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Smart Energy Meter based on Internet of Things

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ABSTRACT: Electrical Power Monitoring and Optimization is essential for energy management solutions, allowing them to obtain appliance-specific energy consumption statistics that can further be used to devise load scheduling strategies for optimal energy utilization. Indian government has announced its ambitions of introducing smart meters to India within a short time span. Current worldwide initiatives show that smart meter deployments demand careful analysis and planning. Functionalities of smart meters are not clearly defined and there are many attempts in defining them. Most of the countries are doing pilot studies to ascertain the cost and the benefits. The reasons of smart meter deployment are different from country to country. Though in principle smart meters could increase power system operational efficiency and support power system control, easy to communicate with consumers and monitor their energy consumption in real time. Smart meters are devised to serve these purposes and can increase power system operational efficiency and support power system control, easy to communicate with consumers and monitor their energy consumption in real time and it is motivating consumers to cut usage wherever possible. It is estimated that the average consumer could save two to three percent in energy use each year using smart meter technology. Multiply that by hundreds of millions of households, and the impact can be significant.

KEY WORDS: smart meters, operation efficiency, internet of things

I.INTRODUCTION

Today the world is facing such an environment that offers challenges. Energy crisis is the main problem faced by our society. A relevant system to control and monitor the power usage is one of the solutions for this problem. One approach through which todays energy crisis can be addressed is through the reduction of power usage in households. a person from the Electricity board should visit each house to note down the power reading and to calculate the bill amount. To carry out this procedure at least a person should be available in each of their respective houses when the person from the electricity board arrives. So, the consumers cannot engage themselves in their private work according to their needs, because the time at which the person arrives from the Electricity board is unknown. Moreover, it does not provide privacy as an unknown person enters into our house for power reading and calculation. This project is designed in such a way to overcome all the above hindrances caused by the former mechanisms of measuring power.

Here the power reading is uploaded to cloud using ESP 8266. It is an UART (Universal Asynchronous Receiver/Transmitter) to Wi-Fi module which allows microcontrollers to connect to a Wi-Fi and make simple TCP/IP connections using AT commands. ESP 8266 is an impressive, low cost Wi-Fi module suitable for adding Wi- Fi functionality to an existing microcontroller. It is one of the leading platforms for IoT (Internet of Things). As there is no human involvement in the entire process, there is no chance of manual errors. These put more control into the hands of customers by giving them more detailed information about power consumption.

II. SIGNIFICANCE OF THE SYSTEM

Smart Meter Reading. A device which remotely obtain meter readings and transmits this data to the system's computer via communication media such as IOT (Internet communication module) This devices can detect outages, remotely connect and disconnect services, detects tampering as well as other uses. Economic benefits include increased cash

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flow, lower Labour and equipment cost, increased accuracy and lower costs. Some customer satisfaction benefits include improved service quality, more customer choices and faster response time.

III. LITERATURE SURVEY

For Communication to the server many options are there as wireless or wired such as cable networks, and the different GSM modules, which is known researchers. Different Countries Trying to implement this idea. From the different papers we have different researcher work regarding our new concept. In paper [1] (2014) Pradip Kulkarni and Manisha Shinde has publish a paper on automation of electricity billing process in that new architecture that the electricity board has manual process and to remove that process they introduced a module in which data is gather from the energy, water and devices and transfer to the centralized station from the billing purpose.

The data is collected using single camera, with means the camera is placed in front of the meter of the everyone's house and the camera will capture image of meter and server will directly fetch that data from the each house, so that human interaction is totally avoided. ARM7- LPC 2138 is used as the interface between the devices. After that the image will reach to server and undergoes the different processing through Mat lab, so that the every month reading is stored in the database of the electricity board. So the technology used in this paper was image segmentation and the AMR, zigbee, so that advantages of this technology was this technology is used properly, and the disadvantages for this architecture was that it is costly. In paper[2](2015) R.G.Yadawad has publish on intelligent electricity billing and the maintenance system in which new way of billing process there was many errors in the different models which were introduced earlier so in this paper the model used was through mobile agents.

IV. METHODOLOGY

The block diagram consists of an Arduino UNO board, an ESP 8266 Wi-Fi module and a 16*2 LCD display. The Wi-Fi module is the main component used in the IOT operation. The centre piece being the Arduino board provides the connection between the different components of the proposed system [3]. The Arduino UNO board is based on the ATmega 328p processor [4]. It is the core of the system which is necessary for the principle operations that are necessary to be carried out such as the automatic electricity billing and tampering detection inputs from the tampering circuit. The load represents the devices that require the electricity to operate. The ac supply is connected to the system through the transformers to power the system. The Meter is also connected to the system to automate the power usage of the household. The readings from the energy meter are then processed and are updated over the Wi-Fi through the ESP 8266 Wi-Fi Module [5]. If any tampering is detected the system updates the situation on the webpage used to display the energy readings. After updating the energy readings on the webpage, the system then displays the energy readings on the LCD display. In case of any tampering the buzzer will go off making a loud noise. All the information from the system is readily available on a webpage called Thingspeak.com.

