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Smart Energy Meter With Theft Detection

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***Abstract*— -We can see a person standing in front of our house from electricity board, whose duty is to read the energy meter and handover the bills to the owner of that house every month. This is nothing but meter reading. According to that reading we have to pay the bills. The main drawback of this system is that person has to go area by area and he has to read the meter of every house and handover the bills. Many times errors like extra bill amount, or notification from electric board even though the bills are paid are common errors. To overcome this drawback we have come up with an idea which will eliminate the third party between the consumer and service provider, even the errors will be overcome.**

In this paper the idea of smart energy meter using IoT and Arduino have been introduced. In this method we are using Arduino because it is energy efficient i.e. it consume less power. In this paper, energy meters which is already installed at our houses are not replaced, but a small modification on the already installed meters can change the existing meters into smart meters. The use of GSM module provides a feature of notification through SMS. One can easily access the meter working through web page that we designed. Current reading with cost can be seen on web page. Automatic ON & OFF of meter is possible. Threshold value setting and sending of notification is the additional task that we are performing)

***Keywords*— Smart Energy Meter, SEM , Energy Meter, Arduino Nano.**

1. INTRODUCTION

Energy meter is a measuring instrument to calculate the amount of electric energy consumed by an electrically powered device. The energy metering which measure line voltage, current, and calculating active power can be used to increase usage efficiency of electricity. This project presents a system which provide real time energy meter reading using ACS712 as current sensor, Arduino and an IoT server with google firebase cloud. The energy meter can display consumed energy in kWh and electricity bills to be paid. system's user interface is in Android. A notification for the amount of electricity energy usage or electricity cost can be generated for user to be displayed. If any theft occur will be notified

Electricity is one of the basic needs of humans, It is commonly used for domestic, industrial and agricultural purposes in day to day's life. Most of us know the role of energy meter in electricity grid. It is an fundamental component of distribution grid. Energy meter helps the utility (Electricity distribution company) to account the uses of electricity by consumer on kw per hour basis.

2. LITERATURE REVIEW

A new concept of energy meter will be discussed, where maximum demand of energy of a consumer will be indicated in the meter used by the consumer. After exceeding the maximum demand, the meter and hence the connection will automatically be disconnected by an embedded system inserted in the meter itself [1] . GSM MODULE SIM 300 is used to produce communication between load circuit and utility side. We actually have used max232 along with DB9 connector to interface it [2] . The system consists of the electricity meter which measures the electricity bill and informs the consumer about the number of units consumed and associated costs with it. The microcontroller coordinates the whole system with the help of its different components connected to it [4] . the display which is 16x2 LCD (liquid crystal display). This information will be sent to cloud with help of Wi-Fi module i.e esp8266.There will be specific limits set inside the microcontroller for the data. Consider if the data goes above this limits, the buzzer will make noise and the range of the data will be shown as out on the display. When no input is outside the limit, the LCD will have the range shown as in. When any input goes beyond limits, the corresponding input range will be shown as out. The buzzer will have beeps if one input is out of limits and will produce noise continuously if all the inputs are outside limits. The data is sent to the esp8266 continuously

3. IMPLEMENTATION

[1] GSM MODULE SIM 300 is used to produce communication between load circuit and utility side. We actually have used max232 along with DB9 connector to interface it [2] . The system consists of the electricity meter which measures the electricity bill and informs the consumer about the number of units consumed and associated costs with it. The microcontroller coordinates the whole system with the help of its different components connected to it [4] . the display which is 16x2 LCD (liquid crystal display). This information will be sent to cloud with

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4. EASE OF USE

Block Diagram:

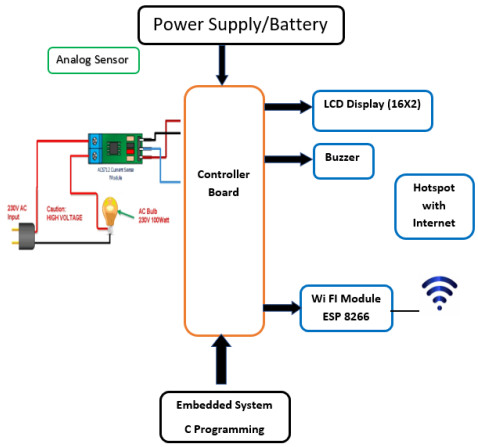


Fig 1: Block Diagram

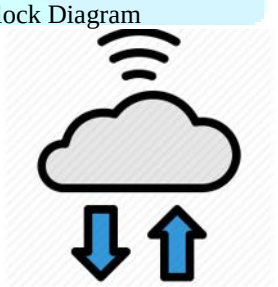


Fig 2: FireBase Cloud Google

4.1 Analog Sensors

There are different types of sensors that produce continuous analog output signal and these sensors are considered as analog sensors. This continuous output signal produced by the analog sensors is proportional to the measured. There are various types of analog sensors; practical examples of various types of analog sensors are as follows: accelerometers, pressure sensors, light sensors, sound sensors, temperature sensors, and so on.

