Smart grid and smart transformer powered by IoT

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ABSTRACT

The electricity sector in the country is facing many problems, one such a major problem is that power theft in power lines and power grids. Still there are some villages in the country do not have 24 hours electric power that is there is a shortage of electricity and this lack of power supply is directly impacting on the country's economic growth. The electricity sector plays a major role in Indian economy. The project is mainly focuses on both hardware and software. The project implements power theft detection and other management services such as voice announcement facility to the concerned department, finding location of power theft, plotting GPS points in google maps, auto police complaint to the nearest police station, power theft location sharing to police and finally capturing photos remotely for proof of theft. Our project consists of SMS enabled application and voice-based application. This project will also consist of the following features such as object detection on the power line and power grid, measuring temperature in the transformer such as high and low and measuring oil level in the transformer. Measuring temperature and oil level in the transformer and taking necessary actions will lead to improve power transmission and it also boosts transformer efficiency.

Keywords: *Microcontroller, GSM, IR Sensor, Temperature Sensor, Current Sensor, Relay, ADC, etc.*

1. INTRODUCTION

Transmission power lines are built to transfer electric power from power source locations to power distribution networks. The transmission power line lengths are exposed to different faults and errors. The error rate is very high in transmission power lines. Faults and errors on power system transmission lines need to be identified and located very speedily, classified perfectly and cleared as fast as possible. At present India is losing more than 55,000 crore rupees every year due to poor transmission and distribution system. If we could save 1% out of it will be a good profit to the power sector and nature can be retained for some more extent. When all the said above

things works better on line, we can save power. Unfortunately, all are not in a single roof and not possible in a single roof because it is a network of about thousands of kilometres.

When we analyse the above said matters a common objective system is needed to remove the unwanted barriers of the power sector.

Here we would like to automate the power theft detection system to overcome the problems we have stated above, and it helps in reducing power loss, to save the time thereby saving the cost.

The embedded technology will be used in our project to minimize the electronic hardware components. Embedded technology is used to minimize the cost and maximizing the work ability. Embedded systems will provide the needs of industrial control, monitoring, interfacing with any latest communication systems like GSM, IR, BLUETOOTH, MICROCONTROLLER etc.

This project is helpful in power theft detection from intruders and provide various management services such as voice announcement to the concerned department, detecting power theft location, provides facility to plot power theft location on google maps, automatic police complaint through online, capturing photos remotely for proof of theft. Overall this project improves power transmission by monitoring transformer temperature and oil level in the transformer using corresponding sensors. It is a IoT CLOUD based project.

1.1 Description of components

1.1.1 Microcontroller

The SST89E516RD is a 8-bit microcontroller product manufactured by CMOS semiconductor technology. It offers significant cost and reliability for customers by using split gate cell design and thick-oxide tunneling injector. The instruction set used is 8051 and it has more random access memory and read only memory capacity. It also has 3 timers.

Fig-1 Microcontroller

1.1.2 IR sensor

Infrared (IR) radiation is part of the electromagnetic spectrum, which includes radio waves, microwaves, visible light, and ultraviolet light, as well as gamma rays and X-rays.

Fig-3 IR Sensor

1.1.3 Temperature sensor

Temperature sensor is mainly used to detect the temperature or heat. LM35 is used as the temperature sensor.

Fig-3 Temperature Sensor

1.1.4 Oil level sensor

Oil level sensor is used to measure the oil level in the transformer. It sends signals as high and low.

Fig-4 oil level sensor

1.1.5 Current sensor

Current sensor is used to measure the current flow in a wire in association with coil.

Fig-5 Current sensor

1.1.6 Liquid crystal display

LCD Display is mainly used to display characters. It contains two rows each of which contains 16 bits. Hence totally two rows each of 16bits can be displayed. BIT 1 is ground, bits 7-14 are the data bits, bit 15 is the back light anode and bit 16 is the back-light cathode. Bit3 is mainly used provide input voltage for LCD.
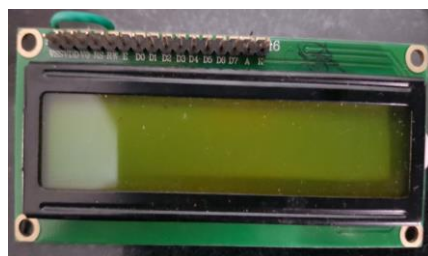

Fig-6 LCD

1.1.7 GSM

GSM mainly acts as an intermediate between the microcontroller and the user. The commands which come from other sensors are passed on to the GSM first and then GSM passes it to the microcontroller.


Fig-7 GSM

1.1.8 Analog to digital converter

ADC is mainly used as analog to digital converter. The readings coming from temperature and humidity are in analog as the microcontroller cannot understand readings in analog hence, readings are converted into digital by using analog to digital converter. Successive approximation is the technique used to convert analog to digital. This ADC are designed to perform repeatable, accurate and fast conversions over a wide range of temperature and humidity readings.

1.2 Methodology

TRANSMITTER SIDE
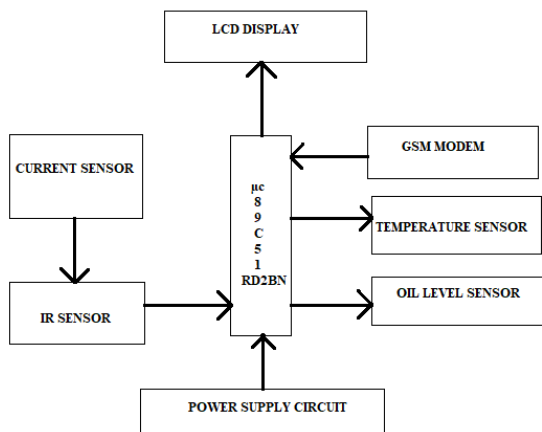
RECEIVER SIDE

Fig-8 Block Diagram

This project mainly works on microcontroller and GSM. When there is a three-phase power the GSM sends message to all the authenticated users. If there is a single phase power or two-phase power GSM will not send message to the users.
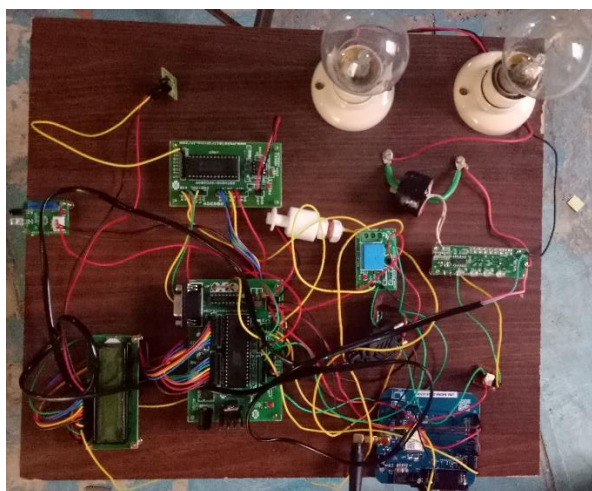
1.3 Results

Fig-9 Implementation

2. CONCLUSION

In this project will helps to find out power theft, it speeds up power transmission It boost transformer efficiency, it does auto complaint and alerts concerned department and it does voice announcement and displays messages over LCD.

3. ACKNOWLEDGEMENT

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