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IoT Based Smart Power Quality Monitoring and Electricity Theft Detection System

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ABSTRACT: Smart homes, smart meters, and the Internet of Things are now widely used to replace traditional analogue meters. This data can be transferred wirelessly, reducing the amount of human labour required. However, there is a possibility of theft. Due to the unavailability of specific approaches in the existing solution, these thefts are not accurately identified. The proposed project's goal is to create a system that can track the amount of electricity used per load and trace as well as eliminate electricity theft in the existing line and meter. This initiative also entails to alert the officials from the Electricity Board about the theft that occurred as a result of IoT. A network of connected devices, such as sensors, aids in the transmission of real-time data over the Internet. The Atmega328p microcontroller is used to detect power theft and relay the information to the Wi-Fi module, which furtherpasses stealing to the electricity board.

KEYWORDS: Electricity, Theft detection, Current sensors, Internet of Things, Wi-Fi module, Microcontroller, Thing Speak.

I. INTRODUCTION

The Internet of Things-based energy theft detection technique is the first of its kind. It can detect powertheft as well as tampering with electric meters. The system usesHall sensors to detect meter tampering or direct loadconnections before the meter in the supply. When it detects a theft, it uses a microcontroller to create a log for the nature and timing of the theft, which it then saves on an IOT platform for backup and simultaneously publishes on the internet page. When the number of theft attempts exceeds, it sends a Signal to web site. It requires only one time installation cost after installation this can be used for lifetime. It will eliminate power theft and will increase revenue for the Government and save electricity.

This project will make user friendly by introducing a system. Customers' costs rise because of electricity theft, which can also have serious safety implications. It causes misuse of costsamong suppliers, which can distort challenge and obstruct the market's efficient functioning. An electricity supplier's costs oforder to detect fraudulent actions by its consumers may be higher than the industry's overall costs. When a supplier senses electricity theft by its customers, it may be liable for generation, network, and trying to balance associated costs with the entry of forecasts of the quantity of electricity theft by that customerinto the settlement system.

But on the other side, this operation does not result in an increase in overall costs for the industry. Physical field checks of adulterate seals have traditionally been used to detect electricity theft. Personal and using balance meters. These techniques, while effective in reducing unmeasured and unbilled electricity consumption, are insufficient. Tamper-evident guards can be easily broken, and while balance meters can detect that some consumers are fraudulent, they are unableto pinpoint the perpetrators.

Despite smart meters' security flaws, the higher-resolution data they collect is seen as a promising technique that will supplement traditional detection tools. They have a great deal of potential to strengthen metering, billing, and collection processes, as well as fraud detection and unmetered connections detection. Theft can take many forms, ranging from affecting the security controls of meters to connecting loads directly to electricity supply lines. Payment default has been a major issuebecause of insufficient monitoring and enforcement. This problem was exacerbated by a lack of new tech and insufficientsupplier incentives.

The main issue in the current situation is the availability of power generation for residential as well as commercial users also there is an increase in cases of line tapping. To minimize theproblem this proposed project "IoT based electricity theft detection and monitoring."

The main objective is reducing the illegal power usage in domestic/commercial are following.

- To develop the portable electricity pilferage detection system.
- To detect the pilferage using Hall sensor.
- To monitor the theft using IOT and separate web site of the project.
- To control pilferage using microcontroller.

II. PROPOSED WORK AND DESCRIPTION

The proposed system uses the concept of Internet of things to communicate theft detection information to Electricity Board officials. To predict current and voltage, this system communicates with the Controller and the detectors that are connected to the Micro-controller. As a result, our projectworks to avoid and eliminate thefts, saving the economy from further energy waste. The parameters including power, current,and voltage are checked in this current proposal, and the poweris determined by calculating and notified to the consumer and EB via the Internet as a result.

