

IoT based-Transformer power theft detection and protection

Sridhar S, Bharath H, Vishvesh V, Gowtham K V
UG Scholar, Dept. of Electronics and Communication
Cambridge Institute of Technology
K R Puram, Bangalore - 36

Prof. Girish H.
Assoc. Professor, Dept. of Electronics and Communication
Cambridge Institute of Technology
K R Puram, Bangalore - 36

Abstract- The electricity is needed to be protected for efficient power delivery to the consumer because electricity is indispensable to domestic and industrial development activity. There are two types of losses technical and Nontechnical losses. Every year the electricity companies fare the line losses at an average 2030% according to power ministry WAPDA Company's loss more than RS.125 billion. Electricity theft is at the centre of focus all over the world, but electricity theft in India has a significant effect on the Indian economy. The loss on amount of theft is reflected in ARR of the electricity company. Thus these costs are routinely passed on to the customers in the form of the higher energy charges. Electricity power theft takes place in a variety of forms and thrives with the support of people from different walks of life: utility staff, consumers, labour union leader, political leaders, bureaucrats and high level utility officials. The problem challenging power utilities worldwide is the electricity, in other words using electricity from utility company without the company's consent. Significantly, it is enough to destroy the entire power sector of country.

Keywords- IoT, GSM, ADC, Microcontroller, Android.

I. INTRODUCTION

The Internet of Things (IoT) is the interconnection of uniquely identifiable embedded computing devices within the existing Internet infrastructure. Typically, IoT is expected to offer advanced connectivity of devices, systems, and services that goes beyond machine-to-machine communications (M2M) and covers a variety of protocols, domains, and applications.¹ The interconnection of these embedded devices (including smart objects), is expected to usher in automation in nearly all fields, while also enabling advanced applications like a Smart Grid.

Things, in the IoT, can refer to a wide variety of devices such as heart monitoring implants, biochip transponders on

farm animals, electric clams in coastal waters, automobiles with

built-in sensors, or field operation devices that assist fire-fighters in search and rescue. Current market examples include thermostat systems and washer/dryers that utilize wifi for remote monitoring.

This Project is basically an automatic electricity theft detection system. Here we used an IR sensor, which is placed near the electricity measuring instrument. It will sense the people or any object approaching the electric poles for power theft. In order to detect the power theft, a current sensor is used. Current sensor generates the pulses, and microcontroller read that pulses and count it. The electricity line is supposed to carry a specific load, if in case more load is drawn, then there is a possibility of power theft happening. Now the GSM will send the theft message to the concerned vigilance department. The microcontroller even watches a message from GSM module. If any message is received from GSM, microcontroller processes the information according to program. If a message is sent by the GSM module to the person at vigilance department and if his mobile is in silent mode, his mobile is converted from silent mode to the general mode and gives the announcement in a very high voice. Once he gets the intimation about the theft, he can receive global photos by sending photo message to the GSM module of the project and the photo is sent to the vigilance team mail id. He can register an online complaint, through the device. Using solid state relay, other sensors are used to protect transformers by sending appropriate messages.

Generally all transformers are oil type in nature. They require regular maintenance, like oil check, Temperature control and fire protection. We use different sensors for the maintenance of the transformer. Whenever the oil level is low, a message is generated and is sent to the maintenance department, stating that the oil-level is low. When the temperature of the transformer is going abnormal, it will intimate the

maintenance team. When there is fire sensed, the same operation repeats. All the abnormal activities are intimated through voice.

II. LITERATURE SURVEY

In et al [1] S. S. R. Depuru, Electricity can be produced through many ways which is then synchronized on a main grid for usage. The main issue for which we have written this survey paper is losses in electrical system.

In et al [2] M. V. Ramesh This design incorporates effective solutions for problems faced by India's electricity distribution system such as power theft and transmission line fault.

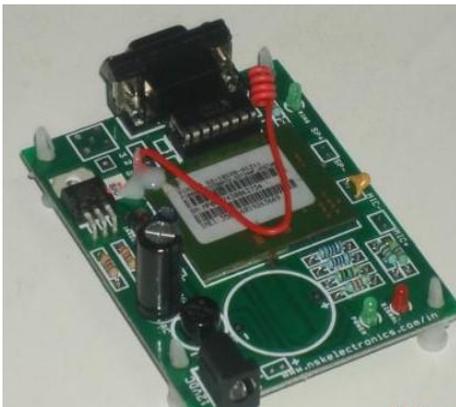
In et al [3] ZHOU Wei, electricity-stealing prevention became a big problem to the electricity board. Based on the kind of electricity-stealing and actual demand of prevention of stealing electricity, realizes the behavior of electricity-stealing with remote monitoring.

