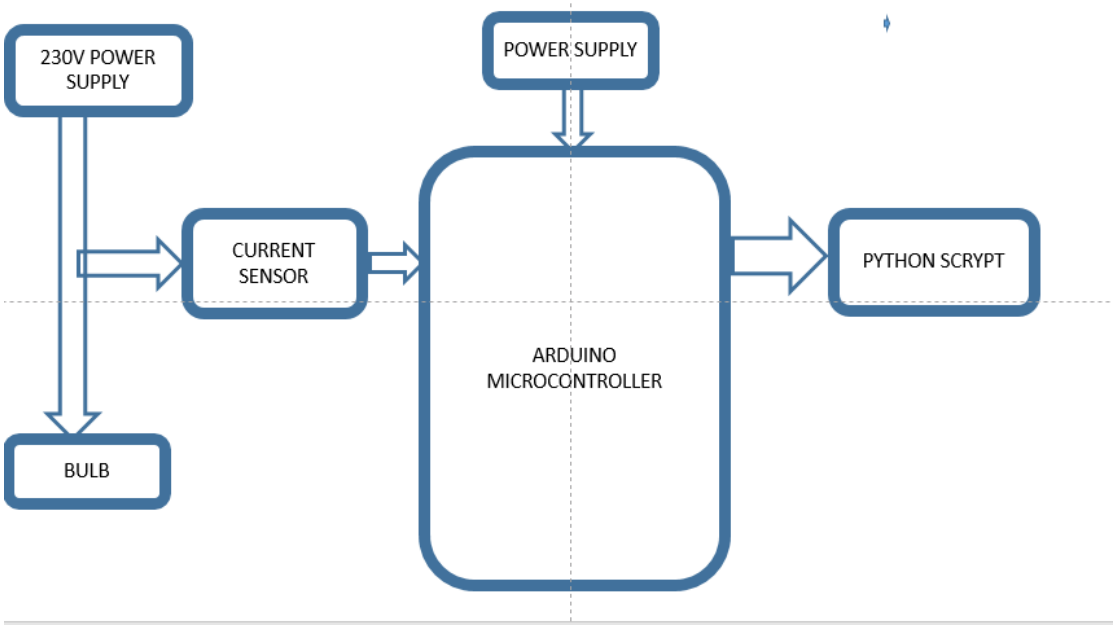
CHAPTER – 1
INTRODUCTION

1.1 GENERAL

In the present scenario, the world is facing energy crisis. The optimum solution of this trending problem is to monitor and control the power consumption. In power system, the number of consumers are growing speedily and thus the energy requirement. Move the energy requirement more is need to save energy losses. To save losses we need to monitor the power consumption losses, so that we can utilize the generated power. As generation is increasing in turn are the requirements. So there is a technological advancement needed, so we develop a system with faster and advanced IOT BASED SMART ENERGY METER Kewal Kokate, Bhagyashri Pagar and Sujata Thombre 2 technology i.e. IoT. Nowadays we have a burning concept of IoT i.e. Internet of Things through this concept or technology the objects are sensed controlled remotely in the existing network infrastructure. The existing energy meter did not perform two way communications. MGVCL employee would come and take a photo the energy meter or note down the reading from the energy meter and would submit this data to the utility. Then there would be a approximation of energy bill and the consumer needed to pay the bill of the amount. Internet of Things (IoT) is a new information processing acquisition technology and also referred as the third wave of information technology after internet, mobiles, computer network. In IoT everything is configured with internet protocol addresses and it can monitor controlled and access remotely in accordance with web technology. The main advantage of this technology is that devices are connected smartly with the help of sensors and transducers and these are again connected to (Local area Network) LAN, (Wide Area Network) WAN, via Ethernet or Wi-Fi connectivity.

CHAPTER – 2
LITERATURE REVIEW

2.1 LITERATURE STUDY



Block diagram representing Smart Electricity using Python.

Recent developments in smart metering applications have led to the conceptualization and construction of a new type of energy meter, operating on the basis of event-driven principles [1]. The event-driven metering concepts are applied to represent the information on the electrical load patterns, which have an integral value . Furter we will discuss about the different meters that are already present.

