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Smart Building using IBM Watson

K. Vinay Kumar,
M. Tech, Associate Professor
Department of Computer science and Engineering,
St .Peter's Engineering College, Kompally ,
Hyderabad, Telangana.

N. Harshitha,
UG Scholar, Department of Computer science and Engineering,
St .Peter's Engineering College, Kompally ,
Hyderabad, Telangana.

K. Roopavani ,
UG Scholar, Department of Computer science and Engineering,
St .Peter's Engineering College, Kompally ,
Hyderabad, Telangana.

K. Shyam Sunder,
UG Scholar, Department of Computer science and Engineering,
St .Peter's Engineering College, Kompally ,
Hyderabad, Telangana.

Abstract:

Reducing electrical energy consumption is of paramount importance. One unit of energy saved is equal to one unit of energy generated. Apart from reduction in electricity bills this has a great environmental impact in reducing pollution causing gaseous and liquid pollutants. In this project energy saving system by using Green building concept is brought out. The model demonstrates the energy consumption in Conventional Building using energy saving parameters such as Temperature, Humidity, lighting controls and some of the measures. The energy saving system consists of three modes i.e., Eco Mode, Away Mode, manual Mode which turns on/off the electrical appliances when required, which saves the energy.

In eco mode the lights and AC of the building are switched on only when it detects the movement of the human. If human is not detected it will switch off the lights and Acs. In the away mode all the appliances are switched off and in the manual mode the lights and fans are switched on and off according to the user input. By using current sensor the current consumption can be calculated. By using DHT we can monitor the weather parameters and all these sensor parameters are stored in the database of IBM Watson cloud services and these parameters are visualized on the User Interface which is created in Node Red. Through that user interface we can select the modes and we can control the appliances.

1. INTRODUCTION:

With the advent of Internet of Things (IoT) technologies and Smart Buildings has compelled the need for Building Automation Systems (BAS) that automatically performs computations without the intervention of humans have also increased. One of the basic applications of every home automation system is motion detection. Incorporating IoT technologies in building automation systems enables a user to monitor a building at real-time. This real-time access to occupancy status is beneficial in a variety of situations. For example, during emergencies such as natural disaster or fire, real-time occupancy tracking can help rescue person to evacuate survivors from a building. In addition to this, for many smart homes and building applications, recent studies have discovered that identifying the occupancy patterns results in significantly lower energy consumption compared to approaches assuming fixed occupancy and usage patterns.

We have proposed a system where a user will have a interface from where he can control the home appliances in three modes which are Eco mode, Away Mode, Manual Mode. In eco mode the lights and AC of the building are switched on only when it detects the movement of the human. If human is not detected it will switch off the lights and Acs. In the away mode all the appliances are switched off and in the manual mode the lights and fans are switched on and off according to the user input. By using current sensor the current consumption can be

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calculated. By using DHT we can monitor the weather parameters and all these sensor parameters are stored in the database of IBM Watson cloud services and these parameters are visualized on the User Interface which is created in Node Red. Through that user interface we can select the modes and we can control the appliances.

2. EXISTING SYSTEM

In the existing system the person should manual go and switch on/off the home appliances from the switch board. The operation of the appliances is only done from the home and can not be done remotely anywhere. If suppose, the person forgets to turn the appliances off , they will consume the electricity till the person turns them off .

2.1. Disadvantages:

1. Person can not control the appliances remotely from everywhere.
2. Consumption of electricity is more .
3. It is not efficient.
4. Things should be done manual every time.

