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IOT BASED SMART GRID

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ABSTRACT

The population may reach 10 billion by 2060, as mentioned by the United Nations. As most of the people move from villages to cities, cities will face to engage to provide the sufficient power to everyone by utilising the power grids. Electric grids which are built in 1890s, are undependable, very costly and not efficient. Globally the IoT systems has contributed its application in many fields and proven to be successful. The various stages of smart grid, internet of things are brought into the effective action to monitor and control for the efficient delivery of power to the particular area. In this paper, the general review of the Smart Grid and Internet of Things is described. This paper gives about the description of the IoT based Smart Grid which is capable in measuring and analysing the parameters such as current, temperature, fire. Current sensor senses the power utilized by the load which gives output in analog form, temperature sensor senses the degree of temperature and fire sensor detects and gives the alarm if it detects any fire. The output of the sensor is provided as input to the analog data. Arduino UNO board has the built-in analog to digital convertor and converts analog input of power to digital output.IoT based software application `ThingSpeak' is used to obtain the real-time electrical information of consumers. Based on this information, the consumer and electric power companies in the SG pattern can better manage their consumption to reduce invoice costs.The system updates the information of output in every 1 to 2 seconds by the internet using public cloud THINGSPEAK. In the present system, energy load consumption is accessed using Wi-Fi modules and it will make easier to consumers to steer clear the undesired use of electricity. The Smart Grid system can be operated from anywhere with help of networking technology. On joining process in research and development in Smart Grid; Artificial Intelligence can be cutting edge technology in data compiling and resource optimization.

Keywords*:SMART (S-Specific, M-Measurable, A- Attainable, R-Realistic T-Time Bound) Grid, temperature sensor, fire sensor, LCD, Arduino, Networking, WIFI and IOT (Internet of Things)*

1.INTRODUCTION

Internet of Things was introduced in 1999 and since then, it has become popular along with the development of embedded devices, latest communication protocols, cloud computing and data analysis. IoT allows different sensors for sensing and to share information regularly and communicate with all the devices which are

interconnected over the internet. This data is then analyzed to make and take intelligent decisions to manage the production intelligently. IoT allows sharing of information with different devices connected through the internet, from which we achieve smart monitoring and administration.

This concept has been obtaining the importance with more and more wireless devices which are increasing rapidly in the business trend. Hardware components are connected with each other by the internet. The ESP 8266 Wi-Fi module which is used in the power monitoring system provides the connectivity with the internet in the system. Now-a-days the command for electricity is becoming greater at a constant rate in the population and is being utilized for various purposes like agriculture, industries, household purposes, hospitals etc.,. So, it is becoming more and more complex to handle the electricity maintenance and necessities. As the population is increasing rapidly and the same should be in the improvement of technology. The proposed system provides a technical information to the basic energy meters by utilising the IOT technology. Monitoring, Optimization of power usage and reduction of power wastage are the major objectives which are needed for a better system. Smart energy meter using Wi-Fi modules is designed based on three major objectives.

They are:- 1. To provide automatic load energy information over an immediate basis.

2. To utilise the electricity in an optimization manner.

3. To reduce the wastage of power.

2. LITERATURE REVIEW

IoT can be considered as a worldwide network infrastructure consisting of various connected devices that depend on different processing technologies such as sensory, communication, networking and information. In order for IoT to provide high quality services to end users, technical standards is needed to define different specifications for information exchange, processing, and communications between things. The future Success highly depends on standardization, which provides various characteristics like interoperability, compatibility, effective operation, and reliability on world scale. Many countries in the world are looking forward to the development of IoT standards because it can bring huge economic benefits in future.

"Landi, C, Dipt. di Ing. dell"Inf, Seconda University di Napoli, Aversa, Italy ; Merola, P, Ianniello, G", titled "ARM-based management system using smart meter and Web server",2011. In this paper it is describes the low cost real-time ARM-based energy management system. It is devised as a part of a distributed system which measures the main power system quantities and gives the possibility to control the whole power plant. An integrated Web Server allows the system to collect the statistics of power consumptions, power quality and is being able to interface the devices for load displacement. This device is distinguished with an easy access to information and the combination of a smart meter and data communication capability which allows local and remote access. In this way it is possible to manage the power consumption of the power system leads to an overall reduction in power consumption and billing costs.