If the load increases, the power to a load is reduced off, and a message about power requirements is sent to an electric board, which is displayed on the LCD. Furthermore, any additional load will cause the power source to the load to be cut off, informing the electric board as well as the individual people who own the house via Wi-Fi, and a buzzer will be installed tonotify the stealing to have occurred, notifying the bill based onthe usage of electrical supply. A Thing Speak Application is being used to store an average load consumed, find the excess load due to theft microcontroller in this project will regularly review a load based on parameters including voltage, current, and power. Thesystem now monitors the load power once more.
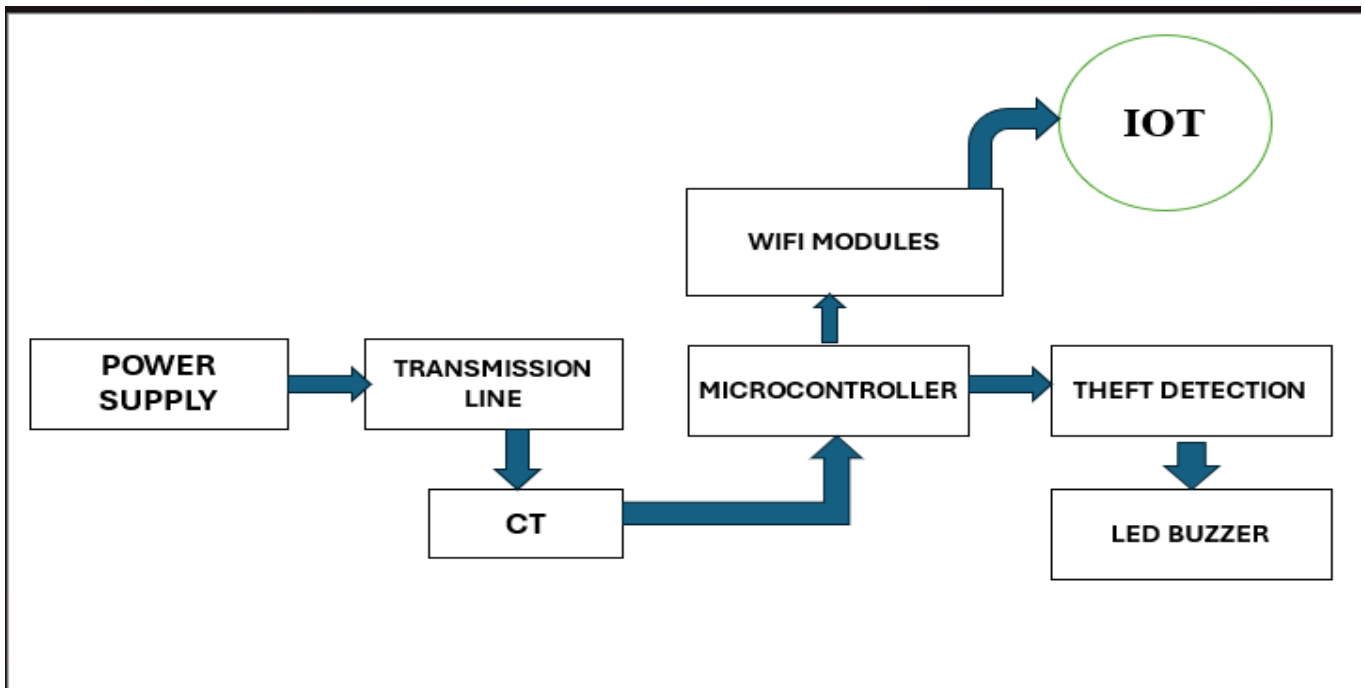
FIG 1-BLOCK DIAGRAM OF PROPOSED SYSTEM

Power Supply: It is a device (Electrical) that provides electrical power to a load. A power supply's primary system that converts electric current from an input to the proper frequency, current and voltage.

Transmission Line: A transmission line is a network of conductors used to transport signals (Electrical) from one location to another.

Current Transformer: It is a transformer that minimizes or multiplies the Alternating current. It creates a proportionalcurrent from primary current to secondary current.

Microcontroller: A microcontroller is a device that is embedded inside a system and controls a single function. It

accomplishes it by using its central processor to interpret data received from its Input/Output peripherals.

Wi-Fi Module: Wi-Fi module (also defined as serial to Wi-Fimodule) is a component of the Internet of Things transmissionlayer.

Theft Detection Unit: This module's primary function is to detect manipulation with an energy meter, turn off the supply, and send the power theft message to the managerial side. Whena customer continues to try tamper with a meter, it detects using magnetic sensors.

LED: It produces light energy from electrical energy, as opposed to traditional light sources that convert electrical energyinto heat and then into light, resulting in efficient light generation with minimal electricity waste.

III. CIRCUIT DUAGRAM AND DISCRIPTION

In Thing Speak [9] is just an open - source platform (IoT) Internet of Things application & API that uses the HTTPprotocol to store data and recover (retrieve) data from things over the Internet using a web Browser Area Network, according to its creators. Sensor location tracking applications, logging applications, and a networking site of things with status updatesare all possible with Thing Speak." io Bridge first launched Thing-Speak in 2010 as a service to assist IoT applications.

Thing-Speak now includes support for MathWorks' MATLAB numerical computing software, enabling Thing- Speak users to process and visualize processing facility using MATLAB without having to purchase a MATLAB license.