Electronic Energy meters:

These are of accurate, high procession and reliable types of measuring instruments as compared to conventional mechanical meters. It consumes less power and starts measuring instantaneously when connected to load. These meters might be analog or digital. In analog meters, power is converted to proportional frequency or pulse rate and it is integrated by counters placed inside it. In digital electric meter power is directly measured by high end processor. The power is integrated by logic circuits to get the energy and also for testing and calibration purpose. It is then converted to frequency or pulse rate

Digital Electronic Energy Meters: Digital signal processor or high performance microprocessors are used in digital electric meters. Similar to the analog meters, voltage and current transducers are connected to a high resolution ADC. Once it converts analog signals to digital samples, voltage and current samples are multiplied and integrated by digital circuits to measure the energy consumed

Smart Energy Meters:

It is an advanced metering technology involving placing intelligent meters to read, process and feedback the data to customers. It measures energy consumption, remotely switches the supply to customers and remotely controls the maximum electricity consumption. Smart metering system uses the advanced metering infrastructure system technology for better performance . Figure 6 Smart Energy Meters These are capable of communicating in both directions. They can transmit the data to the utilities like energy consumption, parameter values, alarms, etc. and also can receive information from utilities such as automatic meter reading system, reconnect/disconnect instructions, upgrading of meter software's and other important messages . These meters reduce the need to visit while taking or reading monthly bill. Modems are used in these smart meters to facilitate communication systems such as telephone, wireless, fibre cable, power line communications. Another advantage of smart metering is complete avoidance of tampering of energy meter where there is scope of using power in an illegal way. This is all about types of energy meter and their working. Hope you are satisfied with this article. We express our gratitude to all the readers

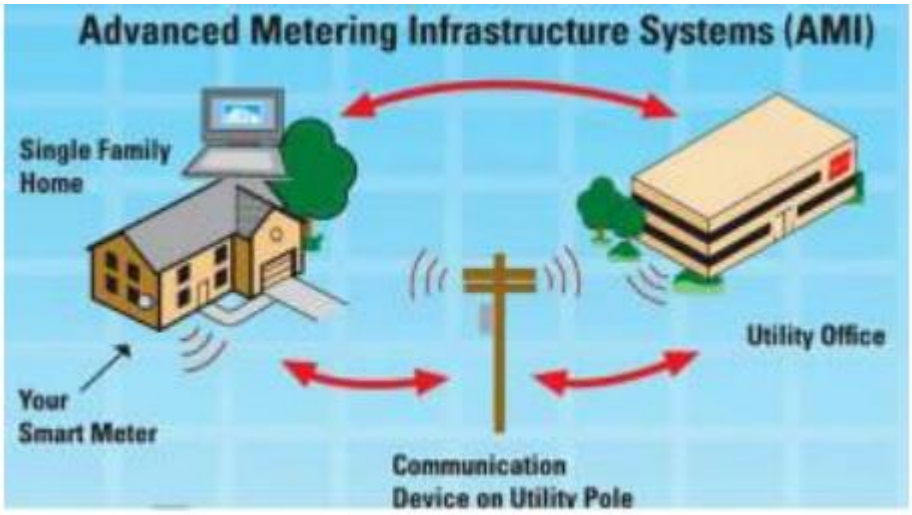


Figure Smart Energy Meters.

2.2 System Design:

The designing methodology of the system has two major portions: software design and hardware design. The hardware is designed by arranging microcontroller, sensors and actuators whereas software design includes programming that is written and uploaded in the microcontroller and some is done in Python. The designed system shows microcontroller connected to Current Sensot and actuator-modules for monitoring power. This design section shows how different hardware components are set up. The specifications and information regarding various components are described below. The various functional units used in the system are as follows:

Working of ACS712 Current Sensor:

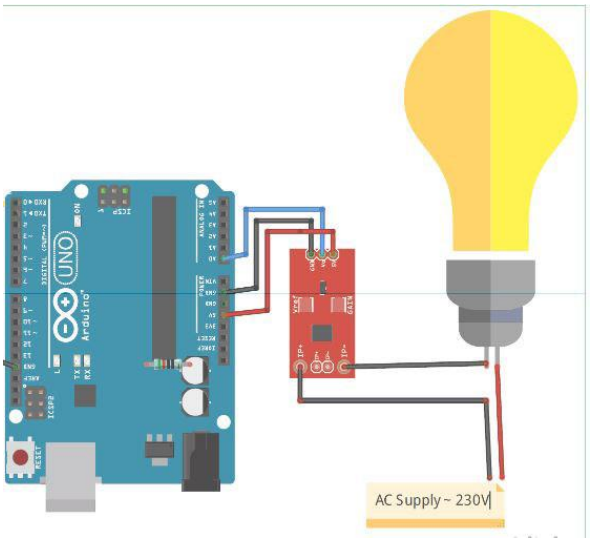
This module works on the principle of **Hall-effect**, which was discovered by Dr. Edwin Hall. According his principle, when a current carrying conductor is placed into a magnetic field, a voltage is generated across its edges perpendicular to the directions of both the current and the magnetic field. Let us not get too deep into the concept but, simply put we use a hall sensor to measure the magnetic field around a current carrying conductor. This measurement will be in terms of millivolts which we called as the hall-voltage. This measured hall-voltage is proportional to the current that was flowing through the conductor.

The module work on +5V so the Vcc should be powered by 5V and the ground should be connected to Ground of the system. The Vout pin has an offset voltage of 2500mV, meaning when there is no current flowing through the wire then the output voltage will be 2500mV and when current flowing is positive, the voltage will be greater than 2500mV and when the current flowing is negative, the voltage will be less than 2500mV.

We will be using the Analog pin of Arduino to read the output voltage (Vout) of the module, which will be 512(2500mV) when there is no current flowing through the wire. This value will reduce as the current flows in negative direction and will increase as the current flows in positive direction. The below table will help you understand how the output voltage and ADC value varies based on the current flowing through the wire.

Smtp lib:

Python provides **smtplib** module, which defines an SMTP client session object that can be used to send mail to any Internet machine with an SMTP or ESMTP listener daemon.



Circuit Diagram of Smart Electricity Meter using Current sensor and Python.

2.3 ADVANTAGESAND DISADVANTAGES:-

ADVANTAGES:-

- Eliminating manual meter reading
- Monitoring the electric system more quickly
- Making it possible to use power resources more efficiently
- Helping to optimize income with existing resources
- Offering more detailed feedback on energy use
- Enabling them to adjust their habits to lower electric bills
- Reducing blackouts and system-wide electric failures

DISADVANTAGES:-

- Ensuring the security of metering data
- Additional fees for the installation of the new meter.
- In case of fluctuations or transients, it can record an error.

2.4 APPLICATIONS:-

- Providing information for authorities and researchers
- Energy Saving
- Meter management
- Tariff Setting (Time of Use, Maximum Demand, Seasonal)
- Automatic processing, transfer, management and utilisation of metering data

CONCLUSION:

An attempt has been made to make a practical model of 'IoT Based Smart Energy Meter.' The propagated model is used to calculate the energy consumption of the household, and even make the energy unit reading to be handy. Hence it reduces the wastage of energy and bring awareness among all. Even it will deduct the manual intervention.

Future Work:

The project mainly aims at providing overall infrastructure of the energy meter presently used for the smart city concept. The main improvement for the future is going to make energy meter readings, IOT BASED SMART ENERGY METER Kewal Kokate, Bhagyashri Pagar and Sujata Thombre 4 tampering identification techniques, and connection and disconnection and also the pre-information providing to the users all is going to happen on wifi internet. Where we are going to develop some wi-fi hotspots in each area through which all the energy meters are get connected and set 4 to 5 parameters which is also going to be monitored. And the overall improvement information will be providing to the energy meter i.e. KPTCL will be easy for them to handle the things. Also in future we can go with some standard apps or standard tools, where in which it makes work easy for KPTCL people by reading the meter readings faster than the fastest method. And connect and disconnect of every meters on the on – payment and non – payment that will be fast as compared to the present method. And we will also include home automation as well.

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