"AMR perspective to save energy in Smart Grids ", 2012. In this paper, an AMR solution provides the enhanced end-to-end application. It is completely based on an energy meter with low-power microcontroller MSP430FE423A and the Power Line Communication standards. The microcontroller comprises an energy

metering module ESP430CEl. The conclusion of this paper is to realize a real time pricing. This solution leads to great interest in low cost and low carbon society point of view.

Application of IOT

Applications related to IoT are still in early stages, but the use of it is rapidly evolving. Only a few applications are considered for being developed and deployed in different industries such as environmental monitoring, food supply chain, security and surveillance, etc. Some of IoT applications related to industries are:

Using IoT in healthcare service industries.

Using IoT in food supply chain.

Using IoT for safer mining production.

Using IoT for transportation and logistics.

Using IoT in fire fighting.

Using IoT in smart environment monitoring.

Using IoT in smart agriculture.

3.Proposed System:

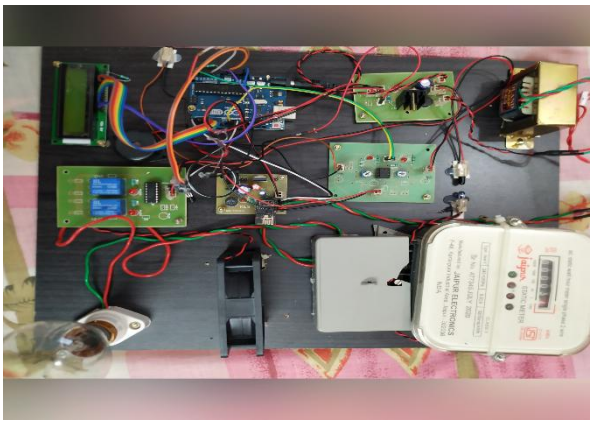

Fig-1

1) Switch on the power supply with a 12v step up transformer and ensure every component in actively energized condition.

2) LCD displays the data related to the values and initial displays as zero.

3) Temperature sensor indicate output to ADC as input and this input is connected to microcontroller.

4) Speed of wind is proportional to the EMF produced by the motor which is converted by ADC is collected by Microcontroller.

5) LDR gives the sense of light and turns on the relay on the LED based on intensity of light.

6) The first comparator acts as reference and compares the level according to the conditions which indirectly indicates the temperature, current and flame.

7) The data from all the modules are collected in parallel to the microcontroller and according to the program the LCD shall display the appropriate module data on screen.

8) As is a serial data transfer the data from microcontroller to RS232 in the form of ASCII which is connected to laptop/ PC monitor screen which helps to visualize at the values ofthe modules same as on LCD.

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3.1.Block Diagram:

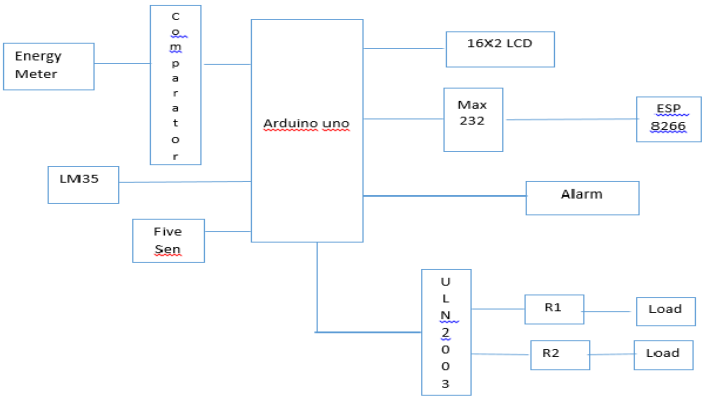

Fig-2

3.2.CIRCUIT DIAGRAM:

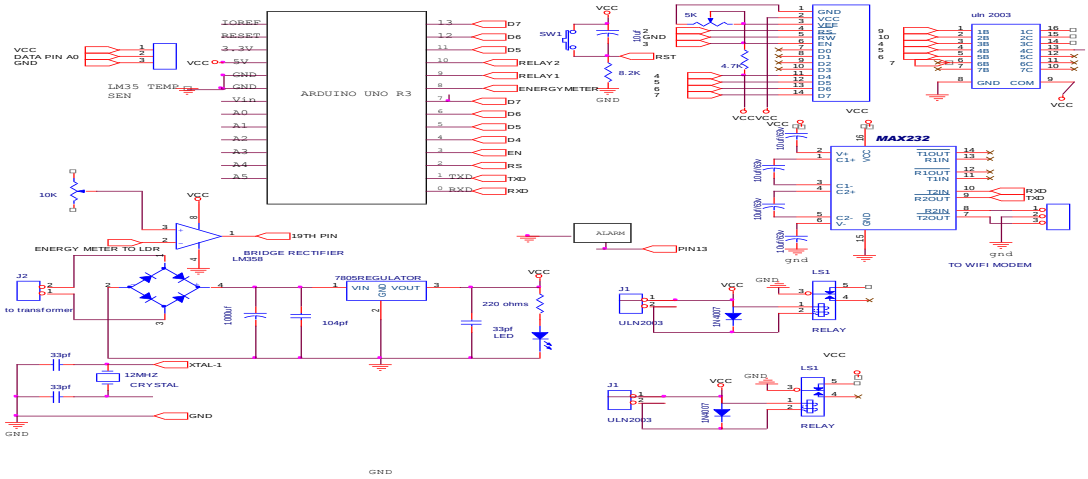

Fig-3

4.ARDUINO UNO BOARD

Arduino is an unwrapped-source electronics prototyping platform based on flexible, easy-to-use hardware and software. Arduino can take the input from various sensors as input to it and reproduce the given output required for actuators, motors etc. It's a User friendly to those who have awareness in basic electronics and C programming language. Arduino platform mainly contains a Hardware Board called Arduino Board & software Arduino IDE to program it. Other external hardware as Sensor Modules, Motors, Arduino UNO and Arduino Software (IDE)- 1.0. The UNO is a type of microcontroller board based on the ATmega328P. It is made up of 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz

quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. Compatible to support the microcontroller; Its as simple as plug and play concept just connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. You can fiddle with your UNO without worrying too much about doing something wrong, worst case scenario it can be easily replaced at every minimal cost. The Arduino Integrated Development Environment (IDE) is a cross-platform application (for Windows, Mac, OS, Linux) written in the Java programming language. It can be used to write in the java programming language. It can used to write and load programs on the Arduino board .

Fig-4

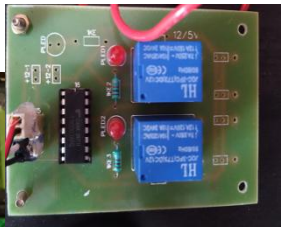

Fig-5

5.TEMPERATURE SENSOR

LM35 TEMPERATURE SENSOR

Any transducer convert any physical data such as temp, light intensity, speed etc.., to electrical signal.Depending upon the transducer, the output produced in the form of voltage, current, resistance or capacitance.For example: Temperature when converted to electrical signals by the utilisation of a transducer is called Thermistor. A thermistor responds to the temperature change by changing resistance, but its response is nonlinear. So nonlinear temperature sensors are replaced by linear temperature sensors like LM34 or LM35 series.The LM35 series are known as precision integrated-circuit temperature sensors, where output voltage is linearly proportional to the Celsius (Centigrade) temperature.Its maximum output is 10MilliVolts per degree centigrade. If the output obtained 310 mV then temperature will be mentioned as 31 degreeC.It has a range of −55 to +150°C temperature. It is a popular low cost temperature sensor.It has three pins. To use the sensor connect the Vcc to 5V, GND to GND and the Out to one of the ADC (analog to digital converter channel). The output will be varied linearly with temperature.

