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Smart Building Using PIR Sensor

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A B S T R A C T

In India, one of the most frequent issues is a power crisis. Consumption of electricity is largely increased due to the inefficient usage of electrical devices such as fans, lights etc. This project represents smart electric system design using PIR (passive infrared) motion detection sensor. This sensor can certainly minimize the consumption of electrical power. PIR sensor works on the basis of motion and infrared radiation from objects in its field of view. This sensor sense movement of people, animals, and then gives high signal to the transistor and the transistor triggers the relay. Relay acts as a switch and controls lights and fans (whether to ON or OFF). So the devices will be turned on only when a person or animal comes in the range of the sensor and will be turned off automatically when they leave the room. It is a low-cost device. So this project is very low costing and also power saving. Making an ordinary building into a smart and power conserving building.

Keywords: Smart Building, Energy Conservation, Pir Sensor

1. Main Text

Inefficient usage of electricity can also occur with fans and lights. Here are some common examples:

Leaving fans and lights on when they are not needed. This can happen when people leave a room and forget to turn off the fan or light, or when lights are left on during the day when natural light is sufficient. This is a waste of electricity and can increase your energy bill[1].

Using fans when they are not needed or using them inefficiently. For example, leaving a fan running in a room when no one is present[2], or using a fan on high speed when a lower speed would be sufficient. This wastes energy and can increase your energy bill.

Nomenclature

The Pir Smart Building works using an pir sensor, and realy module, this devices turns on the electrical appliances on when there is human or animal present in the range of the sensor and turns off when no one is in the range of the sensor, this helps in conserving electricity.

1.1 Structure

PIR SENSOR:

A PIR (Passive Infrared) sensor is a type of motion detection sensor that detects infrared radiation emitted by moving objects. It is commonly used in security systems, automatic lighting, and other applications where detecting motion is important.

The PIR sensor has two main components: a pyroelectric sensor and a Fresnel lens. The pyroelectric sensor is made of a crystalline material that generates a voltage when it detects a change in temperature. The Fresnel lens is a series of concentric circles that focus infrared radiation onto the pyroelectric sensor.

When an object moves in front of the PIR sensor, it emits infrared radiation, which is focused onto the pyroelectric sensor by the Fresnel lens. This causes a voltage spike, which is detected by the sensor's electronics. The electronics then trigger an output signal, which can be used to activate an alarm, turn on lights, or perform other actions.

RELAY:

An automatic on/off relay is a type of relay that is designed to automatically turn on or off a circuit based on a specific condition or input signal. It is often used in industrial, commercial, or home automation systems to control electrical equipment or devices.

2N2222 TRANSISTOR:

The 2N2222 is a bipolar junction transistor (BJT) that is commonly used as a switching transistor in electronic circuits. It is a general-purpose transistor that can handle up to 800 mA of current and up to 30 V of voltage.

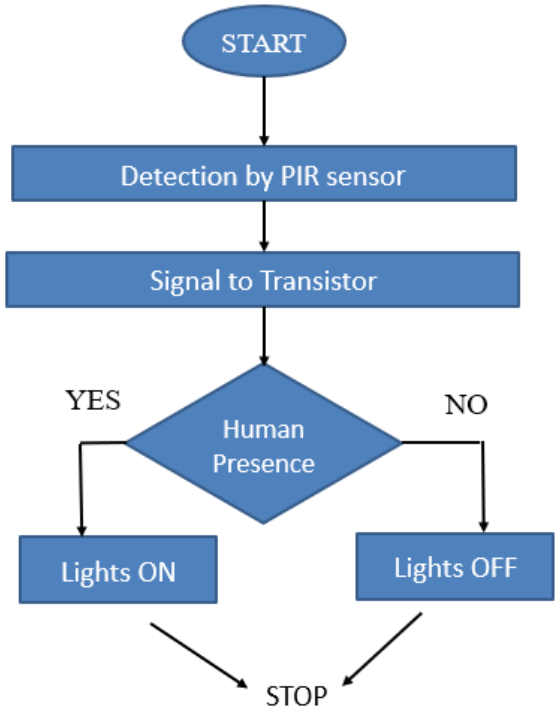
The 2N2222 transistor is a NPN type transistor, which means it is made of a positively doped material sandwiched between two negatively doped materials. When a small current is applied to the base of the transistor, it allows a larger current to flow from the collector to the emitter, effectively turning the transistor "on" and allowing current to flow through the circuit.