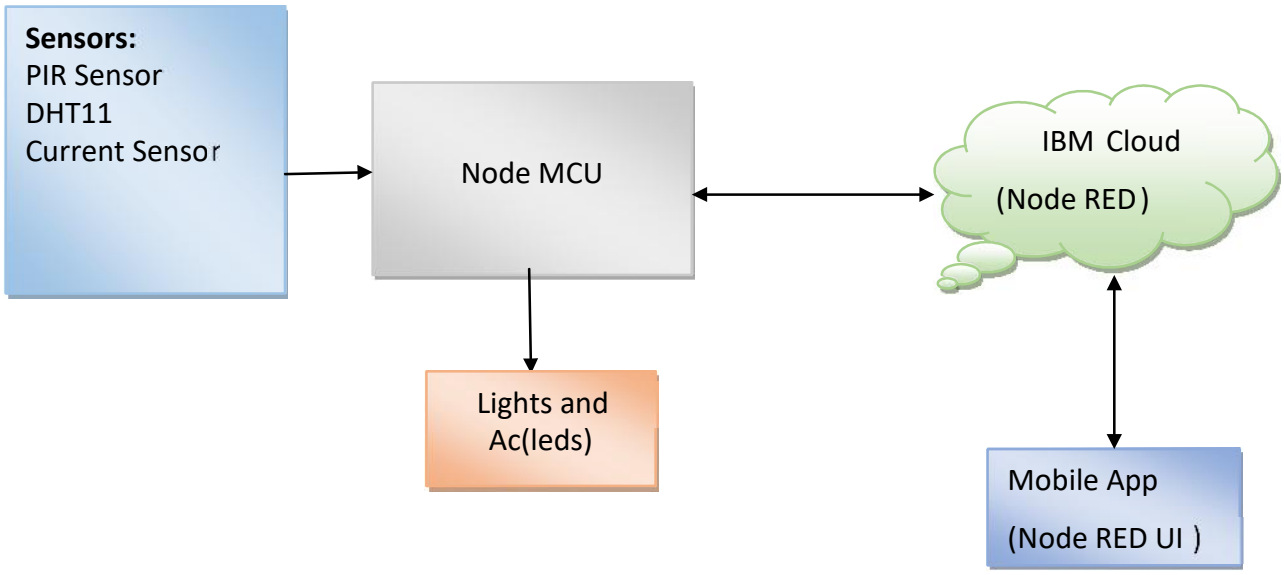
3. PROPOSED SYSTEM

We have proposed a system where the home appliances can be controlled automatically and can minimize the current consumption. Here the person can control the appliances remotely from anywhere. Using the user interface feature in Node Red present in IBM cloud. The appliance are turned on with the motion detection using the PIR Sensor. They can be turned on/off from the interface when the are not at home or whenever they want. The current consumed can be calculated with the current sensor and the temperature and humidity of the room can be known using the DHT11 sensor

3.1. Advantages:

1. Person can control the appliances from anywhere.
2. Reducing the electricity consumption.
3. The appliances can be accessed in three modes according to user convenience and requirement.
4. It is efficient.
5. Person can know the current consumption along with the humidity and temperature of the room.

3.2. Architecture:



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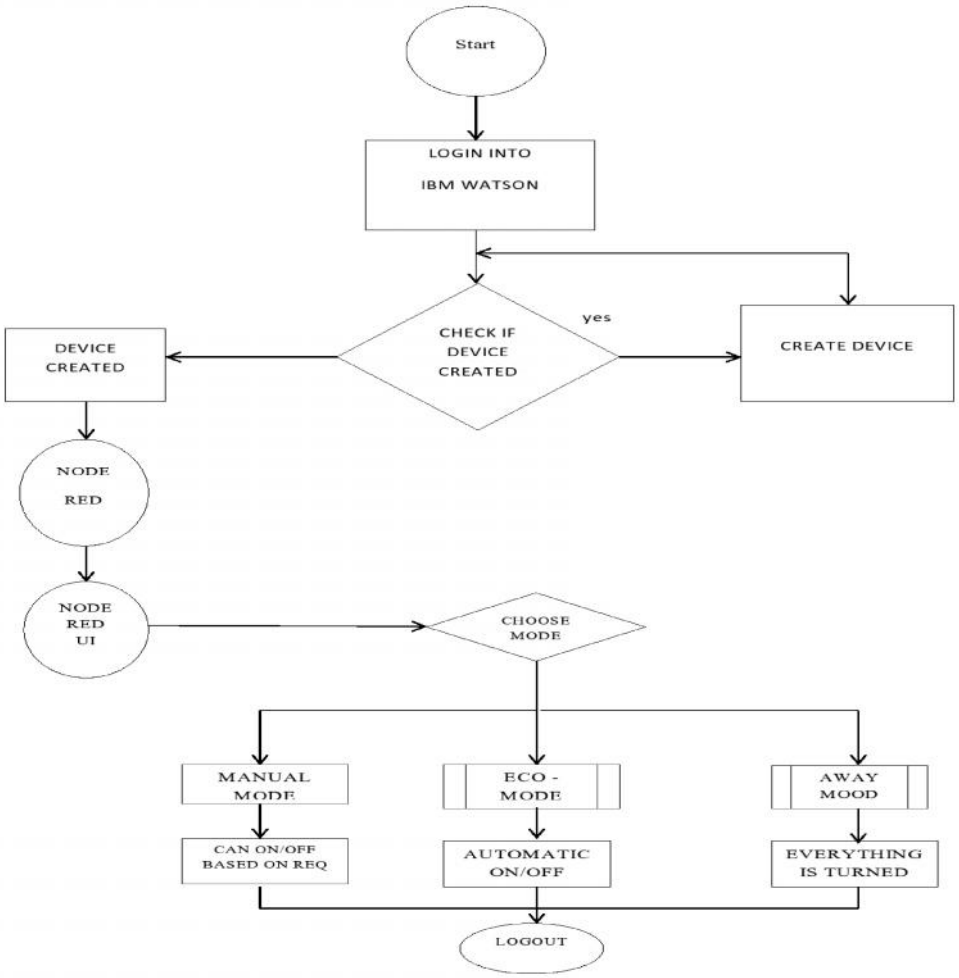
3.3. Flowchart