6.FIRE SENSOR

A sensor which is more sensitive to a normal light is known as a fire sensor. This sensor detects fire of wavelength within the range of 760nm-1100nm from the light source. This sensor can be easily damaged to very high temperature. So this sensor can be placed at a certain distance from the fire. The fire detection can be done from a 100cm distance and the detection angle will be 600degrees. The output of this sensor is an analog signal or in digital signal. The sensor used here is SEN-2800

When this fire module works with a microcontroller unit then the pins are

- Pin1 (VCC pin): Voltage supply ranges from 3.3V to 5.3V

- Pin2 (GND): ground pin
- Pin3 (AOUT): analog output pin (MCU.IO)
- Pin4 (DOUT): digital output pin (MCU.IO)

7.RESULT

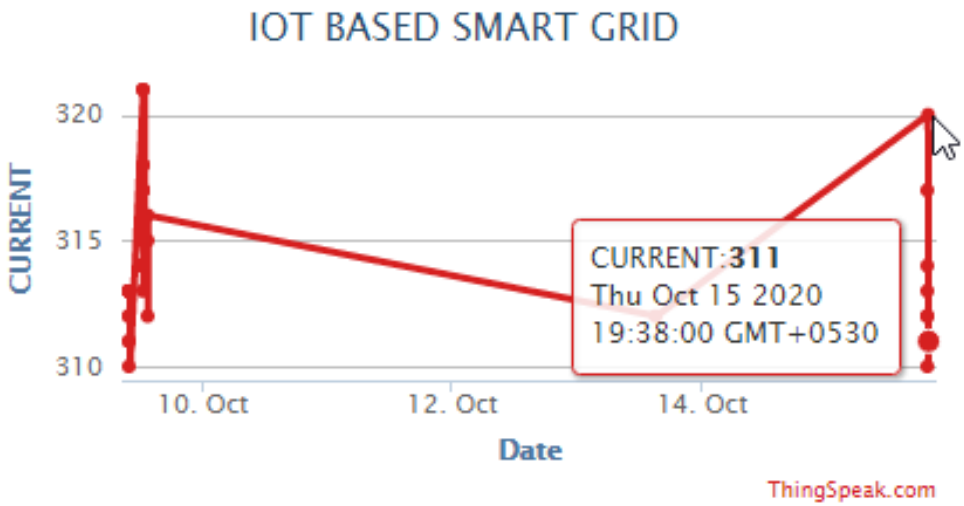

Fig6-chart1

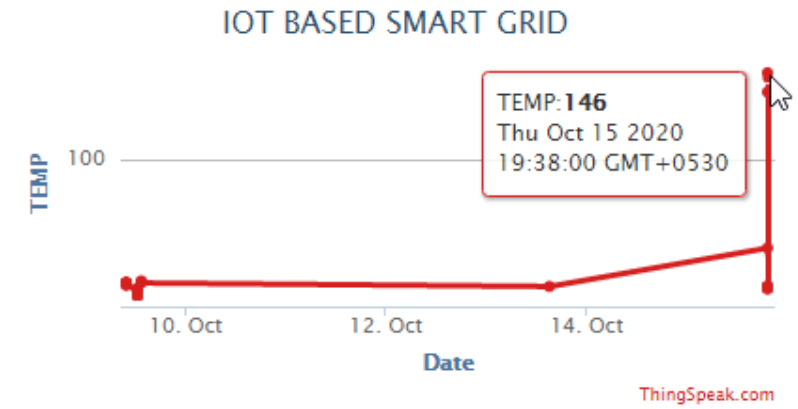

Fig7-chart2

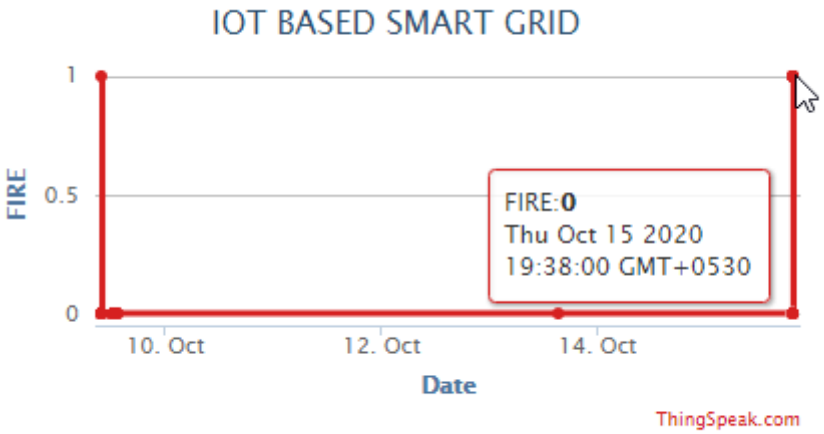

Fig7-chart3

As people move to more populated areas, cities are facing the challenges of providing enough power to accommodate everyone while using outdated power grids. Built in the 1890s, current electric grids are unreliable, costly and inefficient. Internet of Things (IoT) is widely used in smart energy monitoring, industrial automation, and a variety of applications. At various stages of Smart Grid (SG), IoT devices are deployed to monitor and control grid statistics for reliable and efficient delivery of power.

In this paper, firstly an overview of SG and IoT based SG system is provided. This paper describes the IoT based power monitoring system that is capable to measure and analyse the parameters such as current, temperature, fire.

Switch on the mains. The current sensor senses the amount of power utilized by the load which gives output in analog form, temperature sensor senses the degree of temperature and fire sensor detects and gives the alarm if it detects any fire. The output of the sensor is provided as input to the analog input part in the Arduino Nano Board. Arduino board has built-in analog to digital convertor which converts analog input of power to digital output and this digital output in turn will get displayed on LCD display in terms of Watts as shown in Image -1 below. There is a set point value; when the power utilized by the load exceeds the set point value