WSN BASED SYSTEM DETECTING ENERGY THEFT IN SMART GRID

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Abstract: Innovative solutions for WSN based system detecting energy theft in smart grid have been developed as a result of the proliferation of internet of things (IoT) devices. Iot has the potential to completely change how electricity is produced, transmitted, and used in the electricity sector. The use of IoT for detecting and preventing electricity theft is one such application. Meter tampering, also known as electricity theft, is a significant problem that affects the revenue and profitability of electricity boards. It entails circumventing meters in an unlawful manner in order to use electricity without paying for it. This not only costs government's money, but also puts consumers and the electricity grid in danger of injury or damages. In this project, we propose creating an IoT-based system to track down and stop electricity theft. Smart meters with sensors and communication capabilities make up the system, along with a central server for data processing and analysis. Electricity consumption patterns are continuously monitored by smart meters, which also send data to a central cloud-based database. The database values are utilized by the authorities when it discovers anomalies or suspicious activity upon close monitoring of the data stored in real-time. The proposed system could significantly lower the number of instances of electricity theft, increasing revenue and profitability for the electricity providers while enhancing consumer safety. By offering real-time information on electricity consumption and theft, it can also assist utilities in streamlining their operations and enhancing smart grid.

Index terms: **Python; crack detection; yolov8;**

I. INTRODUCTION

The power meters are one of important aspect in the smart grid concept . They are the devices which measure electricity and also connecting different equipment over the electric grids. The concept that introduces the automation of measurements of electronic meters was called AMR (Automated Meter Reading). AMR is a concept that enables devices to be accessed remotely and collect the electronic data generated by the meter at consumer units. The data then transmitted from the meter to the electric company using radio frequency, telephone, power line or satellite communication. A smart energy meter (SEM) is electronic device having energy meter chip for electric energy consumed measurement, protocols for data communication, security purposes, interface for data display and other function. The difference of smart meter from traditional energy meter devices is by its communication ability. A smart meter should be able to record active power consumption and also other information of an electronic device, such as: voltage and current phasors, reactive power, maximum power demand, frequency, power factor and other information, in real time . The Internet of Things (Iot) is defined by ITU and IERC as a dynamic global network infrastructure with self-configuring capabilities based on standard and interoperable communication protocols where physical and virtual "things" have identities, physical attributes and virtual personalities, use intelligent interfaces and are seamlessly integrated into the device and communication technology information network. Following the utilization of Iot, the smart meters needs to be developed with the intention of using to attain consumer satisfaction. This paper presents a design of a smart energy meter, which provide accurate measurement of power consumption and display it to the consumer.

II. LITERATURE REVIEW

The AC power supply line is affixed with the current sensors and the voltage sensors, which passes through the power meter fixed. Each set of sensors and the power meter are treated as a node here. The single

node represents an individual point of power supply which may be an individual unit of home or the point where theft occurs. The current sensors start sensing power usage in the nodes whenever a load is operational. The various readings noted by the sensors in the presence of the operational loads are then passed on to the microcontroller, which gathers the information regarding power consumption in real-time. The gathered information is then processed in user-understandable formats and they are displayed up in the LCD display after which the microcontroller checks for anomalies in the power consumption and the alert for power theft is given. Information processed in the microcontroller is sent to the cloud, via the WI-FI module which is interfaced with a backend cloud storage space where the received data is maintained, the maintained data can be manipulated in a lot of ways which enables the authorities from the side of the electricity providers to remotely manage and control the power flow from the electricity grids. This microcontroller features three Timer/Counters with compare modes and internal/external interrupts, a USART with serial programming capability, a 2-wire serial interface, an SPI serial port, a 6-channel 10-bit ADC (8 channels on TQFP and QFN/MLF packages), a programmable watchdog timer with internal oscillator, and five software-selectable power saving modes. The idle mode conserves power by suspending the CPU, while allowing the SRAM, Timer/Counters, USART, 2-wire serial interface, SPI port and interrupt system to remain active. The power-down mode maintains the register contents, freezing all other chip functions until the next interrupt or hardware reset. The Atmel ATmega328P is a powerful microcontroller that offers a cost-effective solution for many embedded control applications. The device combines an 8-bit RISC CPU with an in-system self-programmable flash on a monolithic chip. In standby mode, the crystal/resonator oscillator runs while the rest of the device is sleeping, allowing for fast start-up with low power consumption.

III. PROPOSED SYSTEM

The block diagram is shown in figure. It consists of an AC line, energy meter, current sensor, voltage sensor, RELAY, ATMEGA328, WI-FI module, LCD display, and cloud interface. The AC power supply line is affixed with the current transformer and the potential transformer, which passes through the energy meter fixed. Each set of sensors and the power meter are treated as a node here. The single node represents an individual point of power supply which may be an individual unit of home or the point where theft occurs. The current sensors start sensing power usage in the nodes whenever a load is operational. The various readings noted by the sensors in the presence of the operational loads are then passed on to the microcontroller, which gathers the information regarding power consumption in real-time. The gathered information is then processed in user-understandable formats and they are displayed up in the LCD display after which the microcontroller checks for anomalies in the power consumption and the alert for power theft is given. Information processed in the microcontroller is sent to the cloud, via the WI-FI module which is interfaced with a backend cloud storage space where the received data is maintained, the maintained data can be manipulated in a lot of ways which enables the authorities from the side of the electricity providers to remotely manage and control the power flow from the electricity grids

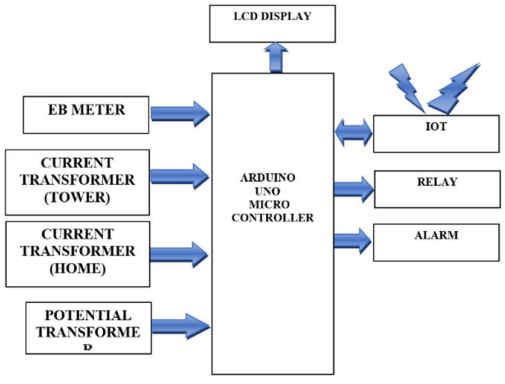

Fig 1.1 Block diagram

IV. SIMULATION RESULT

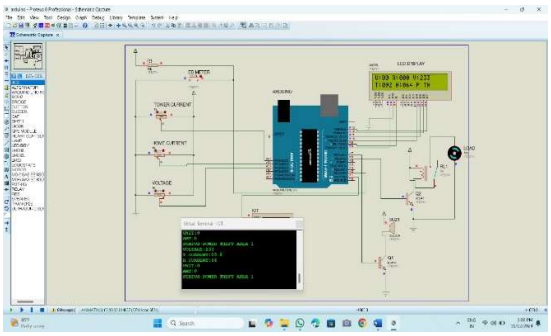

Fig 1.2 INPUT IMAGE

V. RESULT AND DISCUSSION:

A WSN based system detecting energy theft in smart grid 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 IoT helps in achieving the numerous advantages of wireless network communications. Power theft is actually bypassing the energy meter, but in this project, the theft is detected if some unauthorized consumption is done on the main AC supply.

VI. CONCLUSION

A remote cloud-based 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. This main feature of theft detection is done seamlessly using the integrated cloud system, which is able to detect the theft of electricity that is being drawn from the main AC line and also maintain the statistical data of that theft power. This system also helps to monitor the usage patterns of authorized power consumers over a period of time. These recorded data can be further used to study the power consumption under various sub-branches of power supply and would enable the electricity providers on the power grid upgrades and even help them to look for failure on the devices used for power transmission. The project as a whole helps to eradicate theft to a larger amount and lower the financial losses of the electricity providers, thus helping them in manifold ways.

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