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POWER THEFT IDENTIFICATION SYSTEM USING IOT

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ABSTRACT

Power theft can be a challenging question in electrical power networks that cause huge economic losses and lead in an unreliable provision of power. Power steals are also briefly defined as electricity consumption without the awareness of the supplier. It's been India's biggest challenge, and it's a crime. Overall, India has the largest losses of about $16.2 billion. Power theft can take place in several ways, one of which is that authorized members either rob power by transferring the meter. And several other forms, that is, linking across the meter to a live cable on the client side of the meter or tampering with the device to make the meter read less or less consumable. In proposed system, the arduino uno continously calculates the consumed currents of each and every load and compare the actual current rating of the transformer and if any abnormal condition detected, then an arduino will update the data on the web and it will send the message to the authorized person and also gives the alert.

Keywords—Arduino Uno, LCD Display, Current transformers, GPRS/GSM Modem, Bridge rectifier, Capacitor,Voltage Regulator, Power supply and Buzzer.

1. INTRODUCTION

The method of detecting power theft is used to evaluate the energy flow. Power theft surveillance is used to track illegal taping of distribution lines. This real-time strategy can also be used to locate the electrical tap line. But tapping can be found using wireless data transmission and reception techniques [1]. This system will protect your global distribution network. Power savings are very relevant in today's world, but they are challenging.Although there are several ways to generate electricity, the lack of resources has made it very difficult to save energy. So saving power is genuinely important to our society [2]. Power generated must be used in the most logical manner by means of a near assessment of consumption and loss of power. Most probably, the power outage in the transmission lines, the transformers and the power system segment occurred naturally due to technical losses.Details on the energy bill and the maximum throughput shall be used to define technical losses in the transmission and distribution of electricity. The job includes of issuing commands via GSM-based communication.

2. LITERATURE REVIEW

1) In this survey, Energy Audit and Review of Electricity Usage of Educational Building Philippines for Smart Consumption Using Raspberry Pi 2017 IEEE 9th International Conference on Humanoid, Nanotechnology, Information Technology, Communication and Control, Climate and Management (HNICEM)- This paper reports on the findings of energy evaluation performed on educational buildings in the Philippines.
2) The control of the electrical source supplied to the entire space is described in this paper, "Design of Smart Home Mobile Application with High Security and Automatic Features"-2018, the 3rd International Conference on Green Building and Smart Grid Intelligence (IGBSG). The supplied electrical source is tracked and stored in the cloud, and it is managed via an Android app.
3) In this paper-IEEE Transactions on Smart Grid-"Efficient and Autonomous Energy Management Techniques for Future Smart Homes" (Volume: 8, Issue: 2 , March 2017) - The HEMS module is a modern energy device built at the consumer end that is used to analyse, measure, optimize, and control the flow and usage of energy. It is connected to the meter on one end and all the appliances on the other.The user has specified ten appliances, which will remain turned on throughout each time slot. While collecting data, HEMS identifies the use of electricity and measures the price of used electrical power in kwh, and collects data based on customer consumption**.** [3]
4) This paper, titled 'A tamper proof framework for smart meters using IoT technology,' was published in the ARPN Journal of Engineering and Applied Sciences in 2016. Using the Arduino Super 2560 microcontroller, this system can be applied to both the green and brown fields.[4]

3. METHODOLOGY

Fig 1: Proposed System

Many people in this society have engaged in illegal power theft, including certain unlicensed line taps during operation and meter bypassing, which has triggered us to take measures to prevent power theft as much as feasible.The Internet of Things (IoT) is a proven technology.Iot was chosen as a result of rapid development of technology, and therefore its formulation became radical.Electricity usage is legally recognized by manual operation, and we now have no suggestion how much energy is consumed.The proposed system works by detecting power theft in industries.The Arduino Uno, GSM, LCD, Bridge rectifier, Capacitor, Voltage regulator, Current Sensors, and Current transformers all seem to be part of this system circuit. The Arduino controller is the most essential element of this circuit.By using a bridge rectifier, it receives switching frequency from current transformers. A Current Sensor measures the concentration of electric current in a wire and generates a signal.Even though meters cannot handle high currents, current transformers handle current sensing.The load is connected in series well with current transformer and in parallel with said potential transformer in this configuration. To calculate current consumption, a current transformer is used.The potential transformer is used to calculate the supply voltage. The power source is currently evolving, and the bridge rectifier satisfies as a conversion unit.This unit converts an oscillating current output to a significant current supply. In this particular circumstance, the eliminate the unwanted dc signal. The bridge rectifier needs to generate direct current in the form of estimate the efficiency.An A/D converter can be used to convert the operational amplifier produced into digital values. It's then connected to an Arduino Uno, which will be used to set the threshold voltage range. The device's fixed voltage will be continuously maintained.If the detected voltage and current approach the set threshold voltage, the grenade explodes a warning, and a blinking cursor on the LCD monitor. The GSM module, which has a SIM card embedded in it, aids in the creation of the power theft detection message on the screen.The LCD displays the average load and current source status, as well as the amount of current that has deviated. The Arduino board is linked to the web, allowing those involved in the substation to learn about the power theft and take immediate measures against the perpetrator.