In this system all the sensors that is DHT11, PIR and CURRENT along with LEDS are connected to Node MCU. With the help of the Wifi present on Node MCU it can send the data to the cloud once the values or events are published to the cloud, from cloud we can subscribe or control the appliances. It works by allowing the user to login into the IBM cloud where he can choose the device and go into the Node Red User Interface where he can operate the appliances in his preferred mode. This UI gives the values of the Temperature and Humidity along with this it will also calculate the electricity used. Here the user selects the required mode to control.

Fig: Node MCU

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When the user chooses eco mode everything is done automatically that is the on/off of the appliances is done based on the motion detection in that particular room here the user can choose the appliance which he want to use in eco mode. This is done using the PIR sensor. The Pyro-electric Infra-Red (PIR) sensor is an extremely useful device for detecting the presence of a moving body. PIR is simply sensitive to the infrared energy emitted by every living thing. When an intruder walks into the detector's field of vision, the detector "sees" a sharp increase in infrared energy.

Fig: PIR sensor

When the user chooses the Away mode then all the appliance which are connected to Node MCU will turn off. This feature is really useful when the user is leaving to office or anywhere else and he forgets to turn off the appliances then he can switch to this mode so that everything will be turned off and the electricity usage is reduced.

When the user chooses the Manual Mode the he can operate the appliances remotely sitting anywhere in the house without going to switch board. Apart from these features the Node Red UI also displays the Temperature and Humidity of the room using the DHT11 sensor. The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a resistive type humidity sensor and a thermistor to measure the surrounding air and spits out a digital signal on the data pin. Humidity sensing components are Two electrodes and a Substrate. As humidity changes substrate conductivity changes and the change is measured by IC. Thermistor is used to sense temperature. It is a Variable resistor. As the temperature changes the resistance value is changes and the result is measured.

Fig: DHT11 Sensor

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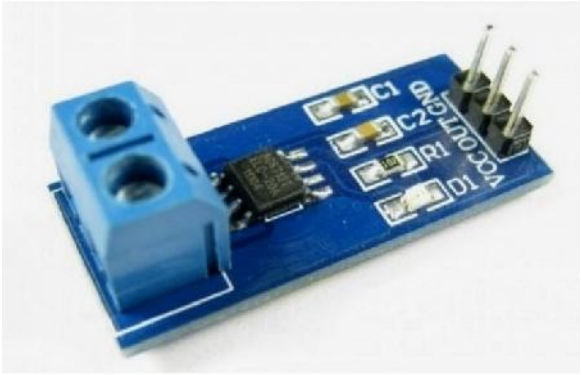
This UI also shows the amount of current used through the current sensor A current sensor is a device that detects and converts current to an easily measured output voltage, which is proportional to the current through the measured path. When a current flows through a wire or in a circuit, voltage drop occurs. Also, a magnetic field is generated surrounding the current carrying conductor. Both of these phenomena are made use of in the design of current sensors

fig: Current Sensor



4. Conclusion & Future Work

The system developed aids is decreasing the consumption of electricity and allows the user to use the appliance in three modes i.e.; Eco mode, Away mode, Manual mode efficiently and remotely from anywhere using the Node Red User Interface present in the IBM Watson cloud. In future, we look forward to use the lights based on the intensity of the room using the LDR sensor so that current can be used more efficiently.

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