In et al [4] H. G. Rodney, this paper presents of design and development of Automatic meter reading (AMR) system. AMR system is a boom for remote monitoring and control domestic energy meter.

In et al [5] Amin S. Mahmoud, This paper deals with automatic meter reading and theft control system in energy meter. This model reduces the manual manipulation work and theft control.

III. Methodology

A. GSM Module



SIM300 is a Tri-band GSM/GPRS engine that works on frequencies EGSM 900 MHz, DCS 1800 MHz and PCS 1900 MHz. SIM300 features GPRS multi-slot class 10/ class 8

(optional) and supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4.

An AT Command can be used to get information in SIM card. The SIM interface supports the functionality of the GSM Phase 1 specification and also supports the functionality of the new GSM Phase 2+ specification for FAST 64 kbps SIM (intended for use with a SIM application Tool-kit). Both 1.8V and 3.0V SIM Cards are supported. The SIM interface is powered from an internal regulator in the module having nominal voltage 2.8V. All pins reset as outputs driving low.

The "AT" or "at" prefix must be set at the beginning of each command line. To terminate a command line enter <CR>. Commands are usually followed by a response that includes "<CR><LF><response><CR><LF>".

B. Project flow

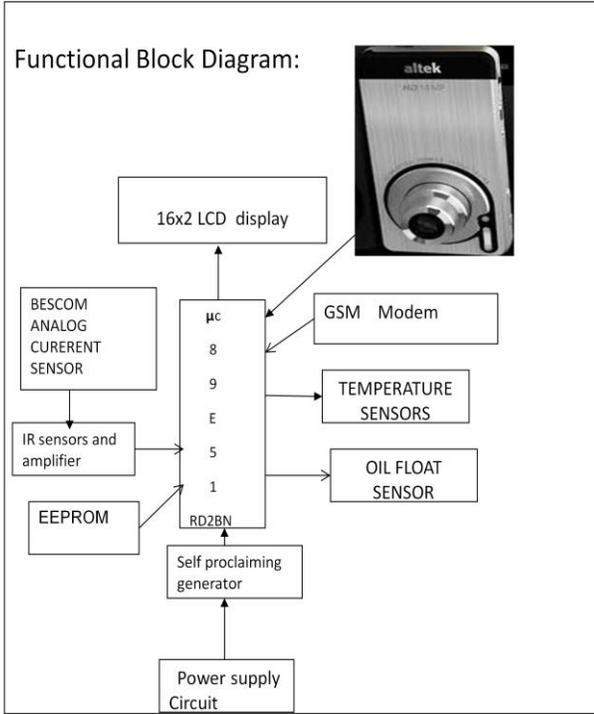


Fig.1 Functional block diagram

The project describes the automatic electricity theft detection system. Here, an IR-Sensor is used to sense if any abstract pass through that sensor path and it will operate in very low voltage, which means the power consumption is very low. The output of sensor is given to the pre-amplifier for adding extra strength to the signals because the output of sensor cannot drive any circuit directly. So this section is used to amplify the weak signals and converting it into strong one. We use an 89C51RD2BN microcontroller, which functions as the Central Processing Unit (CPU) of our project which runs as per the program written in it. A 16x2 LCD Display is used to display the status of the various sensors used and the messages that are to be sent to the person at the vigilance department. Here we use an I2C-EEPROM, which stores the updated data in the microcontroller, because whenever the power goes off microcontroller memory is lost, so we can put information into I2C-EEPROM. The power of the memory is controlled by CMOS battery. A MAX-232 IC is used to communicate between microcontroller unit and the GSM modem. It transfers the data to GSM & receives the data from the microcontroller unit. This unit converts microcontrollers TTL signals into RS232 signal type as the GSM modem needs RS232 signals. For the purpose of maintenance of the transformer, we use a temperature sensor and an oil-float sensor. Here a device named LM-35 is used as a temperature sensor to monitor the temperature of the

transformer and to monitor the oil-level present in the transformer we use an oil-float sensor. In order to sense the power theft, we use a current sensor. The messages regarding the maintenance of the transformer are sent to the maintenance department, using the GSM-module.