In our project we are using sensor as

Description current sensor:

The Allegro® ACS712 provides economical and precise solutions for AC or DC current sensing in industrial, commercial, and communications systems. The device package allows for easy implementation by the customer. Typical load detection and management, switch mode power supplies, and over current fault protection. The device is not intended for automotive applications.

The device consists of a precise, low-offset, linear Hall circuit with a copper conduction path located near the surface of the die. Applied current flowing through this copper conduction path generates a magnetic field which the Hall IC converts into a proportional voltage. Device accuracy is optimized through the close proximity of the magnetic signal to the Hall transducer. A precise, proportional voltage is provided by the low-offset, chopper-stabilized BiCMOS Hall IC, which is programmed for accuracy after packaging.

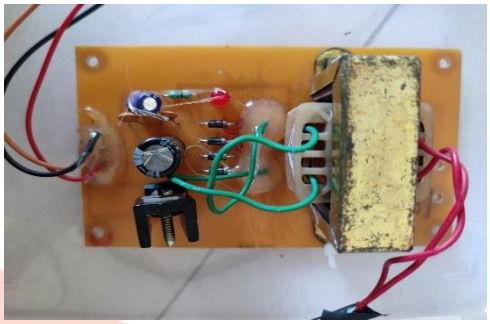


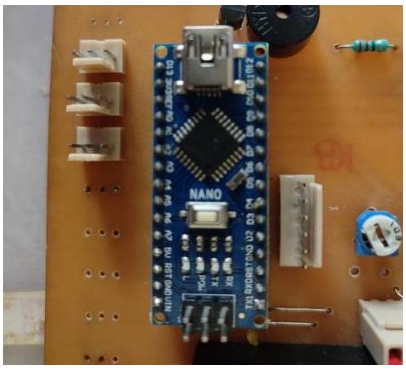
Figure 1: Current Sensor

4.2 Power supply:

Voltage sources in a circuit may have fluctuations resulting in not providing fixed voltage outputs. A voltage regulator IC maintains the output voltage at a constant value. 7805 Voltage Regulator, a member of 78xx series of fixed linear voltage regulators used to maintain such fluctuations, is a

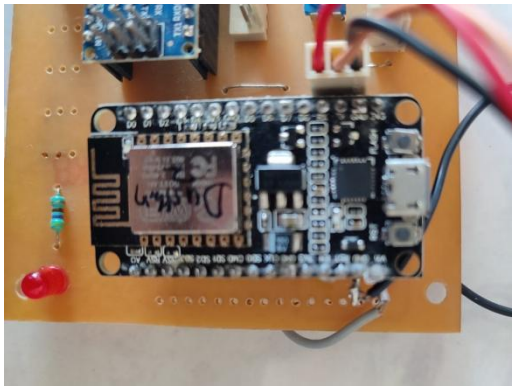
4.3 Aurduino nano:

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328 (Arduino Nano 3.x). It has more or less the same functionality of the Arduino Duemilanove, but in a different package. It lacks only a DC power jack, and works with a Mini-B USB cable instead of a standard one.



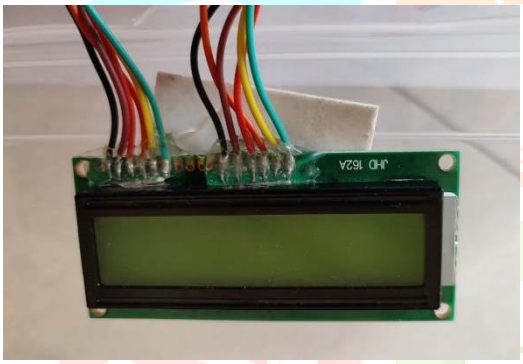
4.4 Wifi module sensor:

Wireless connectivity solutions enable innovative, scalable and dedicated designs. Mobile App Source Code**.**



4.5 LCD 16X2:

An LCD is an electronic display module that uses liquid crystal to produce a visible image. The 16×2 LCD display is a very basic module commonly used in DIYs and circuits. The 16×2 translates o a display 16 characters per line in 2 such lines. In this LCD each character is displayed in a 5×7 pixel matrix.



