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Smart Energy Meter Power Theft System using Arduino Uno

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Abstract: ***Theft by various units of electrical energy as well as residences is a complex issue, due to the theft of electricity there is a loss in electricity, which makes electric energy very expensive. Thus, a working project has been developed using modern Arduino nano microcontroller technology to mitigate such losses, using the project very effectively to catch the thief of electricity by tampering with the electricity meter or in any other way. With the theft of electricity through technology, the officer of the power unit is immediately informed through SMS in his authorized mobile, thus the theft of electricity can be prevented through this project. This project technology can be easily combined with any type of single phase as well as three phase electric meter,***
Keywords: Arduino uno, Bridge Rectifier, voltage regulator, GSM module, current transformer.

I. INTRODUCTION

This project can prevent theft of electrical energy as well as reduce electricity loss and control the price of electricity. Theft by various units of electrical energy as well as residences is a complex issue, due to the theft of electricity there is a loss in electricity, which makes electric energy very expensive. Thus, a working project has been developed using modern Arduino nano microcontroller technology to mitigate such losses, using the project very effectively to catch the thief of electricity by tampering with the electricity meter or in any other way. With the theft of electricity through technology, the officer of the power unit is immediately informed through SMS in his authorized mobile, thus the theft of electricity can be prevented through this project. This project technology can be easily combined with any type of single phase as well as three phase electric meter, this project has function as under,

A. Tampering with the face line is displayed inside the LCD, as well as informing the officer of the electrical company via SMS,
B. Tampering with the face line is displayed inside the LCD, as well as informing the officer of the electrical company via SMS,
C. Illegal opening of the meter box is also displayed inside the LCD, as well as informing the officer of the electrical company via SMS,
D. Arduino nano technology use

To create this project, we have chosen Arduino Nano Microcontroller as the internal RAM of this controller is sufficient for GSM interfacing, as well as the ADC function is provided inside this controller so that it can easily interface the analog input. Available online for free and affordable, this controller is an Arduino nano controller for this project.

II. DESIGN OF SMART ENERGY METER

This project is designed according to single phase and Ч ampere capacity, first of all the functions of the project are determined for this project, these functions are as follows,

A. To prevent power theft by tampering with face wire,
B. 2, Prevent power thefts by tampering with neutral wires,
C. 3, to prevent someone from opening the meter box to steal electricity illegally,
D. 4, all meter data to be recorded in LCD,
E. 5, Report any incident of power theft to the power officer through SMS,

Thus, after deciding to do the above project, we have to choose the controller, we decided to use Arduino nano controller for this project as this controller this Arduino Nano Microcontroller as the internal RAM of this controller is sufficient for GSM interfacing, as well as the ADC function is provided inside this controller so that it can easily interface the analog input. Available online for free and affordable, this controller is an Arduino nano controller for this project.

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This project uses GSM 900 modem to send SMS as this modem can work with almost all the company's SIM cards, as well as the response and SMS sending time of this modem is fast, so I decided to use this modem, according to this circuit diagram of first power supply section, this power section made by step 12volt step down transfer and this 12v ac voltage convert in to 12vDC from full wave bridge rectifier, this bridge rectifier made by diode 4007. 12volt DC filter for use filter capacitor and this number of 1000mf/25volt. This 12volt DC converts into 5volt DC from voltage regulator IC 7805, this IC output supply on joint filter capacitor 1000mf/10volt, +12volt and +5volt supply to all require hardware voltage.

