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POWER SAVING SYSTEM USING SENSOR OVER IoT

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Abstract:- The objective of this paper is to save electric power to detect human using a PIR sensor. We often leave the place without switching off lights, fans and Air Conditioner etc. Therefore electricity is getting wasted. Here we have done a power saving in which electricity cost will be saved by sensing the movement of people entering or by leaving out the room. If the sensor identifies that there are no persons present inside the room, then electrical appliances will be turned OFF automatically. If any person enters the room, automatically devices will be turned ON. Here we are separately controlling every electrical appliance by specifying the area. We can also vary the speed of the fan by sensing the room temperature. If the temperature is more the speed of the fan will even more. If there is no user in the room, it switches off the lights, fans, or AC with the help of interface which is in between the switchboard of appliances and PIR sensor. DC relay is also used for the turn ON and turn OFF of the electrical devices according to the output which is in the PIC controller circuit. How many appliances are turned on can also be checked through online? If anyone wants to see who are present inside the room can also be seen with their images on the cloud.

Keywords: Internet of thing, Cloud, PIR Sensor, Relay, Appliances, ESP8266, Arduino

1. Introduction

The energy consumption has become one of the major problems in our industry. Power consumption plays a vital role in energy consumption. Sometimes the user forgets to turn off the lights and fans; the energy gets wasted. Hence there is a need for power management system to save our electric power. Light, fans and many other electrical devices
are controlled by on or off method. Nowadays most of them are controlled by the remote device. To control through the remote, we need a system; often we need a fan and light to perform a daily basis so that most of the electric power getting wasted because we were making use of the computer to control the electrical appliances. Therefore we need to spend the significant amount of power cost. Here we cannot measure the temperature of the human being, and we cannot change the speed of the fan.

In this paper, we propose a system where we can automatically turn on or off the electrical appliances. Hence whenever a person enters into a room, the sensor which is near to him will be turned on. When he crosses the sensor, this particular sensor will be turned off and which sensor senses his body temperature will be turned on. We can reduce the cost of the electrical appliances. By measuring the body temperature of a person, we can also increase or decrease fan speed.

Passive Infrared Sensor detects if someone is passing through the particular detection area. We connect the relay to the near the output devices. The number of people who are inside the room can be seen through the cloud. And we can also make use of the cloud to turn on or off the electrical appliances. If anyone wants to know the persons who are all present inside the room, an image of a person can also be viewed.

PIR sensor detects a movement of the human within 10m range. Actual detection range is between 5m &12m. PIR is the pyroelectric sensor, detect levels of infrared

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radiation. PIR sensors have a 3-pin. One pin is ground, another is signal, and the last pin is power.

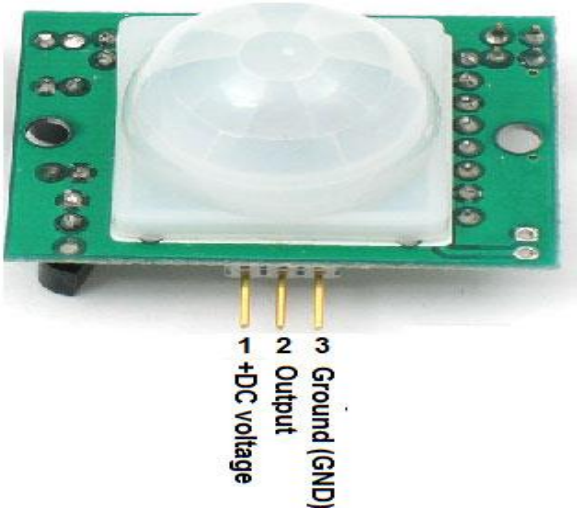

Figure 1. PIR Sensor (Detects Motion)

It senses the motion, senses the movement of human as we move in or out of the sensor range. This consists of ground, output and DC voltage.

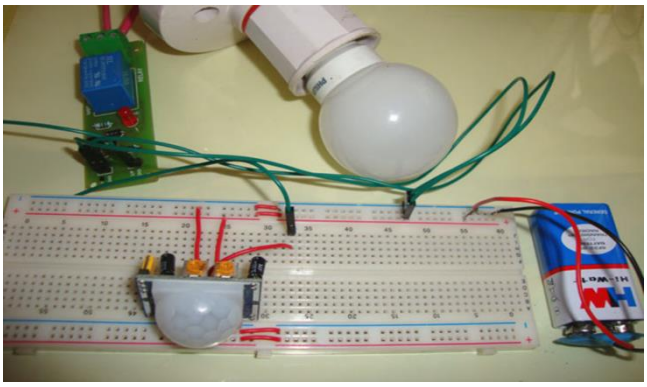

Figure 2. Working of PIR Sensor

2. Related Work

In A literature survey shows that studies on power consumption, the application of that is to reduce the electric power cost for the user. In today's life power cost is more due to the use of more electrical appliances, so power saving system plays an important role in reducing the value of the power. Some references for power saving are as follows,

Energy management system[1], this helps us to save the power using power line communication. Home Energy Management System (HEMS) monitors the smart meter and plans to control the appliances remotely from the internet. So that energy is conserved, and the cost is reduced to the users.