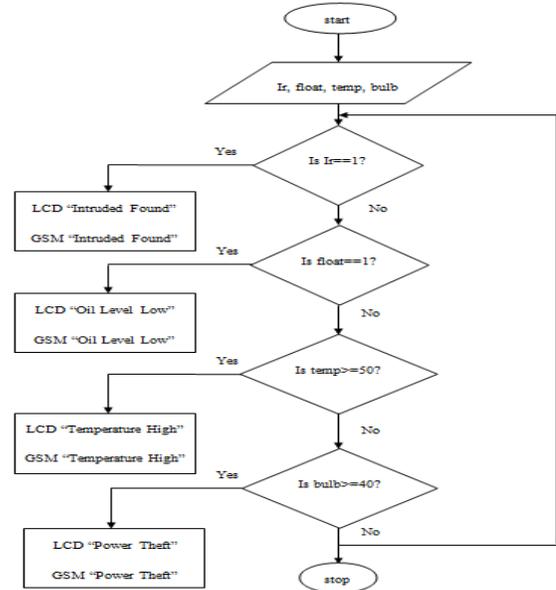
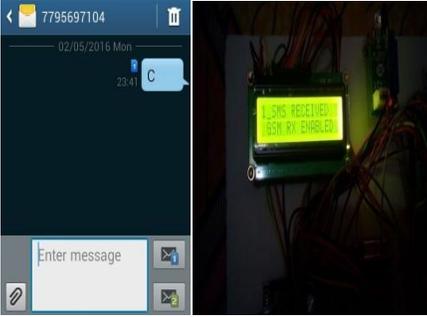


Fig.2 Flow-chart

C. Implementation

The steps for conduction are as follows:
Initially, when the power is switched ON, in order to activate the GSM module, the microcontroller sends an 'AT'-command to the GSM internally. By doing so, the GSM is initialized.



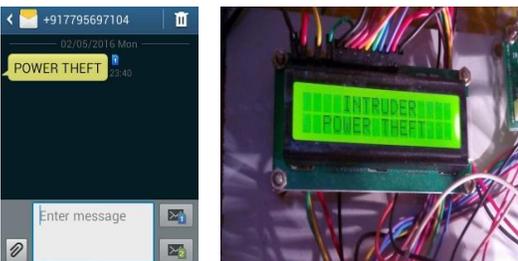


If the registered person wants to listen to the voice alerts, the power-theft app has to be installed in his smart-phone.



IV. RESULTS

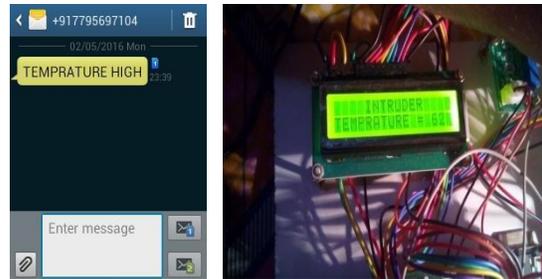
If the power theft takes place, the current sensor senses it and the “POWER THEFT” message is sent to the vigilance department through the GSM module. It is also displayed on the LCD display.



If any intruder is found, the IR sensor gets activated and the “INTRUDER” message is sent to the person at the maintenance department through the GSM module. The message is also displayed on the LCD display.



If the temperature of the transformer is going abnormal, the temperature sensor gets activated and the message “TEMPERATURE HIGH” is sent to the person at the maintenance department through the GSM module. The temperature value is displayed on LCD display.



If the oil-level in the Transformer goes to the minimum level, the oil-level sensor gets activated and the message “OIL LEVEL LOW” is sent to the person at the maintenance department through the GSM module. The message is also displayed on the LCD display.



V. Conclusion

The project finds the solution for monitoring the power theft happening in and around a particular locality. Use of GSM in our system provides the numerous advantages of wireless network systems.

The project can successfully reduce the heavy power and revenue loss that occur due to power theft by the consumers. It

even reduces the operations cost required for maintenance and troubleshooting, as it eliminates the need of labor and operations team.

The project suggests an easy and effective way to carry out the regular maintenance, required by the Transformer.

VI. References

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