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Smart Meter for Household Power Consumption

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ABSTRACT: Life today is getting easier and simpler with advancement of automation technology. Manual systems are getting replaced by automatic systems. With the rapid increase in Internet users it has become part of life. One of its kinds is IOT, latest and emerging technology. Thinks like consumer goods, industrial goods, etc., can be networked to share information and complete the task remotely. Basic home functions and features can be controlled using IOT from anywhere in the world. It is meant to save human and electrical energy. In this system each load is monitored by current and potential transformer.

KEYWORDS: Technology, IOT, Energy, Automated, Home Functions.

I.INDRODUCTION

The most critical problem faces by today's world is irregular power. People in many countries don't get the primary needs of lights, fans, etc. Researchers expect the capabilities of existing energy production will fail to meet future demand without new energy sources. We can make use of available power efficiently. A system can be created to achieve efficient use of power which monitors the environment and controls the power device and turns ON only when needed. The electrical parameters like voltage, current and frequency from smart grid can be acquired remotely and send these real time values using IOT. Electronic meters replace electromechanical meters. This meter consists of LCD/LED to display thereading. Calibration Led is employed on the meter which shows the units consumed. Manpower is required to read the meter and inscribe the reading. The reading on the meter is increasing which is employed to generate the electricity bill. An IOT Based Smart Electricity Meter and billing System does the identical task without human efforts. IOT Based SEM system is controlled using Arduino Mega, which is a microcontroller board. The aim behind choosing this board is its efficiency and memory. It is more efficient in terms of memory and GPIO. The data obtained is then sent to the cloud through the internet. Data obtained may be easily sent wirelessly over long distance with none noise disturbance using the net because the data is directly sent to the cloud there's no occurrence of range and distance problem and is very accurate and efficient because of no human interference. Other wireless technologies like ZigBee, Bluetooth etc. have limited range thus can't be used over very long distances effectively. This project envisages the employment internet and therefore the concept of IOT by which the bottom station, likewise as users, remain updated with the current consumed units, changing the current problems faced by the electricity board and therefore the user.

In the present billing system the distribution companies are unable to stay track of the changing maximum demand of consumers.The patron is facing problems like receiving due bills for bills that have already been paid likewise as poor reliability of electricity supply and quality whether or not bills are paidregularly. The remedy for of these problems is to keep track of the consumers load on timely basis, which will held to assure accurate billing, track maximum demand and to detect threshold value. These are all the features to be taken into consideration for designing an efficient energy billing system. The present project "IoT Based Smart Meter for Power Consumption".

II. LITERATURESURVEY

In 2010, linear detection algorithm is used to detect which advances are active in their power contributions but due to the

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errors in the data base it contains many problems. Problems are robust to errors in this database. In the adjacent year 2011 using cloud computing technology found the solution for efficiency calculation of individualequipment. Later In 2012, using three feedback system, monitored the energy in residential Real-Time. But there is a problem when we try to save the energy due to continuous engagement of the device. During the 30-days after installation residences result in low residential consumption rates which is used to determine the feedback provided by the Real-time energy monitors. In 2013 a smallest ZigBee compatible node in existence came into picture which is known as green technology. This technology will possible in every place sensing different data types from energy metering to the environmental monitoring. Eventually 1n the next year 2014, GSM technology implemented automatic power will be reading. In 2016, Using Wi-Fi technology application can develop for Apple and BlackBerry 10 OS, thus providing multiple platform users support. In 2017, using IOT technology An IOT device was created which measures the voltage, current, power and energy of 3 phase four line power line.

III.PROPOSEDSYSTEM

The block diagram of proposed system comprises of Smart Energy meter containsvarious components.
Power consumption monitoring system that can measure the power usage of each of the loads individually. This system is designed around node MCU microcontroller board. If the overall consumption goes beyond a specified level user will be notified about this and fine will be added if still consumption is not reduced. This system can be used for detecting faulty electrical devices in a household that is consuming unusual amount of power.
Advantages

- Can detect any faulty loads
- Fully automated system
- Can monitor each load individually
- Can reduces EB bill

FLOW CHART:

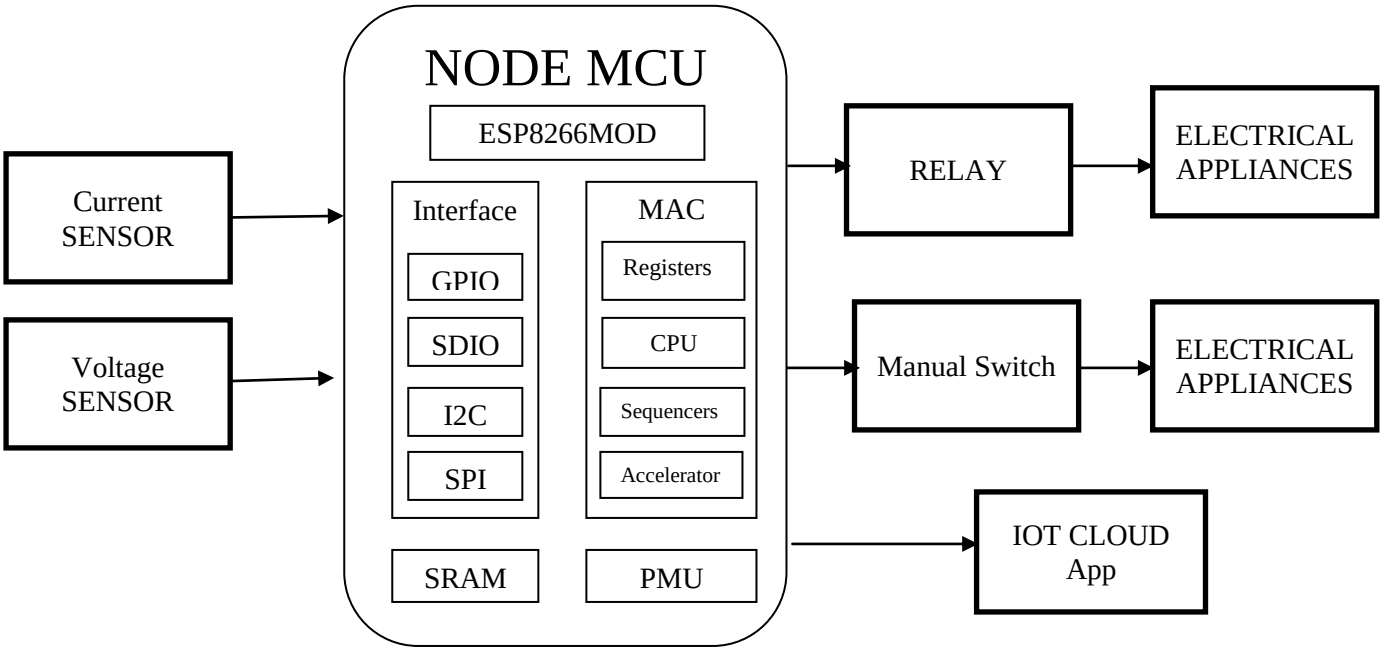

Figure 1: Block Diagram

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BLOCK DIAGRAM DESCRIPTION:

- Node MCU is the controller board used here
- Every other component is connected to node MCU
- It reads the sensor values through an external ADC IC
- All the loads are connected to it using relays
- Relays are connected to GPIO pins in node MCU
- Node MCU is a has a WiFi SoC called ESP8266
- It is used for connecting node MCU to a WiFi network

1. Arduino Nano: Arduino Nano is an AT mega 328 based bread board friendly board in which is small in size. In proposed project Arduino Nano utilized for controlling action of various devices connected to it and also its small size and economic solution. It works with regulated external power supply of 5 V and unregulated power supply in the range of 6–20 V.

2. Node MCU: Node MCU is an IOT platform which is an open source.it contains hardware related to ESP-12 module along with firmware from Espress -if systems which is based on ESP8266 WiFi SOC rather than development kit Node MCU in a firmware by default.

3. Relay: Relay is an electrical switch that activates and deactivates one circuit while it is controlled by another circuit. Basically it is operated by electromagnet in order to open and close either one or more contacts. There are mainly two types of relays single pole double through switch (SPDT) and double pole through switch (DPST). These are used for cutting the power supply of particular load based on the demand of the customer in order to save power.

4. Current Sensor: Present current sensor, ACS721 current module which is based on ACS712 sensor. The main function of this sensor is to sense and control the current flow in a wide variety of applications such as switching mode power supplies, digital watt meters over-current protection circuits etc., the maximum AC or DC that can be detected can reach 5A. The current signal can be detected via analog I/O port of Arduino Nano.

When the Energy Meter gets supply from the main (substation or power station) to the input terminals of the energy meter. Generally energy meter has two input terminals and two output terminals .From the input terminals of the energy meter input is given to ac converter (220v to 12v) by shorting the both input of energy meter and input terminals of the ac converter. This converter converts 230V AC to 12V DC. This 12V DC supply is output of the converter. This output is given as input to the voltage regulator. The output of the regulator is given as input to the Node MCU to Vin. The output of the energy meter is given to the load (2 terminals). One of the output terminals is connected to lamp load by shorting the lamp terminal. And second terminal is connected to the switches through the current sensor. The current sensor has two terminals. One terminal is grounded and the another terminal is connected to the analog output terminal of Node MCU. When we give supply to the energy meter. It transfer to the load through the output terminal passing through the current sensor. This current sensor senses the current that passes through the wire and gives it to the Node MCU. By Node MCU we connected to the Blynk app interfaces. It is IOT platform used to control Arduino, Node MCU. In Blynk app create a new project file name is IOT based smart energy meter. A page is appear hence we create a valued display settings to display the how much load we consume and a labeled value display it will display the cost of power consumed by the load in one month and last finally we insert a notification bar in a Blynk app for when the load is access then the threshold value it send notification alert to the Mobile through the Wi-Fi.

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Figure 2: Proposed system

Figure 3: Node MCU

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IV.FUTURESCOPE

The proposed system makes sure that prime voltage of current can't be used. This can put off the circuit when its high power. The warning are going to be provided and it'll pack up the running circuit, which helps in minimal usage and required amount of power consumption.

V. CONCLUSION

The proposed system makes the unit of measurement reading to be handy. Hence it creates awareness on power consumption and some way to save lots of and manage power by each individual consumer and also eradicates electricity deficit during summer which can make consumer a self-interested guardian of power consumption and avoids wastage together with the electricity bill monitoring. The immediate opportunities of smart metering includes the areas of knowledge access, energy efficiency, billing transparency, compliance and performance which unfolds more exciting possibilities within the upcoming future. This project creates awareness about power consumption and way to manage power together with smart billing through an app by the applying of IOT. It's an enormous importance within the field of energy management and monitoring and it provides the interaction between customer and also the service providers. The proposed project with its real time application for power management and monitoring provides a reliable, comfortable and important application at the identical time it avoids human intervention. Advancements within the technology further make the implementation of this method easier.

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