4.6 CLOUD PLATFORM

INTRODUCTION TO FIREBASE

Firebase is a real-time database in the cloud that provides an API to store and sync data in real-time. the idea of this post is to demonstrate that you could use Firebase as a solution to storing your data in the cloud. It could act as a great aggregator of data from various devices and possibly for different use-cases even sync to other clients where you are monitoring stuff from.

4.7 Software requirements

1. Arduino software
2. Android Studio

Working principle of the project (Android app, Google Firebase, and Node MCU)

In this project, there are three main components which use an Android app, Firebase database, and Wi-Fi Node MCU.

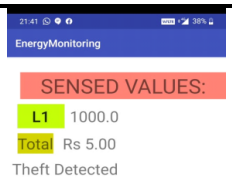
The Android app sends the serial data to the Firebase database. The Firebase database interacts with Wi-Fi NodeMCU and this NodeMCU acts on the basis of data received from Firebase Database. If NodeMCU receives serial data

This project is classified into three different steps:

1. Connecting Arduino Node-MCU with Google Firebase
2. Display value on Android App using Firebase database
3. Opening Window of application

4.
5. Add admin and password

6.
7. Theft detected



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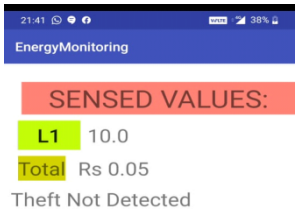
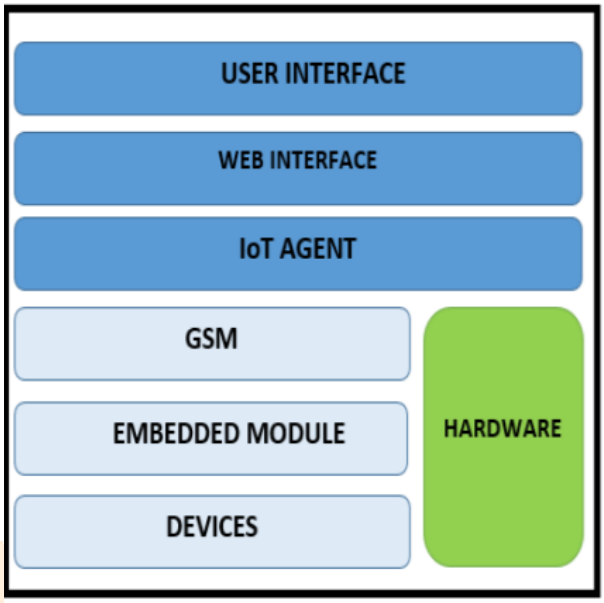
9. Theft not detected

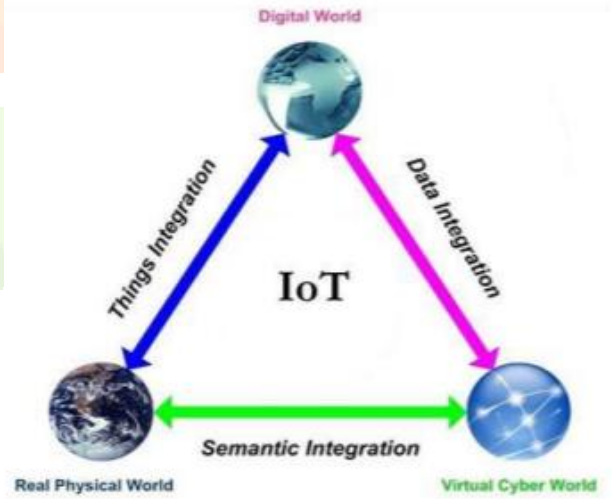


10. 

5. OVERVIEW OF INTERNET OF THINGS

The IoT allows objects to be sensed or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit in addition to reduced human intervention. When IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyberphysical system, which also encompasses technologies such as smart grids, virtual power plants, smart homes and smart cities. Each thing is uniquely identified through its embedded computing system but is able to interoperate within the existing internet infrastructure

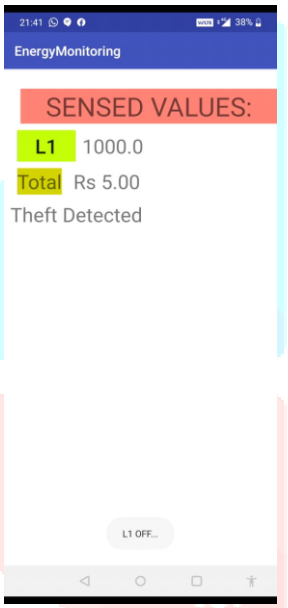




People also want to communicate with all non-living things through internet such as home appliances, furniture's, stationeries, cloths etc. The people already have a lot of technologies to interact with living things butIoT enables to communicate with non-living things with comfort manner. IoT is a convergence of several technologies like ubiquitous, pervasive computing, Ambient Intelligence, Sensors, Actuators, Communications technologies, Internet Technologies, Embedded systems etc.

