

GSM Based Electricity Theft Detection using Arduino

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ABSTRACT:

Every year there is increasing number of electricity thefts across domestic electricity connection as well as industrial electricity supply. If the electricity is illegally used it will affect the economic status of the country. The planning for distribution and production of electrical energy may be difficult in case of unrecorded energy usage. The project's aim is to design a system which is used to detect and eliminate the power theft in transmission lines using current sensor and GSM module. There is a problem with the rural areas where the wired system is difficult to transfer the information on electricity theft to the supplier. A wireless technique, GSM has high efficiency and larger range of communication compared to Bluetooth, infrared etc. that are with the limitations of range and less efficiency. In this project Arduino is used to detect power theft and to send the command to GSM module to send the theft information message in this project. The implementation of this system will save large amount of electricity.

brings an implicit solution for the issues faced by electricity distribution companies such as energy theft and effective meter reading. It includes Smart Energy Meter based technology and wireless communication method to find out the electric theft and power usage done by the consumer. Moreover, collecting the meter readings for billing purposes from all

Conventional energy meter, wireless sensor network, Microcontroller and other simulation software merge together to form an automated power measurement system. With the advent of technology in various fields including the Wireless communication technology by the use of microcontrollers, there are many improvements in automating various industrial aspects for reducing manual efforts. The traditional manual meter reading was not

KEY WORDS: Arduino, Current Sensor, LCD and GSM module.

INTRODUCTION:

Electricity is one of the most fundamental features of all matter. Electricity is used by majority of appliances for various purposes which include industrial, medical or personal use. Electricity is an essential component for overall development of a country. It is a vital source for quality of lifestyle of the public as well as industrial and agricultural development in the present society. A major part of the population depends on a stable and reliable power source on a daily basis. In this situation, it is therefore impossible to imagine a life without electricity. However, a high percentage of electricity income is lost due to unlawful theft and improper management of electricity. The purpose of this paper is to provide an implementation methodology for electricity theft detection which provides the status of the meter at remote location via wireless sensors. This proposal

consumers is a difficult and time consuming task which requires a great amount of human effort. In the proposed model, a Bluetooth based technology is used to transmit the meter reading and creates a detection alert automatically to the authorized energy provider via an alert status which eliminates the risk of false meter reading and power theft.

an appropriate choice as it involves much human and material interference. Calculations involved in electricity consumption and noting down the electricity units may be full of errors.

It is a hard task to handle and manage the power sources as per the growing needs and requirements. Paying a visit to each consumer and noting the reading becomes a cumbersome and time consuming task for the consumers as

well as the companies. Moreover, the manual operator fails to detect a malpractice carried out by the consumer to reduce or alter the meter reading/power supply. The human error can be one way in which a false reading could be noted. The proposed system is considered to evaluate the meter reading and calculate the power consumed.

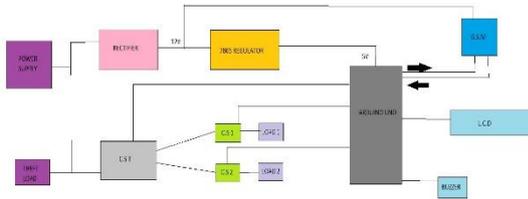


Fig 1. Block diagram of proposed system

In this proposed system GSM technology is implemented for transmitting the information about power theft to the supplier. The system is designed in such a way to prevent the electricity thefts happening in the current scenario. This system is being interfaced with Arduino and sensors which are used to sense the problem, if any problem is detected then the message will be sent to the user via GSM. This will prevent the electricity theft as much as possible. The proposed system gives solution for the existing problems like power theft, wastage of energy and transmission line fault that are faced by the authorized power suppliers.

Arduino:



Fig.2 Arduino

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

Current Sensor:

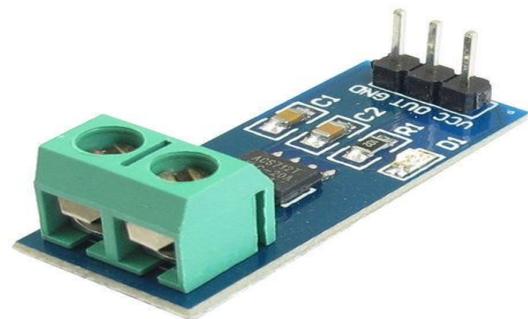


Fig.3 Current Sensor

For measuring current in a circuit, a sensor is required. ACS712 Current Sensor is the sensor that can be used to measure and calculate the amount of current applied to the conductor without affecting the performance of the system.

ACS712 Current Sensor is a fully integrated, Hall-effect based linear sensor IC. This IC has a 2.1kV RMS voltage isolation along with a low resistance current conductor.

Working Principle:

Current Sensor detects the current in a wire or conductor and generates a signal proportional to the detected current either in the form of analog voltage or digital output.

Current Sensing is done in two ways i.e., Direct sensing and Indirect Sensing. In Direct sensing to detect current Ohm’s law is used to measure the voltage drop occurred in a wire when current flows through it.

A current-carrying conductor also gives rise to a magnetic field in its surrounding. In Indirect Sensing, the current is measured by calculating this magnetic field by applying either Faraday’s law or Ampere law. Here either a Transformer or Hall effect sensor or fiberoptic current sensor are used to sense the magnetic field.