Math-works, Inc. and Thing-Speak have a close working relationship. In fact, the Thing-Speak information is fully integrated into the MathWorks MATLAB documentation site, with able to register Math-Works user accounts serving as login details on the Thing-Speak site. Thing-Speak. Com's terms of service & privacy policy are a contract between the user and the math work.
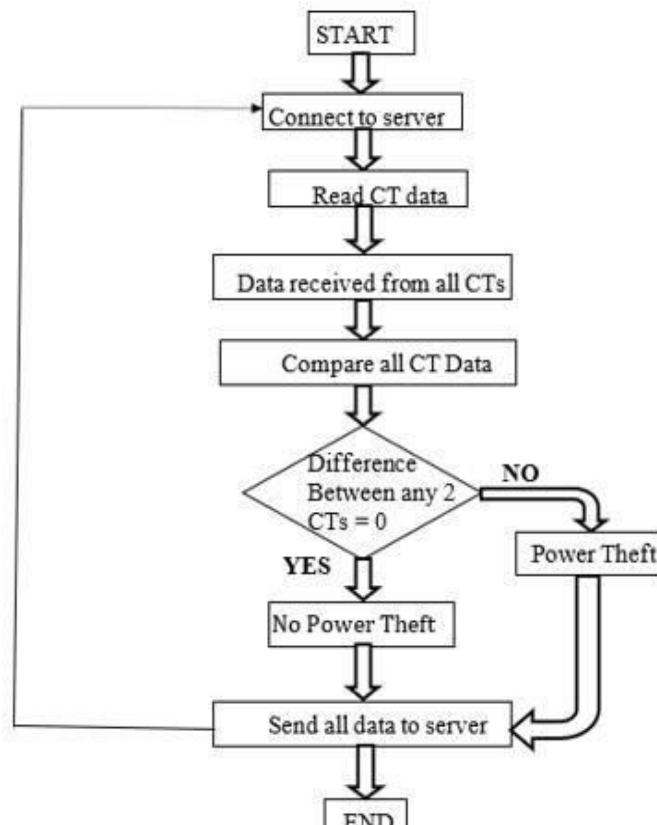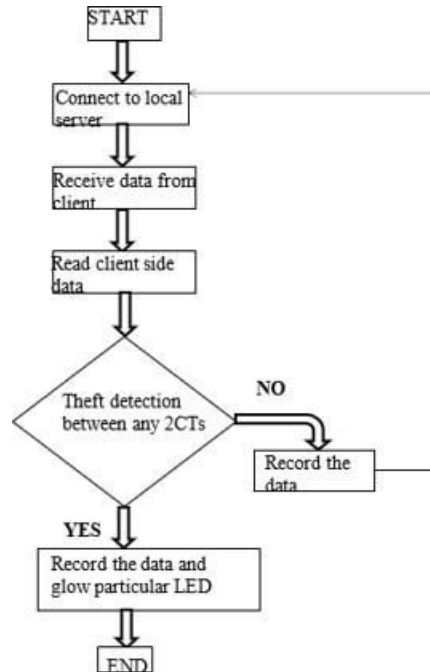

FIG 2- FLOWCHRT (CURRENT SIDE)

FIG 3-FLOWCHART (SERVER SIDE)

