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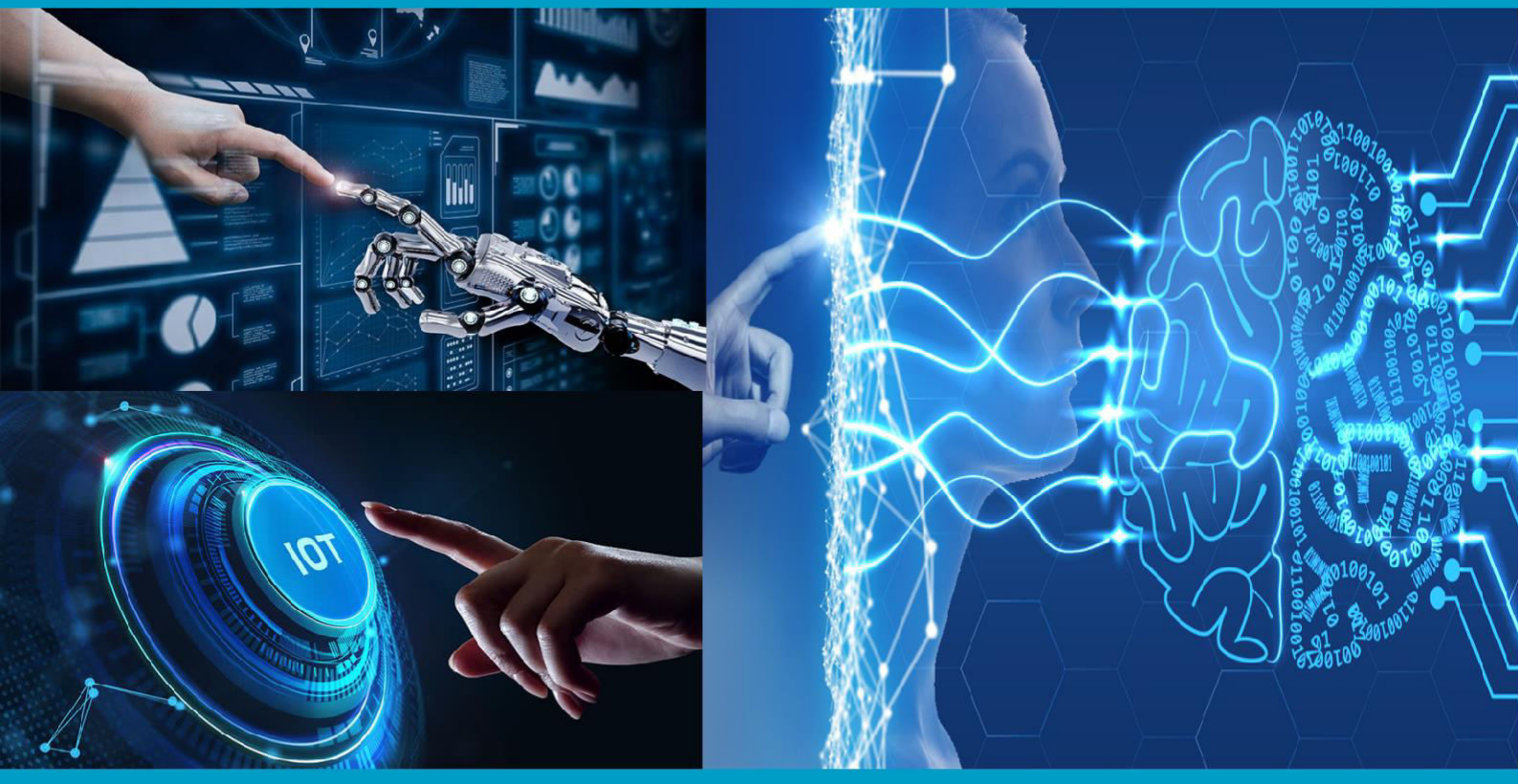

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Design & Implementation of IOT Based Energy Meter

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ABSTRACT: The purpose of this project is to create a system of electricity meters based on IOT. Energy theft is a common problem in countries like India, where energy consumption continues to rise with a growing population. Energy Meter Addressing the ever-present problem of energy theft, especially prevalent in countries like India amid rising energy demands, requires innovative solutions. Traditional automated systems have inadvertently exacerbated this problem due to irregular monitoring procedures. Although Advanced Metering Infrastructure (AMI) has attempted to alleviate this problem, manual checks remain impractical and inefficient. This paper proposes a new methodology using an ESP8266 microcontroller to remotely detect and prevent power theft, thereby increasing accountability and efficiency in power distribution networks.

At the core of this project is the integration of an ESP8266 microcontroller, which enables real-time monitoring and control of electricity meters. Upon detecting unauthorized activity, the system autonomously communicates with the utility's central server through a GSM module, which triggers responses to terminate the illegal supply. Additionally, the inclusion of single pole double throw (SPDT) relay switches, operated by GSM commands, provides a robust mechanism to minimize losses from erratic readings and voltage fluctuations, ensuring accurate energy measurement and billing.

