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AN AGENT BASED IOT SYSTEM FOR INTELLIGENT ENERGY MONITORING IN BUILDINGS

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Abstract:

In this paper we are showing the over load issues in smart grids or in buildings where energy monitoring in building management is neither installed nor effective in monitoring and controlling the day-to-day energy spent & carbon footprint in buildings and industries. The need for monitoring of buildings is required.

This can be achieved by using some cloud server network. In this project we are monitoring the industrial loads. The controller used in this project are Arduino and NodeMCU and Arduino IDE Software. In this project we are integrating Arduino with NodeMCU. Arduino in this project to monitor and control the devices. Here we have used Gas Sensor and DHT11 Sensor. In this project we are monitoring gas values if any harmful gases are in and around the industry. DHT11 sensor is to detect Temperature. If anything happens Message alerts will be sent through GSM. If Over load detects then message will be sent to the user. The values of sensors will be sent to cloud using NodeMCU.

I. Introduction

As the technology increasing day to day. Automation and monitoring of any source is becoming easy and it is secure. The use of electricity demand is more in smart grids and in buildings. Monitoring and controlling of the appliances is becoming important. There are some processes through which we can monitor the buildings but those are not accurate and may not be safe.

The solution for these issues is to use embedded with cloud server i.e., thinspeak for uploading values. For uploading to thingspeak we are using NodeMCU which is in-built have an Wifi Module which connects using Hotspot. This allows user to provide monitoring of parameters.

This project is a low-cost embedded protype for showing the energy using by the buildings and to control and let the concerned person know the fault occurring.

II. Existing Method

The work of sensors (i.e.) PIR sensor and IR sensor which were used in existing system can be done by using the switch sensor.It is highly sensitive and can detect even small pressure that is applied on the floor. The temperature is notconstrain since switch sensors mainly focus on the pressure.The corner regions may not be an issue in case of the switch sensors because the overall pressure on the tile is measured.

III. Proposed Method

In this proposed system we are monitoringdevices light using current sensor and also implemented safety parameters to monitor the temperature and gas in the buildings. If any sensor is activated then message will be sent though GSM. Even if overload is detected then also message will be sent. The sensors data is uploaded to cloud server by using NodeMCU.

Block Diagram

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ISSN : 2454-9924

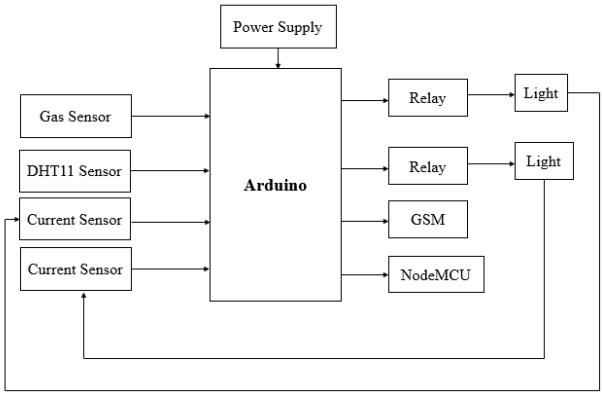

Fig1: Block Diagram

IV.Hardware Requirements

A) Arduino:

Arduino uno is a microcontroller board which inbuilt has an IC that is ATMega328P which is Main Microcontroller. In this we have 14 digital pins, 6 Analog Pins, 16MHz Crystal Oscillator and a Reset Button.

Fig2: Arduino

B) NodeMCU:

NodeMCUis an open-source firmware development board. It has in-built WIFI Module which ESP8266. Multiple GPIO pins on the board allow you to connect the board with other peripherals and are capable of generating PWM, I2C, SPI, and UART serial communications.

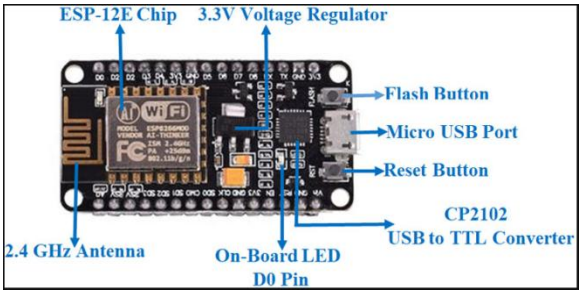

Fig3: NodeMCU

C) Power Supply:

Transformer:

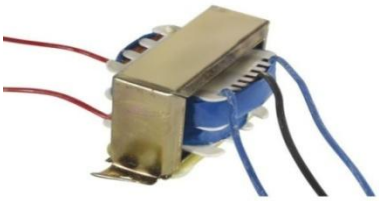

Fig4: Transformer

Transformer is a device which reduces A.C current into required D.C current.

Bridge Rectifier:

Fig5: Bridge rectifier

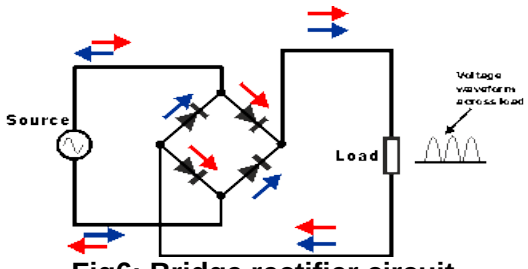

Fig6: Bridge rectifier circuit

A diode bridge is a technique of four diodes in a bridge circuit arrangement that provides equal polarity of output for mutually polarity of input.While used in its maximum shared application, for transformation of an alternating-

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current input into a direct-current output, it is called as a bridge rectifier.

