Smart Energy Meter Using Android Application

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Abstract-The electricity meters in our house generally measure the power consumed. The project focuses on the variation of current with changing load and manipulation of the values for calculation of certain parameters, employing two modules, namely current sensor module and a Bluetooth module.

The current sensor in series with the load determines the values, which are converted into Amperes unit by a formula coded in the microcontroller. The reading is then converted into string to send to the mobile through Bluetooth module. The mobile application decodes that particular sting and displays the required parameters to the user.

I. INTRODUCTION

The electricity meters used in house generally give readings in units. The electricity bill comes directly after a month. People are not able to figure out the number of units they are using per day. And also, the charge for a day or a week

If the readings and the charges of the energy used directly come to the users' mobile, they will be able to keep a track on his electricity bill and figure out a way to reduce it.

As technology evolved humans are now able to design things which are relatively efficient and make life easy. When the electricity meter was first invented, there was no way for wireless transfer of data for short distances. Now we could transfer and access data from anywhere in the world. Therefore, in the project we are transferring data form the electricity meter module to the mobile phone.

Key points: The mobile application will give the energy used for given time period and the charges in Rupee.

II. SYSTEM OVERVIEW

A: Existing System

In the existing system, electricity meter reading for electricity usage and billing is done by human workers from home to home and building to buildings. This requires huge number of workers and long working time to achieve complete area data collection and billing. Human workers billing are prone to reading error as sometime the houses electric meter is placed where it isn't easily accessible. Labour billing job is sometimes also restricted and slowed down by bad environmental conditions. Paper bills are prone to get lost in the post box. The increased development of residential housing and industrial buildings in the developing country such as for example, India require more human workers and longer working hours to complete the usage reading task. This in-creases the energy provider operation costs for meter reading

B: Proposed System

The measure of the current at different load is the main parameter. The current sensor in series with the load measures the values and sends it to the Arduino microcontroller. The microcontroller is coded in such a way that it will convert the values for the sensor in terms of Ampere and then calculate parameters like energy, daily power consumption and the charges. The microcontroller will then send values of these parameters to the Bluetooth module and the Bluetooth module will send those to the mobile phone.
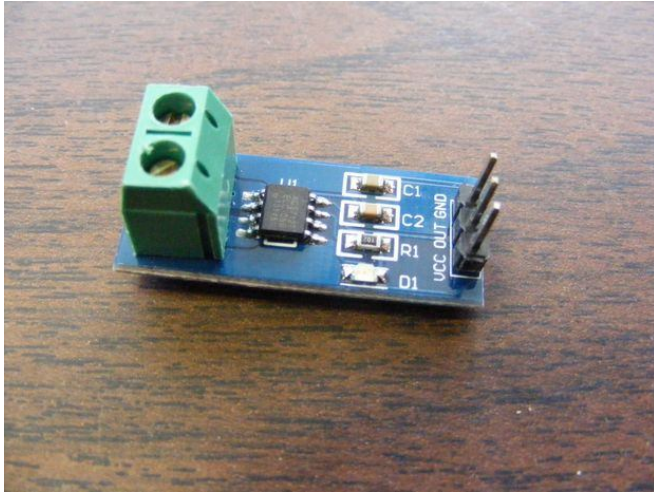
C: System Description:

The system consists of three main components, which are, Current Sensor ACS 712, Bluetooth Module HC – 05 and Arduino Uno Microcontroller. The current sensor is given an input of live wire which is connected to a load and the input of 5V from the Arduino. The Arduino is the controller of the system. It has a code in C language which controls the whole system. The data is manipulated in the Arduino and is sent to the mobile through Bluetooth module. Mobile phone is installed with an android application made with the help of software MIT Android app inventor. The mobile application is able to access Bluetooth switching in mobile and has ability to connect to other devices.

Current Sensor ACS 712

The ACS712 Current Sensors are designed to be easily used with micro controllers like the Arduino. These sensors are based on the Allegro ACS712ELC chip. These current sensors are offered with full scale values of 5A, 20A and 30A.

The basic functional operation of each of these devices is identical. The only difference is with the scale factor at the output

Bluetooth Module HC-05

Bluetooth module is a wireless technology standard for exchanging data over short distances (using short-wavelength UHF radio waves in the ISM band from 2.4 to 2.485 GHz) from fixed and mobile devices, and building personal area networks (PANs). Range is approximately 10 Meters (30 feet).
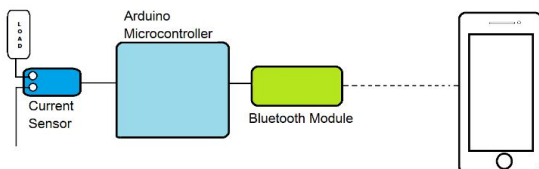

Block Diagram

III. PERFORMANCE AND EXPERIMENTS

For DC voltage, we have used a DC power supply of 10V and potentiometer as the load for the system. When we vary the potentiometer we got the variation in the values in the current viewed in the serial monitor in Arduino IDE.

For AC supply, we used a rack of 100W bulbs as load and then turned the system on. The current displayed in the serial monitor was varying DC as we need that current to be constant for certain load. The reason behind that was the values which we were getting from the current sensor is to be converted into ampere with certain formula in Arduino.

Later on after fixing this we were able to get the expected readings of the parameters from the Arduino.

In both the cases the current measured is manipulated and sent to the mobile application after calculation of certain parameters.

The sensitivity of the current sensor is very high, it was giving instant variation in the readings for the variation in load and for no load it was giving the constant current as expected.

IV. RESULTS

Table1: Open circuit analysis

Sr. no.	Readings
1	510.12
2	510.30
3	510.83
4	510.39
5	510.57

Table2: Closed circuit analysis

Sr. no.	Readings
1	503.35
2	508.24
3	511.5
4	514.78
5	516.98

V. RESULT ANALYSIS

1. For open circuit, the sensor gives constant values as output, which is expected.
2. As we close the circuit, with the increase in current drawn by the circuit, we see that the readings also increase, as can be seen form the observation table.

3. Thus, the current sensor is giving readings that are analog and need to be mapped according to the full range of the current sensor and then put into a formula to be sent via Bluetooth.

VI. CONCLUSION

This smart energy meter takes the advantage of current meter which has a full load coverage of house and is easy to install.

This provides reliable, effective and efficient automatic meter reading through the android application thus reducing human effort in meter reading and this method is very economical and time saving.

FUTURE SCOPE

We look forward to build this project into a product and to further implement on industry scale where many other parameters like per phase power consumption etc. are of concern.

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