Using the capabilities of IoT technology and intelligent metering systems, the project provides a comprehensive solution to effectively combat energy theft. The proposed framework not only enables prompt anomaly detection but also facilitates remote disconnection and reconnection, streamlining resolution processes. With its potential to address regulatory losses and increase operational efficiency, this system is poised to significantly impact energy management and sustainability amid increasing demand and evolving challenges..

I. INTRODUCTION

Currently, there is a lot of interest towards solving the world's energy problems. This has led to research into alternative energy sources that will complement conventional fossil fuels. Solar is a natural source of energy. Solar energy is energy produced by harnessing the power of solar radiation. It is the cleanest source of energy that can contribute to saving exhaustible energy sources. Such systems are based on solar collectors, which are designed to collect the sun's energy and convert it into electrical power or thermal energy.

The purpose of this project is to create an apartment water pump system. This system can sense the water level in the tank and make an intelligent decision to turn on/off the water pump, this system saves solar energy that can be used to pump water at night.

A smart device that can perform this task is the pic controller water level sensor, theme controller and motor interface via relay. The energy from the solar panel is fed to the motor through a relay. Solar energy is also stored in the battery.

II. LITERATURE SURVEY

1] Smart Energy Metre Using Arduino Application & GSM Network: (Prof. Alpha Vijayan) IOT

This is done to get a fully automatic billing system. Its purpose is to control the local consumption of consumers and transfer consumption to the substation, as well as supply the consumption automatically. Arduino IDE as a software compiler and the result of compiling our code and then uploading the result to the microcontroller. As per the previous

point on weak signal, if you get weak coverage in your area, this can sometimes prevent your smart meter from reading at all. Even if your supply is not interrupted, it can cause late payments and confusion among households.

2] IOT Based Energy Meter Reading: (Prof.S.B. Kulkarni)

This helps the owner to reduce energy consumption when the unit is notified. Although smart meters send meter readings to your energy supplier, they do not store or share information such as your name, address and bank details..

3] Smart Energy Meter: (Leenesh Mohan, Jithin Joshi)

Even the latest energy meters are not tamper proof. It is possible to design energy meters which are tamper proof, support automatic metering and billing systems and at the same time help in fault location detection of transmission lines.

Smart monitors are hard to understand. The problem with smart meters is that the average energy consumer does not understand the energy. While the smart meter itself isn't the problem for most households, it's the energy monitor that comes with it that causes the most confusion. While everyone is well versed in pennies and pounds, kilowatt-hours and other energy terms are difficult for most elderly and frail consumers to understand.

4] Arduino Based Smart Energy Meter:
(Himanshu.k.Patel)

Eliminate human billing by reducing meter readings and errors. If there is no network, the system fails because the device cannot send SMS without network. The main goal is to keep the device simple and economical. The software used is reliable and stable. The elderly population can benefit from these devices as they avoid expensive medical care at home.

III. PROPOSED SYSTEM

The block diagram of the proposed system is shown in Fig.1.

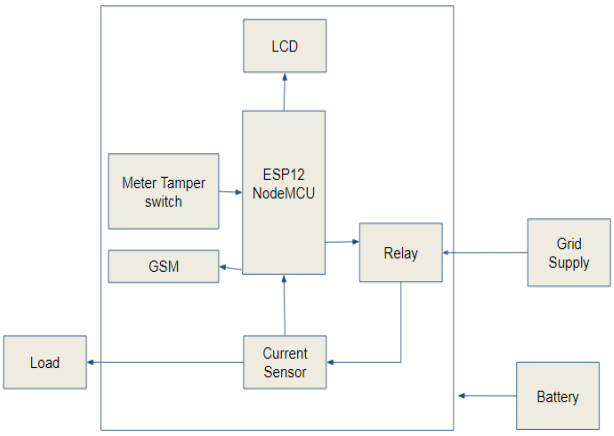


Fig.1

The main central processing unit in this project is an ESP12 based Node MCU. This is a Wi-Fi based controller so that data can be monitored and sent to the IoT cloud server. The grid phase wire passes through the current transformer and to find the wire current through the load and hence the load is calculated and the unit KWH is calculated. Power consumption data is sent to the cloud server on a daily basis. A meter tamper switch is used to detect that an SMS will be sent to the authorized person if an attempt is made to open the outer cover of the meter.

The controller, BLDC hub motor, accelerator is mounted on a structure that can be attached to any wheelchair, who wants to move their wheelchair to maximum potential. An energy meter keeps track of how much energy a load consumes. In the past electromechanical energy meters were available and now digital energy meters are available. Energy meters are primarily because an increase in the amount of current flowing through the circuit causes the disk to spin, indicating that the rotational speed of the plate is proportional to how much current is passing through the circuit. Just as the power consumption per charge is recorded by a microcontroller through the flashing frequency of an LED integrated into the meter, the older sort of disc type meter causes the rotating impact material component to act accordingly.

IV. CIRCUIT DIAGRAM

The Circuit Diagram is shown in Fig.2.