Home Automation system [2], this works based on home safety using a ZigBee. WIFI network is integrated through a gateway. This is designed for the security and the safety needs. Home gateway gives the remote access to the system for security of the home. For the safety purpose, it uses the safety sensor. Therefore ZigBee remote control has been developed with the home automation system.

Remotely controllable power outlet system[3], this is based on Wireless Power Controlled Outlet Module with the scalable mechanism for power management. Wireless Power Controlled Outlet Module(WPCOM) integrates the multiple AC power sockets &simple low-power microcontroller into a power outlet to control the power of the sockets ON/OFF and also to measure the power consumption of appliances. WPCOM has six scalable modules, the Essential Control Module, GSM Module, Bluetooth module, Ethernet Module, power measuring module, and the SD Card Module which control and monitor of electric home appliances. PDA control software & remote control software allows the user to monitor the electrical home appliances through PDA & Internet individually. Use an SMS to control and monitor through a GSM cellular mobile phone for remote use at any time.

Home energy management system[4], this paper is done based on the power line communication. This gives the network ready without increasing the cost. Dispersed Tone Power Line Communication (DTPLC) is also introduced, and it is used for avoiding narrowband power line noise. Here the energy is managed by the power line communication.

Self-adjusting sensor[5], this is based on the ZigBee communication. It consists of the self-adjusting sensor network, hardware and middleware implementations. This system is implemented in the real test bed and tested an experiment. This gives the result it reduces consumption of the energy.

Smart sensor for power management[6], this system is based on smartly monitoring and controlling the system for the electrical appliances which is present in our home. It continuously monitors the voltage & current, and it calculates how much the power is consumed. This design regarding low cost and flexible. So that we can save the cost of an appliance of the user. It is tested in real situations.

Standby power reduction [7], this is the design for the controlling the standby power reduction. It consists of the host agent based structure and ZigBee protocol for communication purpose, verifies the reliability and reduces the power. Therefore the power consumption of the user is connected to the consumer electronics and the power is reduced. This power reduction is based on ZigBee.

Remote controllable and energy saving [8], this system is based on remotely controllable energy saving system. This is used for reducing power consumption. It uses the remote control for controlling the home appliances. It monitors the power when it is below the threshold level; power outlet changes the threshold power. So, the ZigBee controller and the IR code is used for managing the power outlet. ZigBee has the power outlet and controls the dimming light. Remote control of home appliance can be used to control the user's power outlet and dimming light. Therefore energy is saved here using the ZigBee.

Smart home energy management system [9], this is based on energy managing. Here Home Energy Management System architecture is used which consist of energy consumption and generation together. Here ZigBee is used to monitor the energy consumption of the home appliances such as light, fan etc. ZigBee is used to minimize the energy cost. Hence by taking both energy consumption and the generation of the home appliances, HEMS architecture optimizes the home appliances energy use and saves the cost, and the Power is saved using the ZigBee.

Room light detection and control using sensor [10], here microprocessor and the sensor perform the automatic room light detection & control. PIR sensor, light sensor, microprocessor, and the RF module is used, PIR sensor is for detecting the human being entering the allocated area or not. Else the fan, lights will be automatically switched off. Here we can control different lights which are located in the different location. Therefore here in this system, we can save the power using PIR sensor and microcontroller.

Human detection for energy saving [11], the human being is detected using a radio signal strength variations in 2012. This is based on shadowing and fading effects. If there is any change in the radio propagation, this shows that there is a presence of a human being. This method is done only based on radio signal strength. Here we are not using the sensor. It is of sensor less control. Therefore the energy cost is saved in this method using ZigBee.

Power management system with middleware [12], this system executes the power management based on detection of user location and the movement of the human in the home. Here we use the Passive Infrared sensor, light sensor, power meter, microprocessor, PLC module and the LED display. Here power management device detects whether the human being is present inside the room. If there is no one, the electrical appliances are automatically turned off. IPDM reduces the standby power consumption. It detects the light intensity if any and controls the light which is present near to it. Here IPDM is also communicating with the middleware. User living pattern is also sensed here. The wireless sensor was needed in this system. This shows the reduced power consumption up to 75%.