Capacitor:

Fig7:Capacitor

A capacitor could be a passive two terminal eletrical component that stores current in a electric field. The result of this can be termed as capacitance.

Regulator:

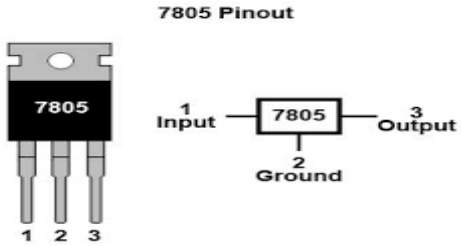
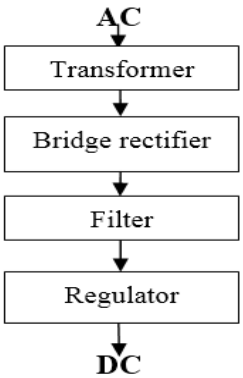


Fig8: Regulator

A voltage regulator IC keeps the output voltage at a continuous value. 7805 IC is one of the IC of 78xx family. It maintains fixed linear regulators which is used to maintain fluctuations.

Flow chart of power supply:



All the above components are used to convert AC voltage to DC voltage.

D) GSM Module:

GSM speaks to Global System for Mobile Communications. It is a standard set made by the European Telecommunications Standards Institute (ETSI) to depict traditions for second time (2G) automated cell frameworks used by PDAs.

A Modem is a gadget which modulates and demodulates signals as per communication requirements. It converts an analogue carrier signal to digital signal and also converts such a carrier signal to required information.

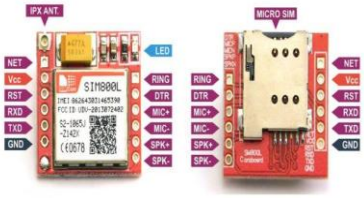


Fig9: GSM

E) Relay:

Relay is electromagnetic switch that open or close the switches electrically or electromechanically.Relay is mostly used to switch smaller circuits.

Fig10: Relay

F) Gas Sensor:

MQ2 gas sensor can be used to detect the presence of LPG, Propane and Hydrogen, also could be used to detect Methane and other combustible steam, it is with low cost and suitable for different application. Sensor is sensitive to flammable gas and smoke.

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Fig11: Gas Sensor

G) DHT11 Sensor:

DHT11 sensor measures Temperature and Humidity from the surroundings. It gives continues values of temperature and humidity even it is connected to digital pin of any inbuilt ADC Microcontroller. It has thermistor inside which gives temperature. And it has capacitive humidity sensor to give humidity values.

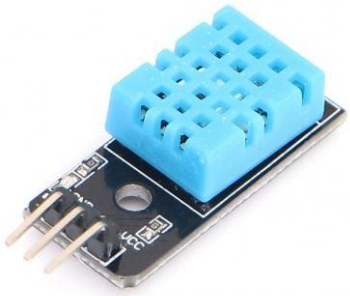

Fig12: DHT11 Sensor

H) Current Sensor:

Current flowing through a conductor causes a voltage drop. The relation between current and voltage is given by Ohm's law. ACS712 Current Sensor is the sensor that can be used to measure and calculate the amount of current applied to the conductor without affecting the performance of the system.

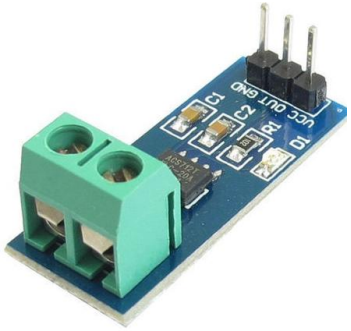

Fig13: Current Sensor

VI. Software Requirements

A) Arduino IDE:

The Arduino IDE is an open-source programming which means the software is available on internet and can download and this Arduino IDE has inbuilt libraries and example codes which are helpful to write codes for beginners also. At present we are using the 1.8.5 Version of Arduino IDE which is very easy to connect to the PC with Arduino Microcontroller Board.

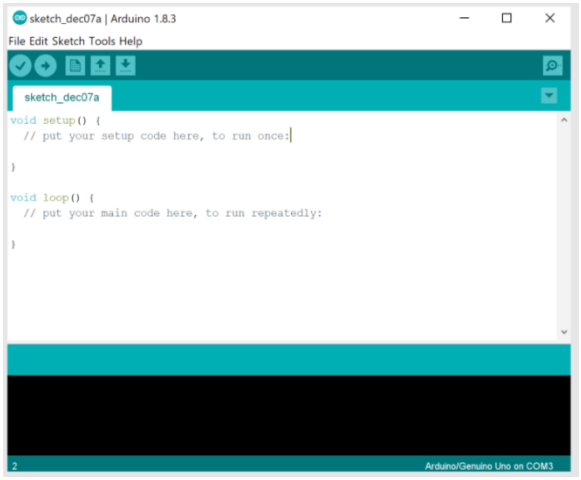

Fig14: Arduino IDE Window

VII. Advantages

- Automatic Message alerts will be given
- Controlling loads Using Cloud Server
- Can monitor continuously

VIII. Applications

- In industries
- In houses

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- In any offices
- In bus systems
- In train Systems.

IX. Conclusion

This paper also proposes and presents an energy awareness smart plug that can provide energy management systems with more information regarding the load environment. This feature enables a better understanding of the load and therefore, can improve the energy managementalgorithms and techniques.

X. Future Scope

In future we can use Raspberry Pi which is a Microcontroller as well as Microprocessor. In this we can add Camera module for advance monitoring of the parameters like fire detection and automatic water sprinkling and alerting of intruders inside by sending mails of that person.

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