ACS712 Current Sensor uses Indirect Sensing method to calculate the current. To sense current a liner, low-offset Hall sensor circuit is used in this IC. This sensor is located at the surface of the IC on a copper conduction path. When current flows through this copper conduction path it generates a magnetic field which is sensed by the Hall effect sensor. A voltage proportional to the sensed magnetic field is generated by the Hall sensor, which is used to measure current.

The proximity of the magnetic signal to the Hall sensor decides the accuracy of the device. Nearer the magnetic signal higher the accuracy. ACS712 Current Sensor is available as a small, surface mount SOIC8 package. In this IC current flows from Pin-1 and Pin-2 to Pin-3 and Pin-4. This forms the conduction path where the current is sensed. Implementation of this IC is very easy.

ACS712 can be used in applications requiring electrical isolation as the terminals of the conduction path are electrically isolated from the IC leads. Thus, this IC doesn’t require any other isolation techniques. This IC requires a supply voltage of 5V. Its output voltage is

proportional to AC or DC current. ACS712 has a nearly zero magnetic hysteresis.

Where Pin-1 to Pin-4 forms the conduction path, Pin-5 is the signal ground pin. Pin-6 is the FILTER pin that is used by an external capacitor to set the bandwidth. Pin-7 is the analog output pin. Pin-8 is the power supply pin.

RESULTS AND DISCUSSION:

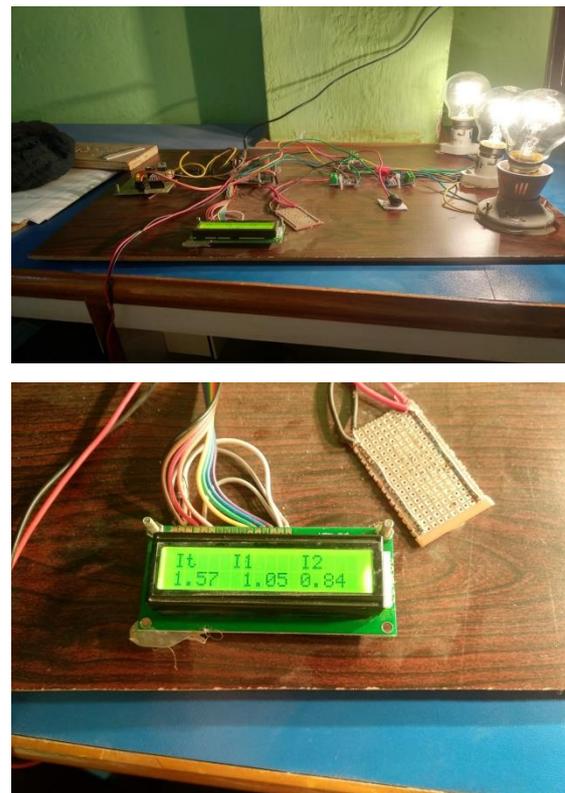


Fig. 4 GSM based Arduino Circuit

Power Description:

S.NO	WEIGHT(kg)	POWER(W)
1	10	0.012
2	20	0.024
3	50	0.600

The proposed system gives solution for the existing problems like power theft, wastage of energy and transmission line fault that are faced by the authorized power suppliers.

CONCLUSION:

A Wireless Electricity Theft Detection and monitoring system has been designed and developed with proper integration of both the hardware and the software. Without any human interface this system provides an effective and easy way to detect electrical theft. The use of GSM helps in achieving the numerous advantages of wireless network systems. Power theft is actually bypassing the energy meter but in our project we have indicated the theft by increasing the load and this method is cost efficient.

REFERENCES:

- 1) Dr.B.Premalatha international journal of electronics, electrical and computational signals ISSN 2348-117X, volume 7, issue-3, march 2018.
- 2) IOT based Power Theft Detection. R Giridhar Balakrishna, P Yogananda Reddy, M L N Vital.. International Journal of Innovations in Engineering and Technology (IJET) ISSN: 2319-105, Volume 8, Issue 3, June 2017.
- 3) IOT Based Power Theft Detection and Monitoring System. N Kunan, Poornima BK. IJIREEICE. Vol. 5, Issue 5, May 2017.
- 4) "Anti-Electrical Theft and Trouble Shooting Through Mobile", International Journal of Advancements in Research & Technology, vol. 3,issue 5, pp. 193 – 200, May 2017.
- 5) G.L. Prashanthi, K .V . Prasad 2016, Wireless power meter monitoring with power theft detection and intimation system using GSM, International journal of engineering science and computing, Volume9, pp. 330-348.
- 6) Nilesh Mohite,Rinkuraj Panaware, Prakash Kakade, International Journal of Scientific Engg.and Applied Science, Volume-2, Feb 2016.
- 7) G.L. Prashanthi and K.V. Prasad., "Wireless Power Meter Monitoring with Power Theft Detection and Intimation System Using GSM and Zigbee Networks", IOSR Journals of Electronics and Communication Engineering(IOSR - JECE), vol. 9, issue 6, ver I,pp. 4 – 8.
- 8) R. Kalaivani, M. Gowthami, S. Savitha, N. Karthik and S. Mohanvel, "GSM Based Electricity Theft Identification in Distribution Systems", International Journal of Engineering Trends and Technology(IJETT),Vol 8,No 10, pp. 512 – 516, Feb 2014.
- 9) V.Pandey,S.S.Gill, and A.Sharma,"Wireless Electricity Theft Detection System Using Zigbee Technology", International Journal on Recent and Innovation Trends in Computing and Communication,Vol. 1,Issue 4,pp. 364 – 367, Mar 2013.