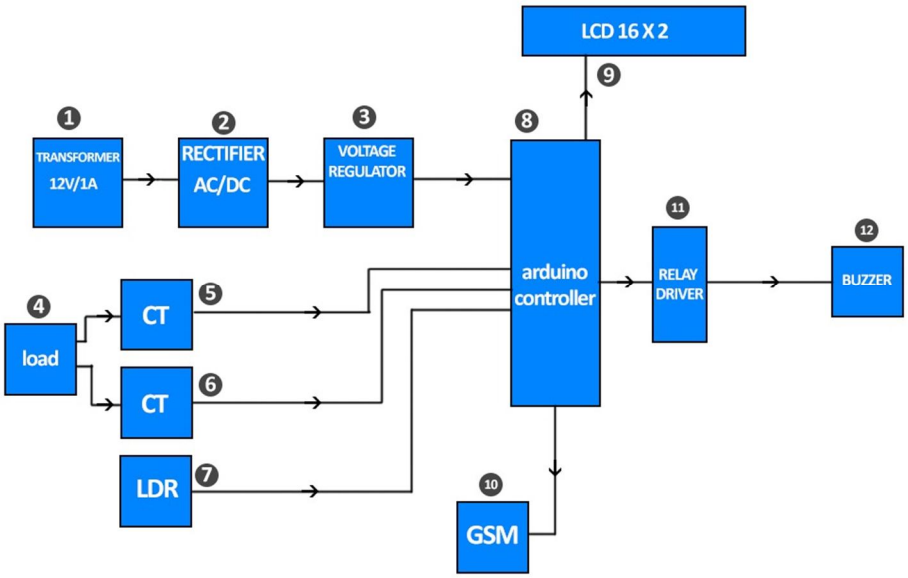

Fig. 1. Block diagram of advanced footsteps power generation for charging system

III.COMPONENTS

1) *Arduino Uno:* The Arduino Uno is a microcontroller board based on the ATmega328. It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs), a 16 MHz resonator, a USB connection, a power jack, an in-circuit system programming (ICSP) header, and a reset button.

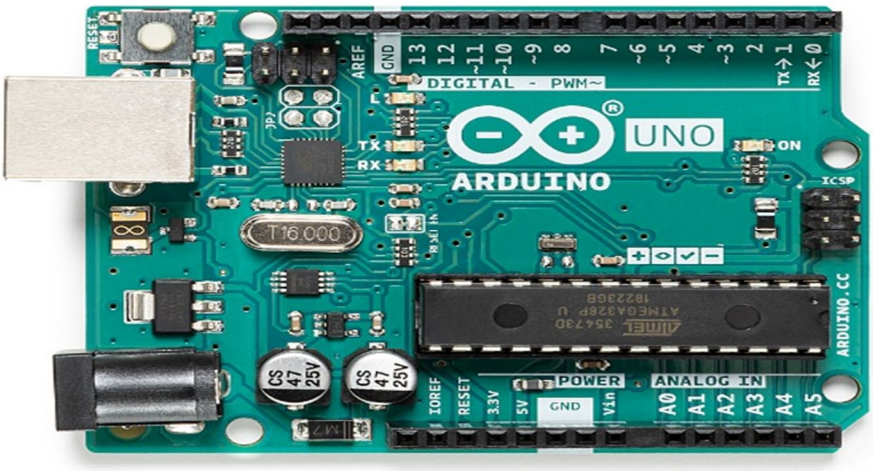

Fig 2. Arduino uno

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2) *GSM Module:* GSM is combination of TDMA (Time Division Multiple Access), FDMA (Frequency Division Multiple Access) and Frequency hopping. Initially, GSM use two frequency bands of 25 MHz width: 890 to 915 MHz frequency band for up-link and 935 to 960 MHz frequency for down-link. Later on, two 75 MHz band were added.

Fig 3. GSM Module

3) *IC-7805 Voltage Regulators:* IC 7805 is a 5V Voltage Regulator that restricts the output voltage to 5V output for various ranges of input voltage. It acts as an excellent component against input voltage fluctuations for circuits, and adds an additional safety to your circuitry. It is inexpensive, easily available and very much commonly used.

