the framework. Power quality is characterized as completely sinusoidal voltage and continuous power supply to the clients. The power quality factor (PQF) is a remarkable pointer going from 0 to 100%, which reflects nature of the 3 stage power supply given the client has been recommended here.

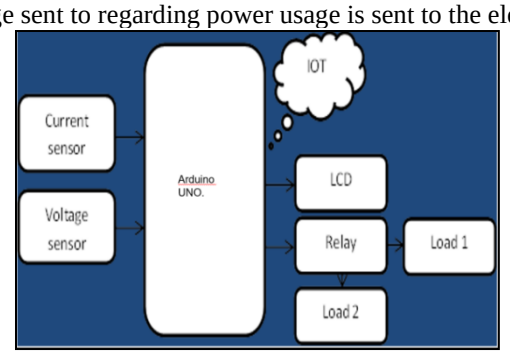
[6,7]The current remote correspondence arrangement of energy meter has been finished using ZIGBEE and GPRS. This strategy is chiefly used to get the correspondence channel and ZIGBEE for the transmission of information in a sequential interaction.

[8] Broadly, absolute transmissions and dispersion misfortunes approach 23% and a few states' misfortunes surpass 50%.

3. Overview Of Proposed System:

In this proposed system, the information of theft detection is informed to the EB officals by using GSM and Internet Of Things technology. This system interfaces with the Arduino the sensors interconnected with the Arduino to predict the current and voltage. This will restrain electrical theft to its maximum .Therefore our projects aims to prevent and banish the thefts occurring hece saving the country from further energy wastage.

In this proposed system, the parameter such as power, current, voltage is checked based on that the energy is calculated and the payment is generated to respective mail. If there are increases in load the power supply to the load is cut off and message sent to regarding power usage is sent to the electric board and display on the LCD.

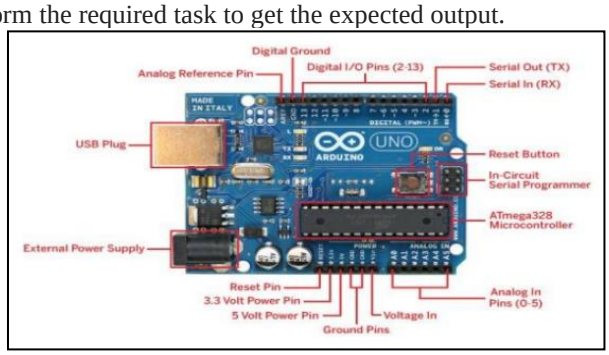


Further any increase in load, the power supply to the load will cutoff and the electric board is intimated and also the individuals who own the house using GSM and a buzzer is also fitted to alert the theft to have occurred, it will generate the bill based upon the usage of power supply.

A ThinkSpeak Software is used to store the usual load consumed and to find the increase in load due to theft and its also used to detect the theft. In this project, the Arduino Uno will continuously monitor the load based on the- parameter such as voltage, current, power.The Arduino Uno again continues on monitoring the load power.

3.1 Arduino Uno:

Arduino Uno board is a microcontroller. It can be issued power by an external 9-volt battery. Operating voltage is 5 Volts and the input voltage is 7 to 20 Volts. It consists of one UART,
I2C and SPPI pins respectively.This is used to coordinate all the functions of the sensors and devices connected to the board to perform the required task to get the expected output.



3.2 Voltage Sensor:

A voltage sensor is utilized to calculate and view the amount of voltage in an object. Itis the one that can determine both the AC voltage . The volts between 0 and 12 is measured. Formula of analogRead (A0) voltage = value * (5.00/1023.0) * ((R1 + R2)/R2) formula is used to calculate the value. This device is used in our project to

measure the voltage being supplied so that we are getting to have a stable electric connection and also to detect a theft.

3.2.1 Current Sensor Module :

Current Sensor, which is used to accurately read AC or DC current. 20A is the maximum AC or DC that can be detected and the current current signal is viewedthrough analog I / O port of a microcontroller**.** This module is involved in our project to measure the current we get and also to keep the reading so that any change to the original value will help us in detecting theft.

3. LCD:

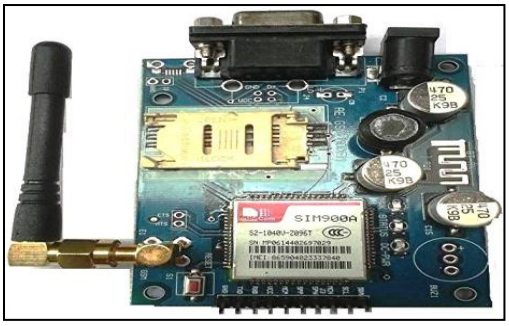
Liquid Crystal Display is a display which uses its first form of operation. Here the load is monitored continuously by the Arduino UNO. If there are increases in load the message is sent regarding power usage to the electric board and display on the LCD.

3.3.1 Relay:

It is an electromagnetic electric switch. When the it gets de-energized, the closed gates opens and breaks the connection.. Further any increase in load ,the power supply to the load will cutoff by the relay.