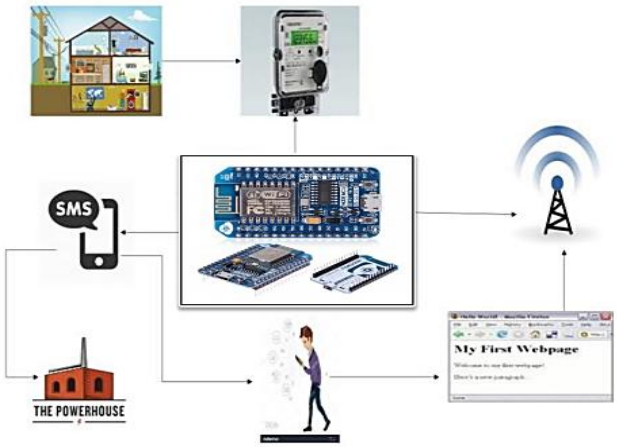

Fig1. System Design

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V. EXPERIMENTAL RESULTS

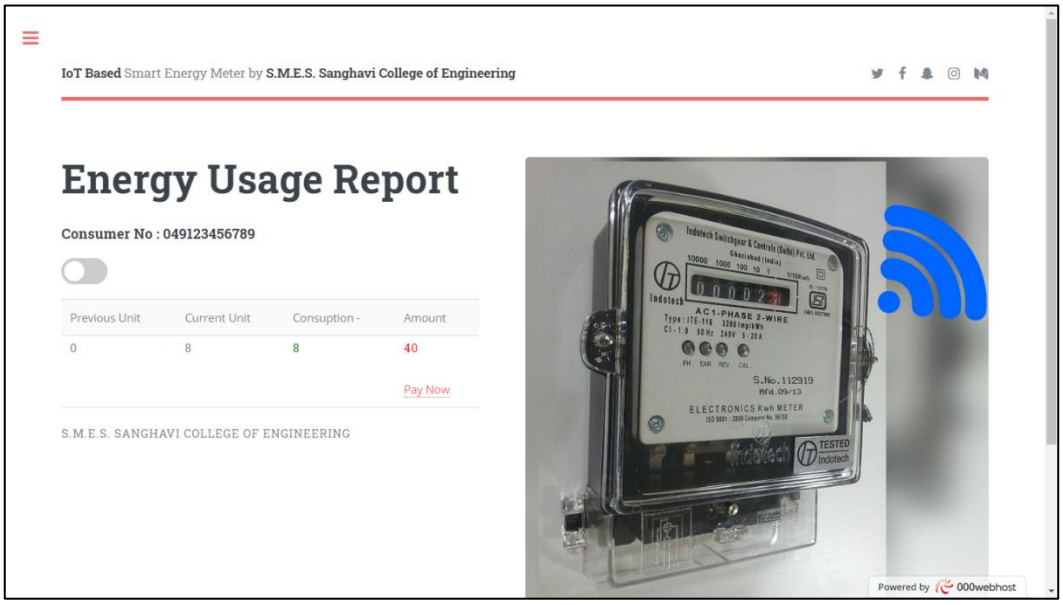

Fig 2 - Screenshot of Web Application

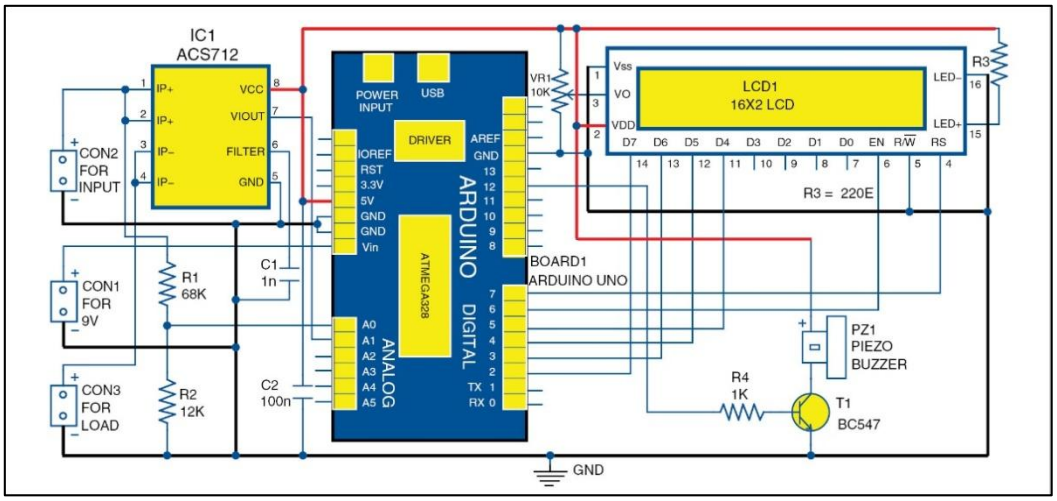

Fig 3 - Screenshot of Circuit

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VI. CONCLUSION AND FUTURE WORK

The system is mainly intended for smart cities with public Wi-Fi hotspots. The project is based on the internet of things concept. This is aimed at replacing the old energy meters with an advanced implementation. It can be used for automatic power reading by which one can optimize their power usage thereby reducing the power wastage. The readings from the meter are uploaded to Thingspeak.com where a channel with the energy usage for an energy meter can be viewed by both the service end and the customer. MATLAB visualizations can be further added to provide detailed power usage and billing as per the government rules. A smart app can be used to alert the user when a threshold is crossed.

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