220V AC to 5V DC Convertor:

A 220V AC to 5V DC converter is an electrical device that converts the high voltage, alternating current (AC) from a wall outlet or power source into a lower voltage, direct current (DC) suitable for use in electronic devices that require a 5V power supply

The selection of materials are based on the requirement of the project.

1.2 Flow chart:



1.3 Construction of references

1. Selection of sensor : The first step is to select the appropriate sensor for the application. This will depend on factors such as the range, sensitivity and accuracy.
2. Selection of the relay module: The second step is to select the appropriate relay module based on the number of devices.
3. Design of the circuit : The next step is to design the circuit that will support the pir and relay module, and controls the electrical devices.
4. Wiring of electrical circuit: The electrical circuit is then wired up, including the transistor, resistor and any necessary control circuits. The wiring should be neat and organized to minimize the risk of shorts or other electrical issues.
5. Enclosure in housing: The entire system is then enclosed in a housing made of plastic to protect it from the elements and to provide a safe and secure installation.

7. Testing and optimization: Once the system is constructed, it should be tested under various temperatures and other conditions to ensure that it is performing as expected. Any necessary optimizations or adjustments can then be made to improve the performance and efficiency of the system.

1.4 Section headings

Introduction: Inefficient usage of electricity can also occur with fans and lights. Here are some common examples:

Leaving fans and lights on when they are not needed. This can happen when people leave a room and forget to turn off the fan or light, or when lights are left on during the day when natural light is sufficient. This is a waste of electricity and can increase your energy bill[1].

Using fans when they are not needed or using them inefficiently. For example, leaving a fan running in a room when no one is present[2], or using a fan on high speed when a lower speed would be sufficient. This wastes energy and can increase your energy bill.

Existing systems: Passive Infrared (PIR) sensors are widely used in a variety of applications in real life. Here are some examples:

Home Security Systems: PIR sensors are commonly used in home security systems to detect the movement of intruders. When a person or animal moves within the detection range of the PIR sensor, the system triggers an alarm or sends an alert to the homeowner.

Automatic Doors: PIR sensors are commonly used in automatic doors, such as those found in supermarkets, hospitals, and airports. When a person approaches the door, the sensor detects their movement and opens the door automatically.

Automatic Hand Dryers: PIR sensors are commonly used in automatic hand dryers to activate the device when someone approaches it and turn it off when they move away. This is a popular application of PIR sensors as it helps to reduce energy consumption and increase the convenience of using a hand dryer in public restrooms.

Working of the circuit: The PIR smart building circuit works when there is an human or animal heat radiation or a movement is present in the range of the sensor, when the sensor sense the presence in its range ti triggers the relay switches and turns on the lights and fans and triggers them off when no radiation is present in the range of the sensor.

Future scope: Home Automation is getter popular day by day making it the basic requirement for future homes which will be smart enough to provide the best possible comfort to people. This technology has a lot of scope in feature, here are some of them.

- Integration of Smart Home Devices.
- Development of smarter home appliances.
- Increasing control, customization, and efficiency**.**
- Smart structure health monitoring
- Smart surveillance

2. Illustrations

Smart buildings use advanced technologies to optimize energy efficiency, enhance occupant comfort and safety, and reduce operating costs. PIR sensors are a key component of many smart building systems, as they can be used to detect the presence of people and trigger various actions based on that information.

