Building Management System using IOT

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***Abstract*- building management system is a computer controlled mechanical and electrical EQUIPMENT like cooling systems, ventilation, lightings and security unlike home automation the building management system take care of building parameters like HVAC now a days it has a prominent place in industries. BMS provides a recursive approach of updating a data and accordingly adjusting the EQUIPMENT on the basis of the reference maximum provided to the DCS (digital control system). The control mechanism here has been updated and the information of all the sensors data installed to the building is sent to the cloud or any other platform which is used to observe the building condition on regular basis. Power saving and a comfortable environment for the employees inside the building is the major advantage.**

I.INTRODUCTION

Saving the energy in the modern world has its own importance and to provide a wise usage of electricity at the corporate level has been the important intension of researchers. The corporate offices has a huge infrastructure and the building dimensions are usually big and the facilities are vast, one such facility is the cooling inside the building, there are many types of multistory building, right from the small offices to the big corporate structures, banks, institutions, hospitals and commercial spaces which has an enclosed space and the cooling inside has to be provided. During this proper monitoring of cooling is needed like in the HVAC system Air conditioning play a vital role controlling of the AC systems on base of temperature change. The spaces are so much enclosed if there is no proper ventilation some peoples might run into health issues so a co2 sensor is installed just to monitor the co2 level inside the space. Fire and other safety sensors are also provided. These data's are sent to cloud and the sensor details are recorded and the feeds are provided to control the EQUIPMENT.

Fig 1.1 connected IOT BMS

The above figure shows how the BMS system is connected to IOT for controlling and maintaining the building management.

A. Scope of IOT in BMS

First thing is that IOT reduces human efforts and provides a remote control access to the user, the EQUIPMENT connected to the IOT could be operated from anywhere; it enables interfacing of WIFI modules to the embedded controllers or DDC (direct digital controller) which are integrated with number of sensors, these sensors provides huge number of data to the server of the IOT platform whichever is going to be choose. These data's could be used for data analyzing, prediction, control and many other things.

The one more important application is that IOT in BMS has a monitoring systems for security, taking visual data, capturing images. IOT provide an opportunity for peoples, business, and industries. The application of IOT has been a real importance in electrical, medical and in research field. Advantage

of IOT is that growth of production, improvement in efficiency.

Application of IOT in BMS is that it is one way or the other way creating a smart building which focuses mainly on management of heat and light system like HVAC (heat ventilation and air conditioning system) there are sensors like occupancy sensor which based on the occupancy controls the lighting scheme, temperature, humidity moisture such data's are transferred to the server data based on this data utilization accordingly depends on the particular building type.

II. PROPOSED DESIGN

To understand the IOT BMS using IOT system having knowledge in the hardware used will help to understand the whole mechanism. The design proposed here is cost effective and efficient. The hardware used are NODEMCU unit which has a built in esp8266 WIFI and a controller unit to accepts the command and process the need along with the sensors whose data's are displaying on the server.

A. Proposed methodology

Some of the cases where IOT is used to control through GSM unit, this proposed model utilizes a cost effective WIFI module, which makes the internet of things not only effective but also ease of use. The one more important highlight of this project is that the server is actually a MQTT broker which has various feeds and an attractive design for feeds structure and a more number of feeds are provided. The usual transport of data is done using TCP/IP protocol which is required to PROGRAMME the socket but in MQTT it is quite easy and effective since it works on lightweight publish-subscribe network protocol there are many app which supports such protocol. But nowadays many REPUTATED companies have put themselves in making MQTT platform easily available one of such companies are ADAFRUIT industries, mosquitto.org, node red, hivemq.com, UBIDOTS and many more, most of them are free and easily accessible, these platforms are used with MCU i.e., microcontroller unit like avr, Pic, ARDIUNO and raspberry pi.