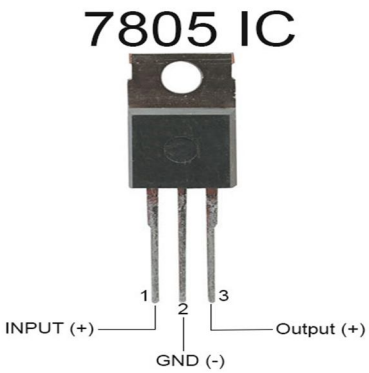

Fig 4. Voltage Regulator

IV. CIRCUIT DIAGRAM AND WORKING

The function of this project is complete Arduino nano microcontroller base, the theft of electricity can be prevented by this project, the theft of electricity by tampering with neutral or phase supply as well as energy meter in any way can be done immediately by sending SMS to the officer of Power Company in his mobile. Power theft is reported by, as well as the details of power theft are displayed inside the display of the electricity meter.
This project has function as under.

1) Tampering with the face line is displayed inside the LCD, as well as informing the officer of the electrical company via SMS.
2) Tampering with the face line is displayed inside the LCD, as well as informing the officer of the electrical company via SMS.
3) Illegal opening of the meter box is also displayed inside the LCD, as well as informing the officer of the electrical company via SMS.
4) Arduino nano technology use.
5) SMS sending for GSM sim 900 module is use.
6) 16/2 LCD is use for all meter riding data and status displaying.

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This project technology can be easily combined with any type of single phase as well as three phase electric meter.

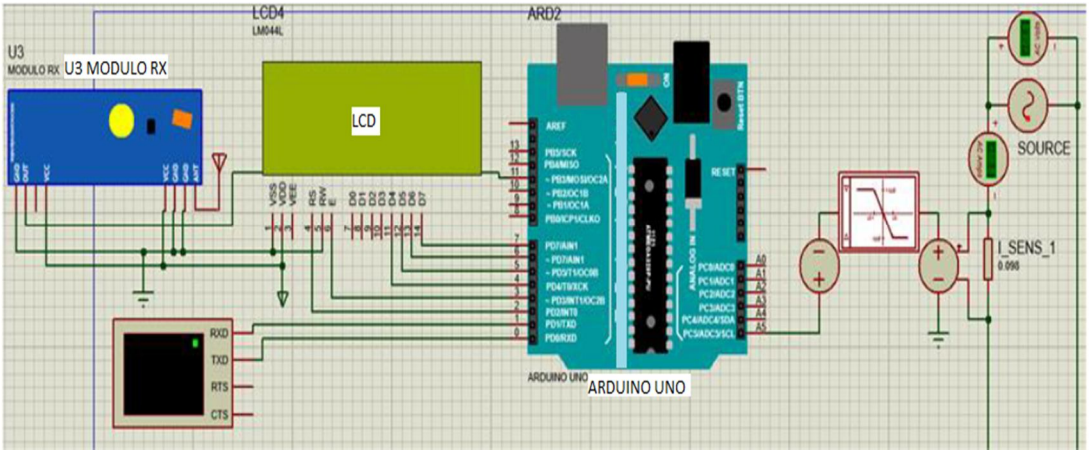

Fig 4. Circuit Diagram

V. CONCLUSIONS

The design, simulation and construction of a GSM-based power theft have been achieved. It has covered various forms of electricity theft which include unaccountability of servicemen, irregularities of billing leading to a reduction of funds by the utility companies has also been achieved as this work prevents one on one contact between the end user and the workers. With remote monitoring of the meter reading and sending SMS, whenever there are abnormal readings, in the customer electricity meter, the developed system may able to help Utilities to reduce the incidences of household electricity theft. An automatic circuit breaker can be integrated into the unit so as to remotely cut off the power supply to the house or consumer who tries to indulge in power theft. This system design mainly concentrates on single phase electrical distribution system. Automation of the customer billing system has been achieved as the meter keeps track of the consumer's load on a timely basis. This design, therefore, removes the manual reading of meters with its attached consequences of time-consuming system and bill manipulation which affects the company while adding higher bills to the consumer. The work also revolves around the automatic disconnection and connection when the recharge is low or high respectively and extra cost due to reconnection can also be removed.