4. HARDWARE DESCRIPTION

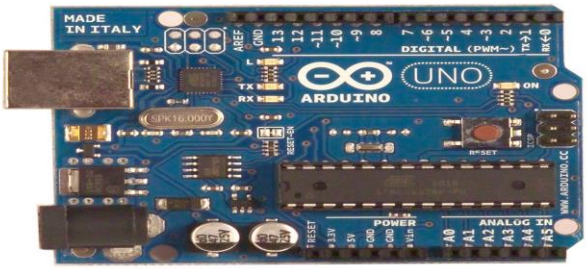

Fig 2: Arduino Uno

Arduino is a versatile subspecialty configuration. The arduino programming change condition is now accessible on the internet. The Arduino Uno is a microcontroller board that is based on the ATmega328 (datasheet). It has 14 digital input/output pins (6 of which can be used as PWM outputs), 6 analogue inputs, a ceramic resonator with a frequency of 16 MHz, a USB connection, a power jack, a reset button, and an ICSP header. It comes with everything you need to assist a microcontroller; simply connect it to a device via USB or power it via an AC-to-DC adapter or a battery to get started. The FTDI USB-to-serial driver chip is not used on the Uno, as it is on all previous boards.

Instead, it uses an Atmega16U2 (Atmega8U2 up to version R2) that has been programmed as a USB-to-serial converter.[5]

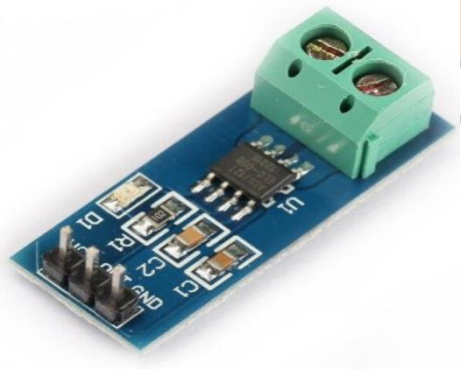

Fig 3: Current Sensor

The ACS712 Current Sensor Module - 30A is capable of sensing current flows of up to 30A. Detecting and monitoring current flow is a fundamental requirement in a wide range of applications, including over-current safety circuits, battery chargers, switching mode power supplies, optical watt meters, programmable current sources, and so on.

The ACS712 Current Sensor Module - 30A is built around an ACS712 sensor, which accurately detects AC or DC current. The maximum AC or DC that can be sensed is greater than 30A, and the current signal can be read via the analogue I/O port of a microcontroller.

Fig 4: Buzzer

The Smoke detector is an electronic system that converts sound energy to electricity. It is an audio signaling system that also serves as a timer and a warning device. Buzzer plays an important role in several modernized apps, and it is the only hardware that is commonly used in all electronic related instructions. It can be used with a power supply ranging from 4v to 9v. This is usually combined with converter systemthat assists us in turning the buzzer on and off.[6]

Fig 5: GSM/GPRS modem

Furthermore, the Sim Card can send SMS to and from the framework. Any GSM sort out chairman SIM card can be understood by GSM Modem and function as a cell phone with its own unique exceptional phone number. GSM improvement provides the advantage of making the structure accessible in isolated places. SIM800L is a tiny electronic module that allows for GPRS transmitting.SIM800L is a miniaturized cellular module that allows for GPRS transfer of data, SMS transmitting and receiving, and voice call making and receiving. When the power supply link boots up, it checks for the cell connection and instantaneously logs in.

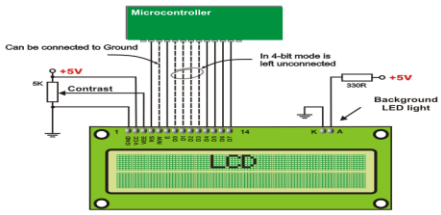

Fig 6: Interfacing of LCD to a micro controller

Quantum dots displays are made from a material that combines the properties of liquids and crystals (LCDs). Rather than having a molar mass, they have a temperature range in which the substances are as mobile as they

would be in a solvent, but are grouped together in an organized crystal-like configuration. An LCD is housed in two glass panels, with the quantum dots substance sand witched in bet.

The inside area of the wooden boards is coated with electrical applications that recognize the characters, inscriptions, or patterns of the polymeric layers, allowing the liquid crystal atoms to maintain that same angle of orientation between the electrodes and the liquid crystal. One of the polarizer's has been pasted between the two layers of glass.Radiations passing into them at a particular wavelength and in a specific direction will cause these polarizer's to rotate. While the LCD is turned off, light rays are adjusted by the two polarizer's and the water crystal, resulting in light rays coming out of the LCD with no position and the LCD appearing transparent.If a proper voltage is applied to the electrodes, the liquid crystal molecules will be aligned in a specific direction. The polarizer would rotate the light rays passing through the LCD, allowing the desired characters to be activated/ highlighted. Because the LCD consumes less power, it is compliant with low-power electronic circuits and can run for extended periods of time. Because LCDs do not emit light, light is required to read the display. Using backlighting, it is possible to read in the dark. The Sensor has a long lifespan and wide maximum temperatures are thin and light, measuring only a few millimeters thick. Because the LCD consumes less power, it is compatible with low-power devices.[7]