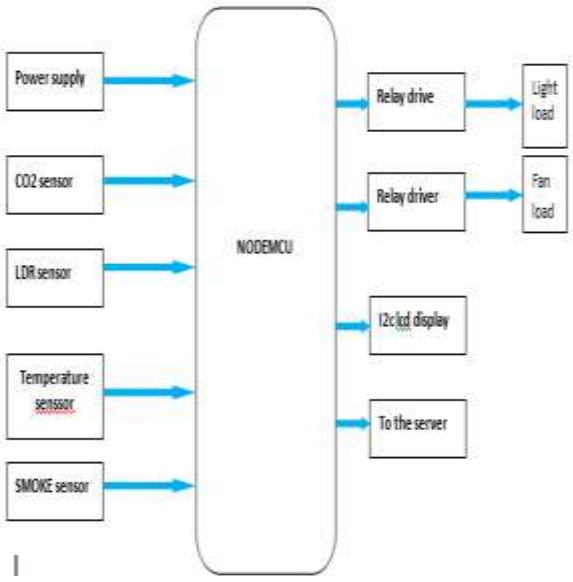

Figure 2.1 block diagram of a BMS controlled IOT

The above block diagram has a NODEMCU unit which is a WIFI and MCU unit like in the microcontroller there are digital analog pins, there is a such similar availability of pins are available with one analog pin and some 8 digital data pin to access the block diagram clearly shows that it is accepting some sensor input and giving the output to the driver modules the status of module is always printed in the LCD. The MQTT broker allows the sensor data's to be displayed in the server. Relay driver are provided to switch when the reference set is reached above the limit for instance if the occupancy sensor senses any movement sends the signal to the NODEMCU which then drives the relay on to make connection and
Turns the bulb on or sometimes designed to control the intensity and it informs in the server about the status of the sensor and hence there is an option or feed to control switch action if the occupancy is less or no occupancy is noticed.

III. HARDWARE REQUIRED

A. NODMECU

It is an open source firmware; it has 12 GPIO, 1 analog pin along with PWM and I2c support, it could be powered using 3.3v and 5v in the VIN pin 4mega bytes of flash memory and 80M hertz system clock frequency 50k usable RAM, 1 SPI and one UART for serial communicating

Figure 3.1 NODMECU

B. Dht11 sensor

Figure 3.2 DHT 11 sensor

DHT11 is a low cost temperature and humidity sensor works on thermistor mechanism to sense temperature and to measure humidity it uses capacitive humidity sensor DHT11 has 4 pins out of 4 there is one digital and one analog pin.

C. SMOKE SENSOR

Figure 3.3 DHT 11 sensor

Mq135 is a gas sensor which senses gases such as carbon monoxide smoke/ carbon dioxide, methane natural gas, coal gas ETC, this sensor also has four pins power pins and GPIO'S.

D. OCCUPANCY SENSOR

Figure 3.4 occupancy sensor

Occupancy sensor or PIR sensor is used in indoor application in automation and BMS to provide the occupant count. It works on the thermal difference, it has pyro electric sensor which detects the presence humans it is used to control lighting in domestic and industrial purposes.

E. LCD display

Figure 3.5 LCD display

LCD or liquid crystal display is a 16x2 matrix display which displays alpha numeric characters to provide a visual experience to the user to see any commands, comments, status, observations ETC.

F. RELAY MODULE

Figure 3.6 Relay module

Relay driver is required to switch the load on either lighting or cooling it works on two method hard switching and soft switching hard switching uses transistor driven relay module and soft switching uses opt coupler driven Relay.

G. FLAME SENSOR

Figure 3.7 flame sensor

Flame sensor is sensitive to normal light it is usually used in fire alarm in BSM is it used for the safety and an alert system during accident it can turned on and turned off using IOT.

IV. WORKING AND IMPLEMENTATION

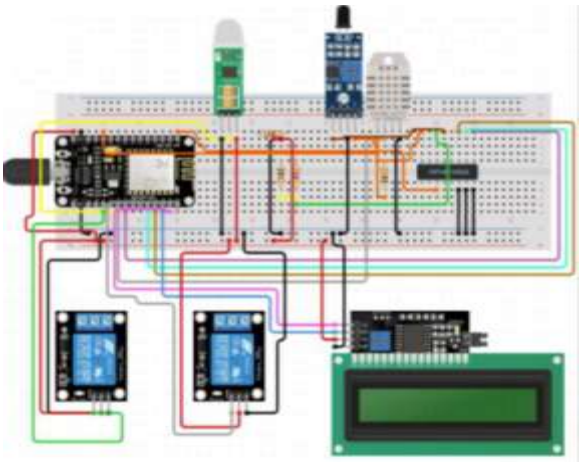

Fig 4.1 circuit diagram of BMS

All the sensors connected to the NODEMCU is given to digital and analog pins of NODEMCU as shown in the figure sensors like flame, temperature, PIR and smoke senses the respective parameters and send it to the ADAFRUIT MQTT server which requires user name password and IO key the ADAFRUIT MQTT is android support MQTT server which could be opened directly in android mobiles. Display is connected through i2c to display sensor status and parameters. In the figure two relays are connected to turn on lighting and cooling loads.

V. CONCLUSION

The system proposed is based on the observation of the sensors which is configured in such a way that sensor values are set to a maximum ref to perform an operation. This scheme proposed provides the better environment for the company and saves a lot of power, building will smart and saving in the energy will be huge.

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