Smart Prepaid Energy Meter

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ABSTRACT –

Recharge Based Meter utilizing Arduino Uno microcontroller and GSM SIM900A module. The system aims to address issues such as energy theft, billing inefficiencies, and manual meter reading errors commonly encountered in traditional energy metering systems. The prepaid energy meter system operates by allowing users to purchase energy credits in advance, which are then deducted based on their energy consumption. The Arduino Uno microcontroller acts as the main control unit, interfacing with the energy metering unit and the GSM module to enable communication between the user, utility provider, and the meter.

The GSM SIM900A module works to users regarding their energy credit status and provides a platform for remotely monitoring and managing the meter. Additionally, the system incorporates security features to prevent unauthorized access and tampering. The proposed prepaid energy meter system offers a cost-effective, efficient, and reliable solution for energy management, benefiting both consumers and utility providers alike.

INTRODUCTION –

The project involves developing a prepaid electricity energy meter system using an Arduino Uno microcontroller and a GSM module to enhance the efficiency and security of traditional energy metering. The Arduino Uno serves as the central control unit, managing interactions between the energy meter and the GSM module for seamless communication with users and utility providers. Through real-time SMS alerts, users receive updates on their energy credit status, helping to prevent energy theft and billing inaccuracies. The system not only automates meter readings but also provides essential alerts such as low balance, disconnection, resumption, and recharge notifications directly to users' mobile phones. Furthermore, it integrates security measures to safeguard against unauthorized access and tampering. Overall, this prepaid energy meter system offers a practical, cost-effective solution to enhance energy management for consumers and utility companies, tackling key challenges in traditional metering systems.

Block diagram of (smart prepaid energy meter)
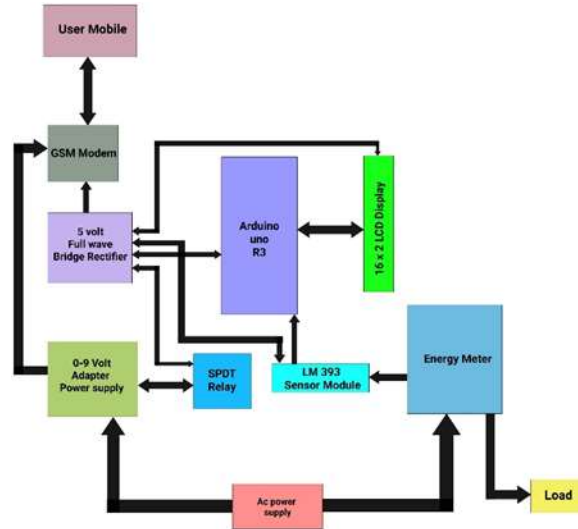
EXPLANATION OF COMPONENTS:

A. **ARDUINO UNO R3-** The arduino uno r3 using atmega328 microcontroller is the main processing part for the programming and the pins of arduino is connected to gsm, lcd display and lm393 to receive singles and give command to use the required amount of load and as the specifications of Arduino uno r3 pins. The Arduino controls the power supply to the load based on the credited units and monitors energy consumption in real-time.
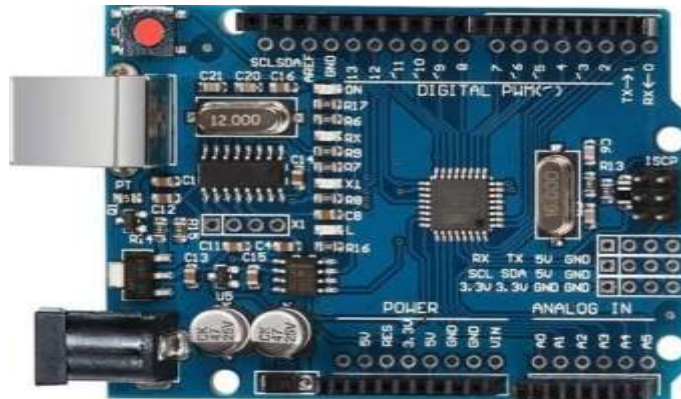
(FIG 1. ARDUINO UNO R3)

B. **SPDT RELAY MODULE-** SPDT relay works as a switch in this mechanism as the Coil get energize and flip the switch from NO to NC and can open and close the switch in case of fault detected. The normal operation of SPDT relay in NC (normally close).


(FIG 2. SPDT Relay Module)

C. LM393 MODULE - In a prepaid meter, the LM393 module can be employed to monitor the voltage levels of the power supply and battery, ensuring that the meter operates within safe limits. This capability enables the meter to automatically disconnect power when credit is depleted, preventing unauthorized usage, and promoting efficient energy management.

(FIG 3. LM393 MODULE)

Internal structure Schematic Diagram:
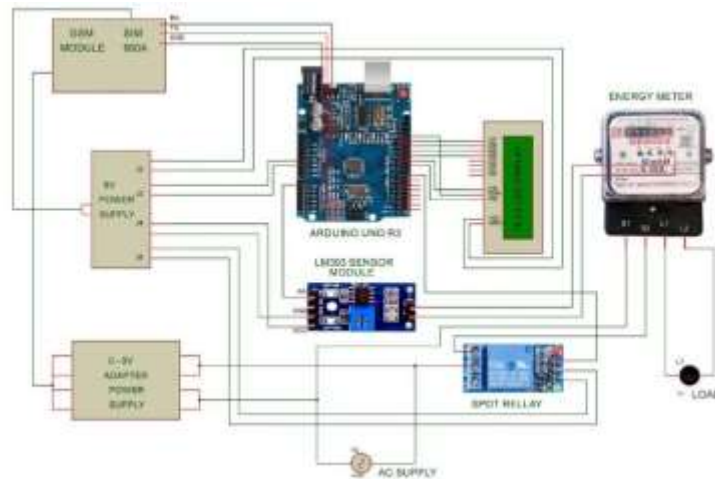
RESULT –

When the code for the amount is texted it recharges the amount with it as shown below:

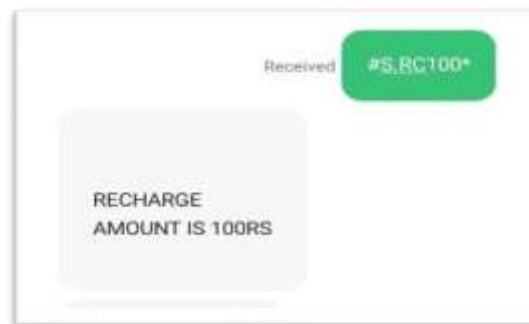
Fig 4. Recharge code and Recharge activation

And when the balance is getting low or got fully consumed it shows as below:
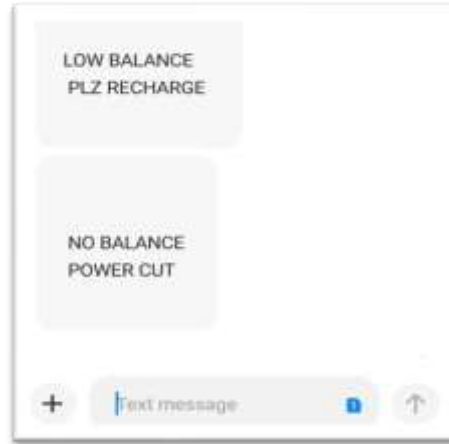
Fig 5. Low balance alert

CONCLUSION: -

The Smart prepaid energy meter is capable of billing without any errors and the automatic billing with the simple text message is easy to pay the amount for the units required and the utility centre is also work hassle free if the recharge ended the supply get's cut-off for the particular consumer.

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