LCD displays "Temperature" as shown in the fig -chart2 and fire detected in fig.chart-3. The Node MCU can be connected to the internet with the monitoring hardware system. The power utilized by the load is displayed in the cloud-ThingSpeak cloud in graphical format as shown in the Chart -1, Chart-2 and Chart -3. It shows time to time power utilization of the load/loads connected to the system, temperature and fire.

From the chart-1,2 we can observe when there are load fluctuations there is a change in current. With the increase in voltage then current decreases which in turn there is a change in increase of temperature. From chart-3 we observe the detection of fire at particular interval of time.

7.CONCLUSION

Energy Monitoring using IOT is an innovative application of internet of things developed to control home appliances remotely over the cloud from anywhere in the world. The system updates the information of output in every 1 to 2 seconds by the internet using public cloud THINGSPEAK. In the present system, energy load consumption is accessed using Wi-Fi modules and it will make easier to consumers to steer clear the undesired use of electricity. The Smart Grid system can be operated from anywhere with help of networking technology. On joining process in research and development in Smart Grid; Artificial Intelligence can be cutting edge technology in data compiling and resource optimization. Also, a system where a user can receive SMS, when he/she crosses threshold of electricity usage slab can be equipped. Also using cloud analytics we can predict future energy consumptions.

8.ACKNOWLEDGEMENT

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REFERENCES

[1]IRJET on internet of things based smart grid,*Vol.-5, IssueNo.08, August 2018 "Internet of Things based Smart Grid"*: A Survey" Shavet Sharma".

[2] A book on "*IoT for Smart Grids*" by "published on 24 November 2018 by Springer,2018.

[3] Thesis on *"Internet of Things in Smart Grid: Architecture, Applications, Services, Key Technologies and Challenges"* received on 12February 2019 and accepted on 21March 2019; published on 26March 2019 by the University of Applied Science and Technology, Tehran, Iran.

[4] International Journal of Energy,Information and Communications Vol7, issue 3(2016) *"A Review on Iot Based Smart Grid".*