3.4 GSM:

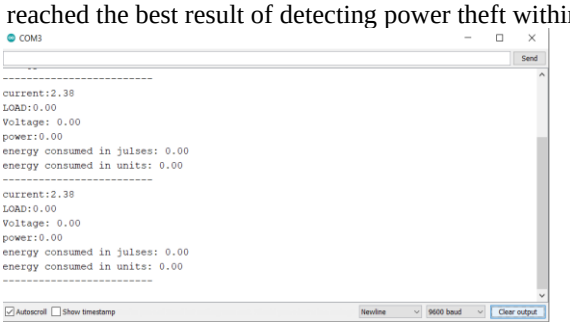
The Arduino GSM is connected to an Arduino board to send and receive SMS, and make voice calls using it.It is an open technology, transmitting signals at 850Mhz to 1900MHz. TDMA is used for communication purposes. SIM is required and insertcard just likemobile phones to activate communication. The modem then sends back a result after it receives a command. In our project too the GSM is used to send alert messages to the EB officials and the individuals about the theft of electricity happened at anytime in a day. This is essentially used on top of other devices similar to this is because of it wide frequency range.



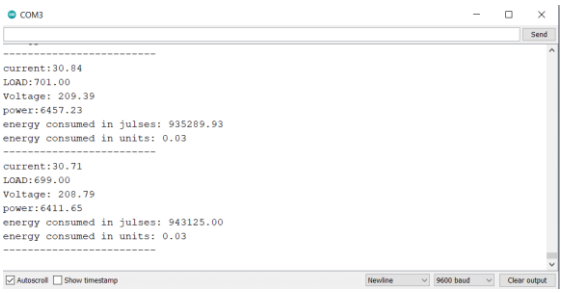
4. Expiremental Results:

We have included the following input data for the smooth working of our project. The inputs are, Current, Voltage, Power and the Transmission Loss. These factors will help in enhancing the accuracy of the project.

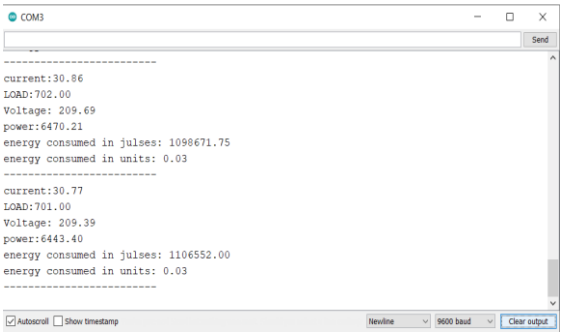
Using the formula of V=IR, the voltage sent to a house can be determined and from that the difference with the previous reading that occurs usually can be compared and alerted for any theft in an efficient way. By using this method we have reached the best result of detecting power theft within seconds of happening.



With no load



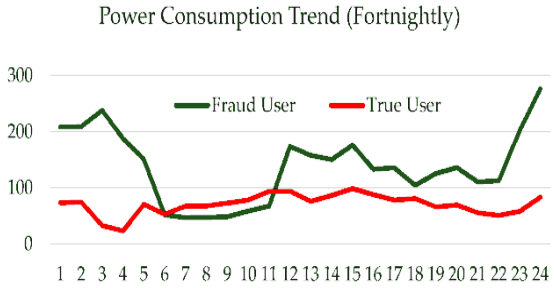
With one load



With dual load(theft)

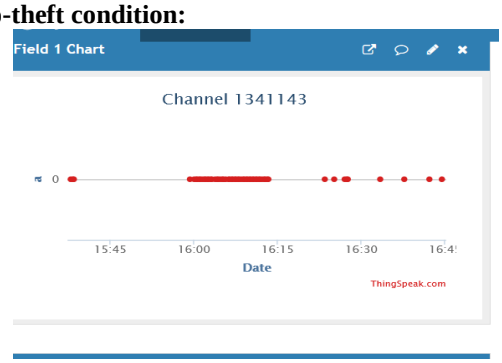
5. Performance:

Overall graph:



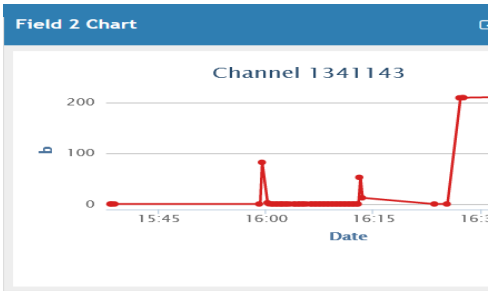
The above graphs shows the amount of electricity used by the original user and the fraud one.

Graph determining a no-theft condition:



The above graph shows the normal current readings i.e: without theft .A straight line represents the normal flow of current and voltage in the meter.

Graph determining a theft condition:



The high range points shows the theft being occurred in the meter. These high point values are the result of sudden increase in the usage of current that ultimately leads to one condition i;e: presence of theft.

The results would be like

The above mentioned would be the message resulting on the meter about theft-detection and a private message would be sent immediately after the theft detection after these procedures, the entire power supply line would be shut off to prevent further more electricity theft.

6. Conclusion:

The performance of the project is discussed.Thus our project on power theft detection and alert system using IOT is successfully implemented .

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