Energy saving system by standby power reduction [13], this is done by energy saving system among the home appliances for standby power reduction. It is applied in the test bed and measured the power consumption. The power consumption is up to 10.5%. Thus energy is saved using the standby power reduction and energy saving outlet.

Remote control of home appliances through WSN [14], this is based on a wireless network Protocol to control legacy home appliances. It provides a bidirectional communication channel between control devices and gateway. Controls a legacy home appliance using IR signals and returns it as the digested image so a user can determine if control work has been done properly.

PIR sensor based lighting device[15], this is based on a PIR-sensor-based lighting device. It will turn on when it detects the motion and turn off when there is no motion; it reduces the standby power. MCU receives signals from PIR sensor which detects individual approaching the device using PIR sensor. It controls the SSR On or off.

Energy management system using ZigBee[16], this is based on, IEEE802.15.4 and ZigBee. It divides and assigns different home network tasks to appropriate components. It integrates physical sensing information and controls consumer home devices using active sensor network. Routing protocol DMPR that is Disjoint Multi Path-based Routing improves the performance of ZigBee sensor networks.

Energy saving over cloud network [17], this is based on Automatic standby power saving systems was developed. This is cloud based on demand standby power management. It offers rule-based management service along with 3 usage type which is determined by user preferences and living patterns. Therefore it reduces the power consumption.

Hand gesture-based remote control[18], this is based on hand gesture detection and recognition using PIR sensors and regular camera. Any movement within a range of a sensor. It checks if this is due to a hand gesture.

Classification of hand gestures is carried by a new winner-take all that is WTA hash based recognition method. Jacquard distance is to compare the WTA hash codes. Only when there is hand gesture, it turns on appliances.

3. Summary of the Survey

The applications are compared based on the techniques used, notifications, and Future enhancement. Majority of the applications use ZigBee technology to save the power consumption. Most are based on the remote control. All the appliances are controlled through the remote access. This helps the user to save the power cost. It also uses the SMS alert if any electrical appliances are in on mode in an empty room.

4. Table

Author name	Technique used(reference)	Controlling devices
Young-Sung Son	Load management, power management & Home network(1)	Remote control
Khusvinder Gill	ZigBee, Home Automation, Sensor Network(2)	remote control
Chia-Hung Lien	Power Management, Short Message Service, Bluetooth, Remote-Controllable Outlet System(3)	Remote control
Masahiro Inoue	energy management system, networked appliance, home network, power line communication(4)	Commands from Bluetooth Module &Ethernet Module and SMS commands from GSM Module.
JinsungByun	Wireless sensor network, home energy management system, smart home service, self-adjusting, topology control(5)	WSN, Self-adjusting sensor, SMS message.
Nagender Kumar Suryadevara,	ZigBee, Energy management, intelligent control system, wireless sensor network(6)	ZigBee(when power outlet below a fixed value)
Joon Heo	ZigBee, Networked Home, standby power reduction, Control Mechanism, Home Automation(7)	ZigBee protocol, IEEE 802.15.4
Jinsoo Han	ZigBee, IR, Energy-saving, Standby Power, power outlet, Remote control(8)	ZigBee controller, IR remote controller.
Chang-Sic Choi	ZigBee, HomeEnergy Management System, Powerline communication, renewable energy(9)	Energy measurement module, renewable energy gateway, EMCU.
Ying-Wen Bai	Microcontroller, light control, Pyroelectric Detectors, Illumination Measurement(10)	PIR sensor, RF module, light sensor, micro Controller.
Minsoo Lee	Energy-saving, Standby Power, power outlet, wireless sensor and actuator networks(11)	iPMD, PIR sensor, light sensor, microprocessor , power meter, PLC module.
BojanMrazovac	Object detection, sensorless control, RF signal, wireless sensor networks(12)	Sensor, radio signal strength (By fading and shadowing).
JinsungByun	Intelligent energy saving system, standby power reduction, zero energy home, energy saving outlet(13)	Zero energy home(able to supply energy by itself, through the distributed energy generation).
Hyung-Bong Lee	Home automation, TDMA, wireless sensor network, time-synchronized forwarding protocol, home network(14)	Remote control, Wireless sensor control.
Cheng-Hung Tsai	Boost Module, Power Consumption, PIR sensor, SSR, Standby Power(15)	PIR Sensor, MCU
Dae-Man Han	Smart Home, ZigBee, Energy Management, Sensor network(16)	IEEE802.15.4 and ZigBee sensor network
Taehwan Shin,	Standby power	Cloud-based

	management, cloud computing, intelligent power management system, pattern-based Control(17)	control

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