The fig shows that the current flowing from each pole which is sensed by current sensor and fig. 4 shows that theft detectionbetween two poles. We provided logic here that logic 1 shows theft is detected and logic 0 shows there is no theft between anypoles. The document starts here. Copy and paste the content in the paragraphs Furthermore, any additional load will cause the power source to the load to be cut off, informing the electric board as well as the individual people who own the house via Wi-Fi, and a buzzer will be installed to notify the stealing to have occurred, notifying the bill based onthe usage of electrical supply. A Thing Speak Application is being used to store an average load consumed, find the excess load due to theft microcontroller in this project will regularly review a load based on the graphical representation.
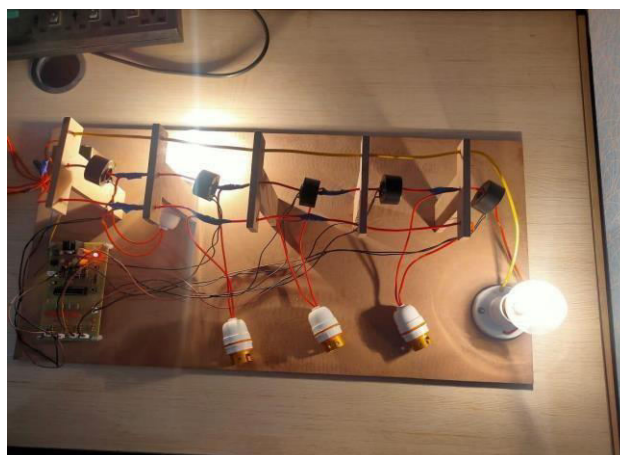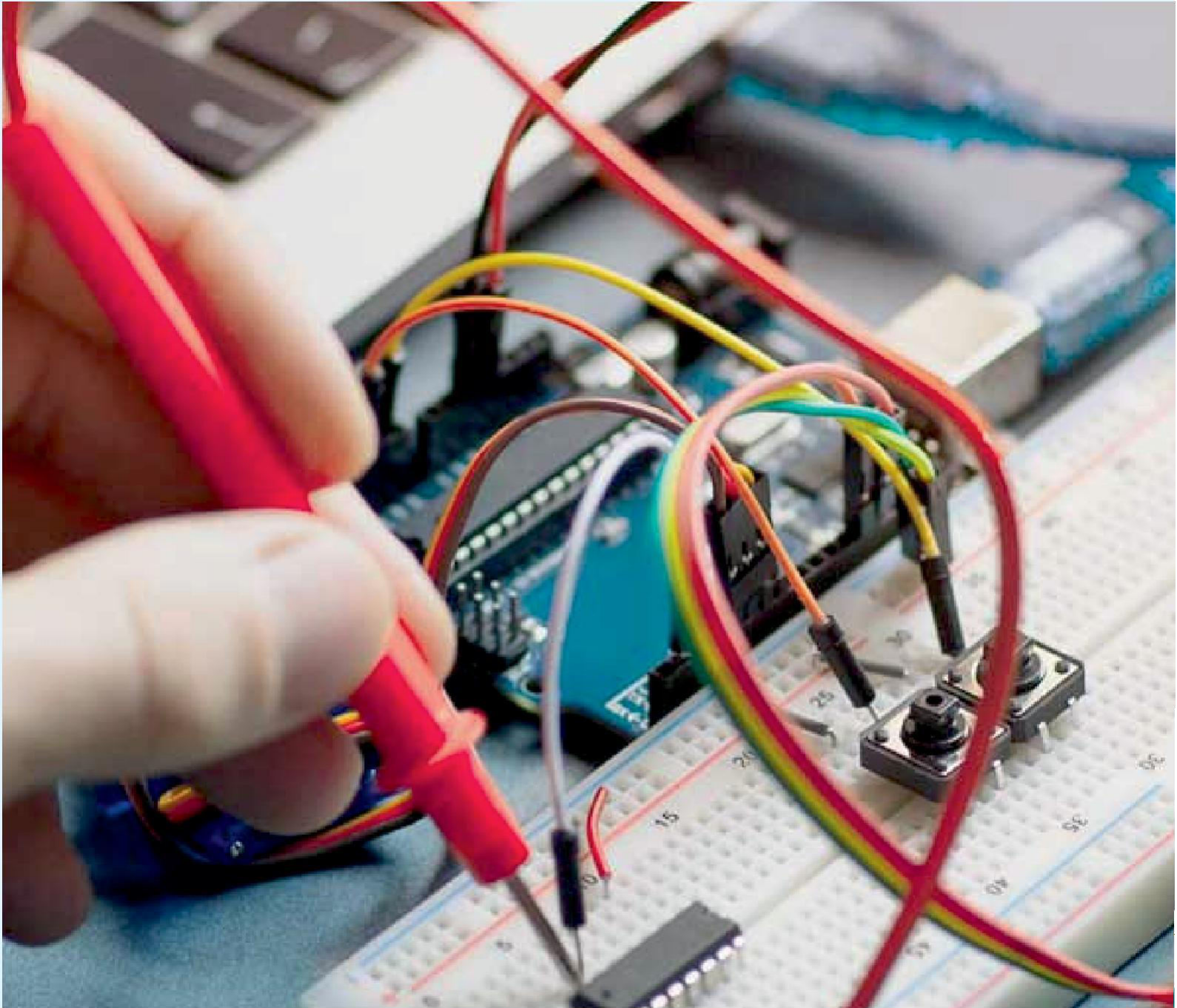

FIG 4 – RESULT OF THE PROJECT

IV. CONCLUSION

The system would make it simple to detect electrical energytheft without the need for human intervention. This system is able to detect faults on the pole side of a distribution system. We are going to look forward to implementing smart metres in this system. Grasped the fundamentals of the Internet of Things. The above idea can also be implemented in domestic areas to prevent illegal electricity usage.

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