6. Result and evaluation

Have successfully created a system to provide electric usage unit with bill to the user along with a subordinate theft detection service.



7. Conclusion

We as a group had begun working for more than a year ago and now we come to the completion of our project. It has been a very fulfilling experience for all of us. We have got a thorough learning experience and we shall cherish it for long. Despite being challenging and different from other assignments, it is a path where we have learnt a lot about hardware, software, troubleshooting and other aspects of engineering. It was a chance given to us that we go deep into applying what we had learnt in earlier years of our studies and we grabbed it with both hands.

For simplicity we divided the project work into smaller parts and alternately took leads in performing those parts following the principle of the best man for the job. Since we were new to this, at initial stages most of our decisions were not apt for the required situations. At such times our professors and other knowledgeable friends came to our help. From finding the project idea to publishing this report, learning has been a continuous process. There have been times where we have taken inappropriate decisions but have then learnt how to overcome them and not to commit those errors in future tasks.

The project has helped us study the practical use of microcontroller programming and its application. We have learnt that what are the various stages one needs to follow when pursuing a project and how efforts as a team can be put towards finding solution to problems arising in the process. This opportunity given to us had proved very beneficial as it provided us with an avenue to furthermore dig into analog and digital electronics

8. Acknowledgement

We would like to thank our project guide Mrs Nikhat Fatma Shaikh for encouraging us to work on this project and a special thanks to our parents for the constant support through this endeavor.

9. References

1 Kenneth Ayala, The 8051 Microcontroller, Cengage Learning, New Delhi, 2005.

2 K Keerthana Rathan ; Ayana Ajith ; S Aswathi ; V M Silpa, Survey of robotic arm controlling techniques, 2017, Published in: 2017 International Conference on Intelligent Sustainable Systems (ICISS) E.Moni Silviya, K.Meena Vinodhini "GSM based automatic energy meter system with instant billing", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, page no 44-49, 3,April 2014.

3 MohaleV.P , Babar D.G, Dr.D.Y. Patil "Ingenious Energy Monitoring Control And Management of Electrical Supply",

4. Institute of engineering and technology, Page no 254-257, October 30- November 01 2015. 4. Patel Darshit, Patel H.B "GSM based energy meter monitoring and load control", IRJET ,vol-0

5. Govindak "Design of Smart Meter using Atmel 89S52Microcontroller", SMART GRID Technologies, Page no 376-380 August 6-8 2015.

6. Mr. Ankush S. Gutte, Dr. H.K. Naidu "Power Meter Billing Plus Load Control Using GSM", International Journal for Research in Applied Science & Engineering Technology (IJRASET) , page no 210-212, august 2017.

7. Mr.Rahul Ganesh SarangleProf.Dr.Uday Pandit Khot "Gsm Based Power Meter Reading And Control System" International Journal of Engineering Research and Applications (IJERA) , page no 664-671, 4, June-July 2012.

8. Prof. S.R.Kurku "Automatic Energy Meter Reading System Using GSM Technology", international journal of innovative research in electrical, electronics, instrumentation and control engineering , page no 149-152, 3 march 2016.

9. Shi-Wei Lee, Design of an Automatic Meter Reading System, IEEE IECON 22nd International conference,Aug 1996.

10. H.G.Rodney, Tan IEEE, C.H.Lee and V.H.Mok, 2007. Automatic Power Meter Reading System using

GSM Network. The 8th International Power Engineering Conference, PP: 465-469.

11. T.Chandler, The Technology Development of automatic metering and monitoring systems, IEEE International Power Engineering Conference, Dec 2005.

12. W.Amer, Y. Attitude, A. Nadeem, Abdul Ghafoor 2010. Comprehensive E-monitoring, E-managementand E-billing system with ZOOM-in ZOOM-out Capabilities to Reduce Electricity Distribution Loses for Developing Countries. 4th IEEE Annual System Conference, PP:174-177.

13. Jubi k. , john Mareena Prepaid Energy Meter With GSM Technology", American international journal of Research in science , Technology, Engineering & Mathematics, page no. 195-198.,June-august 2013.