VI. ACKNOWLEDGMENT

Research work, lays the foundation of student's career today. The satisfaction that comes with successful completion of task would be but incomplete without the mention of the people who made it possible. It gives us immense pleasure to acknowledge all those who have extended their valuable guidance and magnanimous help.
It is a matter of great pleasure and privilege to have this Research entitled:

"Smart Meter Power Theft system using Arduino Uno"

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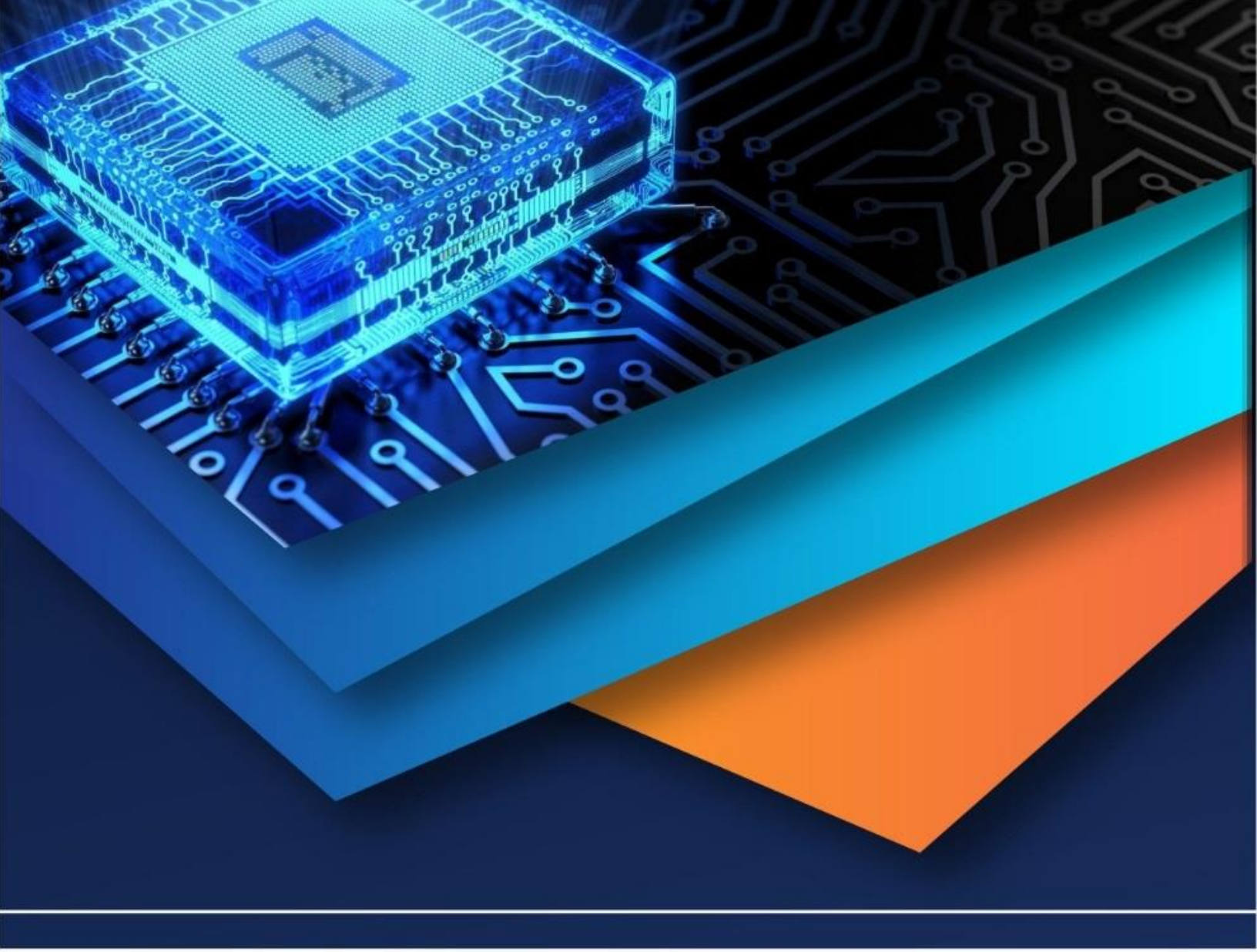

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