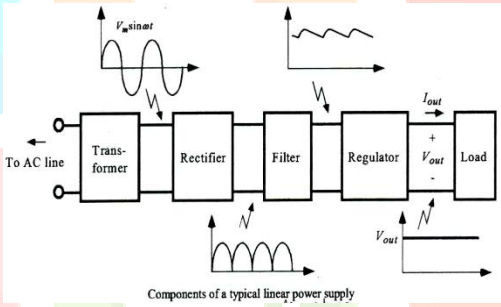

Fig 7: 5V regulated power supply system

Electrolytic capacitors are intended to convert high voltage alternating current electricity into a low voltage supply suitable for electronic circuits and other devices. The power supply can be divided into a number of blocks, each of which serves a specific purpose. A "Regulated D.C Po" is a d.c power supply that keeps the output voltage constant regardless of a.c mains fluctuations or load variance.

Fig 8: An Electrical Transformer

A transformer is an electrical device that transfers electrical power from one electrical circuit to another without using a frequency shift. With no power loss, it transforms electricity from a voltage to another. It can only run

on AC, and is one of the reasons that AC is perhaps the most common form of electricity. Step-up transformers increase the output voltage, while step-down transformers lower it. A step-down transformer is used for many power sources to reduce the dangerously high mains voltage to a more stable low voltage. The input coil is the primary coil, and the output coil is the alternate coil. The two coils are connected by an alternating magnetic field generated in the soft-iron core of the transformer, rather than by an electrical connection. The two lines in the central core of the circuit symbol identify the nucleus. Transformers waste very little energy, because the energy output is nearly proportional to the power input. Keep in mind that as the voltage is depleted, the current increases. To have a regulated voltage, the break transformer has a large number of turns on its primary (input) coil, which is connected to the power line mains supply, and a smaller number of turns on its secondary (output) coil.

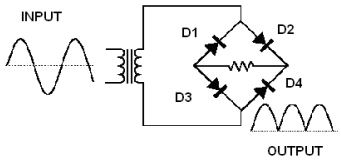

Fig 9: Bridge rectifier

The bridge rectifier uses four diodes to achieve full-wave rectification in the bridge configuration. This is a typical configuration, both with individual diodes wired as shown and with single-component bridges with an internally connected diode bridge. To achieve full-wave corrective actions, the bridge rectifier employs four diodes in a bridge circuit as shown in fig.

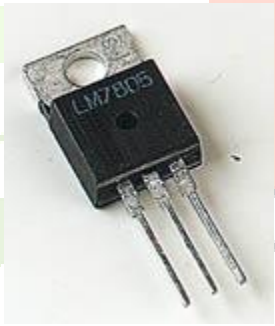

Fig 10: A Three Terminal Voltage Regulator

Set (usually 5, 12, and 15V) and variable output voltage regulator ICs are available. They are also ranked by the maximum current they can pass. Negative voltage regulators are usually used in dual supply systems. Most regulators have some automatic protection against overcurrent ('overload protection') and overheating ('thermal protection'). . Many fixed voltage ICs, such as the 7805 +5V 1A regulator shown on the right side, have three conductors and resemble power transistors. The LM7805 is simple to operate. Simply attach the positive lead of your unregulated DC power supply (anything from 9VDC to 24VDC) to the input pin, the negative lead to the common pin, and you'll get a 5 volt power supply from the output pin when you turn it on.

5. ADVANTAGES

1) Protection will be automated.

2) The economic growth of the country has been saved.

3) Even if the Internet is down due to GSM failure, an alert may be generated.

4) The energy transfer capacity offline is not defective.

5) This would save enormous money, e.g. Smart meters (wifi enabled) probably going to cost INR 15000 each will be subsidized by the Indian state, expected to cost the user INR 1000.

6) A world with a big population saves a lot of energy.

6. RESULT

With the help of automation, the experimental setup for theft is completed. Voltage and current values are calculated using a current transformer and a potential transformer, then sent to bridge rectifiers and filters to eliminate unwanted signals, and analog values are converted to digital values using a converter.The current and voltage values are set using Embedded C coding on the Arduino Microcontroller, and when the new load is connected, the buzzer sounds alarmingly, and the crime is detected, and a warning will be sent to the authorities.The existing transformer and the future transformer are also attached to the load. The current and voltage quantities are measured using these transformers, and the maximum current and voltage value are encrypted on the Arduino Uno through Embedded C coding.

7. CONCLUSION

This paper provided an outline of power theft in various fields and how to tackle it. At the moment, there is a greater power crisis in India as a result of theft,by using GSM and Internet of Things (IoT) the crime of stealing power Will be eliminated, resulting in a new bloom in our motherland's economy and less scarcity for power utilization, nevertheless this technology helps us to conserve power effectively. This initiative can be implemented in both domestic factories and power plants.

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