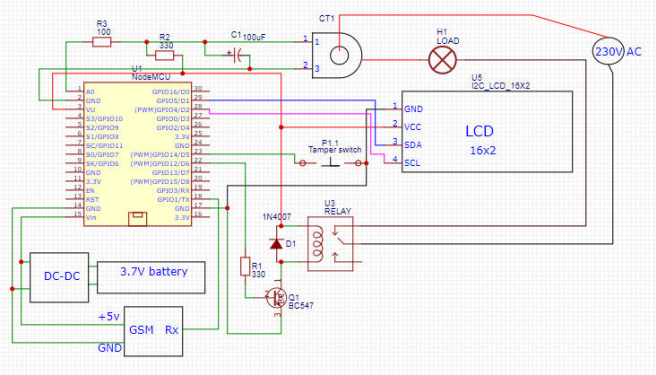
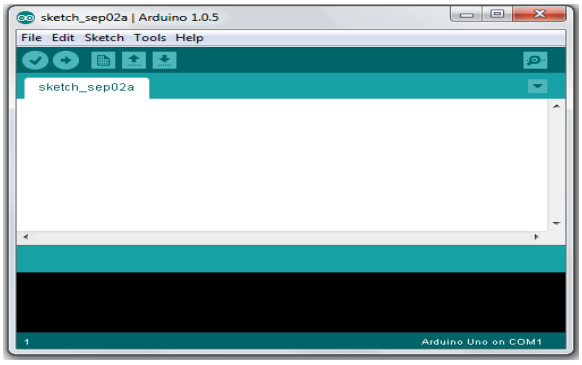


Fig 2.

In Fig.2, a current sensor is used to detect the current consumption by the load. A voltage sensor is used to detect the AC voltage supplied by the grid supply. NodeMCU is used to understand data through programming. Calculate power in KWH by programming. Data is sent to the cloud server using PHP and MySQL. The NodeMCU is connected to the Internet through programming and sends the calculated data in KWH. There is a switch on the meter box cover which is used when a person tries to open the meter box the relay closes and hence the power supply to the house/industry is cut off. An SMS is immediately sent to the grid company for meter tampering. Cloud server used to get reading data online is 000webhost.com which is free version and can also use paid version. Admin and user can login to this website and view the data online.

V. SOFTWARE DETAILS



Downloading Arduino IDE

- First download the Arduino IDE to ensure that you have the latest software version (some older versions won't work), visit the following URL: https://www.arduino.cc/en/Main/Software.
- The CH340G is a cheap serial to USB programming chip and does not come with native windows or mac drivers. However it has been made very easy to install.
- Download and install the drivers through the wemos website: https://www.wemos.cc/product/d1-mini.html

Installing the Node MCU ESP8266 Board

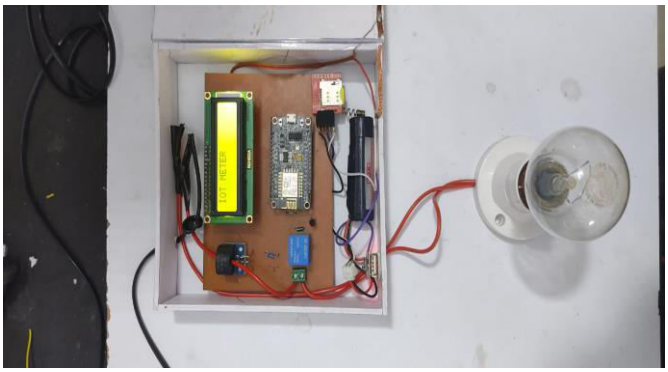
To install the board in your Arduino IDE, follow these next instructions:

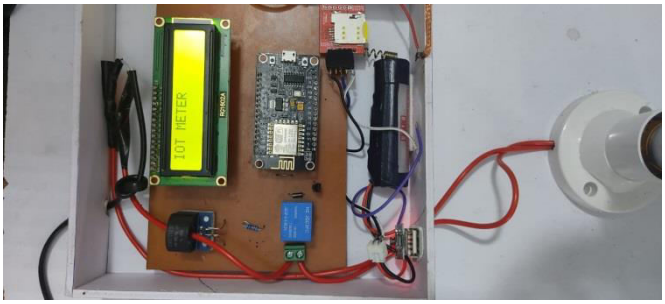
- 1) Open the preferences window from the Arduino IDE. Go to File > Preferences
- 2)Enter http://arduino.esp8266.com/stable/package_esp8266com_index.json

into the "Additional Board Manager URLs" field as shown in the figure below. Then, click the "OK" button.

VI. WORKING MODEL

The Working Model system is shown in Fig.3.





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VII. CONCLUSION

As per the study of the system will be designing and implementing the digital energy meter for home. Here the system will be implemented to work on a Wi-Fi network to send the power data to the cloud servers. The proposed system will be based on the internet of things. So by using this system the manpower of taking meter reading door to door will be reduced. human intervention and streamlining This ensures that individuals can conveniently purchase stationery items at their convenience without any time constraints.

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