For example, PIR sensors can be used to control lighting and HVAC systems in a building. When a person enters a room or area, the PIR sensor detects their presence and sends a signal to turn on the lights or adjust the temperature to a more comfortable level. When the person leaves the room, the PIR sensor detects the lack of movement and sends a signal to turn off the lights or adjust the temperature to a more energy-efficient level.

PIR sensors can also be used for security and safety purposes in a smart building. For example, PIR sensors can be installed in corridors, stairwells, and other areas to detect intruders or unauthorized access. PIR sensors can also be used to trigger emergency lighting or alarm systems in the event of a fire or other emergency.

In addition to PIR sensors, smart building systems can incorporate other sensors and technologies, such as occupancy sensors, ambient light sensors, and Bluetooth or Wi-Fi connectivity, to provide even more advanced functionality and control.

Overall, PIR sensors are a key technology for smart building systems, as they

PIR sensor output voltage equation:

The PIR sensor output voltage (Vout) can be calculated using the following equation:

Vout = Vs * (Rs / (Rs + Rl))

Where:

Vs = Supply voltage of the PIR sensor

Rs = Resistance of the PIR sensor

Rl = Load resistance

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With Sincere Regards,

Rithwik Mamidala

K.V. Sudheer Kumar Reddy

6. Appendix

PIR (Passive Infrared) sensors are commonly used in smart lighting systems to detect the presence of people in a room or space. These sensors work by detecting the infrared energy emitted by a person's body heat. When someone enters a room, the PIR sensor sends a signal to the lighting system, which turns on or adjusts the lights accordingly. When the person leaves the room, the PIR sensor detects the lack of body heat and sends a signal to turn off or reduce the lighting.

One of the main benefits of PIR smart lighting systems is energy savings. By automatically turning off lights when they are not needed, PIR sensors can help reduce energy consumption and lower electricity bills. Additionally, PIR smart lighting systems can improve the overall efficiency of lighting systems by ensuring that lights are only on when they are actually needed.

PIR smart lighting systems are also relatively easy to install and can be retrofit into existing lighting systems. They can be used in a variety of settings, including homes, offices, schools, and commercial buildings.

However, there are some potential drawbacks to PIR smart lighting systems. For example, PIR sensors can sometimes have difficulty detecting people who are sitting still or moving slowly, which can result in lights turning off prematurely or not turning on at all. Additionally, PIR sensors can be triggered by pets or other animals, which can lead to false readings and unnecessary energy consumption.

Overall, PIR smart lighting systems can be an effective and energy-efficient solution for many lighting needs. However, it is important to carefully consider the specific needs of each application and ensure that the system is properly installed and configured to minimize false readings and optimize performance.

7. References

1. Kim, D., et al. Smart led lighting system implementation using human tracking us/ir sensor. in ICTC 2011. 2011. IEEE.

2. Subramanyam, B., et al., Design and development of intelligent wireless street light control and monitoring system along with gui. 2013. 3(4): p. 2115-2119.

3. Alex, R.S., R.N.J.I.J.o.E. Starbell, and A. Technology, Energy efficient intelligent street lighting system using ZIGBEE and sensors. 2014. 3(4): p. 2249-8958.

4. Magno, M., et al., A low cost, highly scalable wireless sensor network solution to achieve smart LED light control for green buildings. 2014. 15(5): p. 2963-2973.

5. A.M Sindhu, George Jerin, Roy Sumit and J Chandra, "Smart Streetlight Using IR Sensors", IOSR Journal of Mobile Computing & Application (IOSR-JMCA), vol. 3, no. 2, pp. 39-44, Mar. - Apr. 2016, ISSN 2394–0050

6. Somasekhar and B. Umakanth, "An Intelligent Lightening System for Power Saving Applications", Department of ECE Narayanadri Institute of Science & Technology International Journal of Engineering Trends and Technology (IJETT), vol. 13, no. 1, Jul 2014.