Arduino Based Smart Light
Management System for Smart Cities

Gopinath. V[1], Arunkumar. V[1], Bhavan. S[1], Aswin. M. D[1], Kishorekumar. A[2]

[1]Student, [2]Assistant Professor,

[1,2]ECE, Hindusthan College of Engineering and Technology, Coimbatore, Tamil Nadu, India

ABSTRACT

Automatic gismo system mistreatment Arduino and PIR (Passive Infrared) device will be wont to activate and OFF the lighting system of home mechanically by detective work the presence of human. this technique will be employed in garages, classrooms, staircases, bathrooms, etc. wherever there's no would like of continuous lightweight however only if there's somebody's. Also, there's no got to worry concerning electricity bills because the lights get OFF once there's no human and thus one got to pay the bills as per use. This paper projected as concerning automatic gismo system that mechanically management the area lights mistreatment Arduino and PIR device. the most elements employed in this technique square measure Arduino Uno, PIR device and Relay Module. Out of those elements, the operation of system chiefly depends on PIR device that helps in detective work human presence. Experimental results show that a minimum of five hundredth of power will be saved by mistreatment the projected system.

KEYWORDS: Smart power saving

INTRODUCTION

Scientific inventions have created this world price living. they need provided North American nation comforts and luxuries. Technology has become a very important and necessary a part of our lives. In previous few years, there's tremendous advancement in technology. So, human life becomes additional passionate about these technologies. The invention of Electricity is one among the best of all its inventions. Electricity has become an essential a part of human life. Electricity is taken into account because the soul or the life while not that the whole world remains dead and dormant. to produce additional comfort to human there's a technology referred to as as Home Automation. once there's management of all social unit amenities and appliances in conjunction with the employment of technology then it's termed as Home Automation. As non-renewable sources square measure decreasing day by day, there's want of conservation of energy. Electricity is that the most vital to all or any the activities of the trendy society. Hence, wise use of non-renewable energy sources is should. Home Automation provides energy economical area by perceptive and dominant totally different devices. Now a days, downsides} associated with energy become main problem. during this present folks square measure in hurry and therefore forget to show OFF the lights and fans. In such a state of affairs, this Automatic device system that may be a a part of home automation saves electricity. On the idea of human presence above all space of area, the electrical appliances will be switched ON or OFF mechanically. this is often the most advantage of this method.The remaining paper is ordered as: Section a pair of is concerning literature survey which provides data concerning analysis work. Section three is concerning hardware and software system style of Automatic device system. Section four provides the operating of this method victimisation Arduino and PIR device. Section five is that the result, half-dozen is that the conclusion and7 is that the future work.

LITERATURE SURVEY

Literature survey is that the study of already established systems and assortment of data that helps in doing new tasks.

Vibhuti et al [1] projected a system that operates with management of relays and with the employment of WAGO PLC (Programmable Logic Controller) and Arduino Uno. change operation of devices like tube light-weight, fan, AC, etc. are often operated impromptu by mistreatment PIR sensing element and on the idea of environmental conditions. In period of time implementation, automatic management is finished by sensing element knowledge and manual management is finished by humanoid application. But, problem during this paper is that the dominant and observation of devices done by WAGO PLC and Arduino Uno

each. These operations are often done by mistreatment solely Arduino Uno.

Maslekar et al [2] projected a wise lighting system within which Raspberry Pi has used. Raspberry Pi is observation lights and fans at the same time. within the absence of person area lights and fans can mechanically turns OFF. Energy is preserved by mistreatment this sensible lighting system. The experimental results of this technique have shown that fifty energy is preserved. however the issue is Raspberry Pi is costlier than Arduino Uno.

Automatic Lighting and system for room within which electrical light-weight is controlled by Bluetooth, PIR sensing element and relay. to change ON or OFF the sunshine Bluetooth module isconnected to Arduino Uno that sends voice command from Arduino Uno by mistreatment the mobile humanoid application. The experimental results have shown the five hundred energy is preserved. however this paper are often enforced by removing the Bluetooth module moreover [3].

In [4], the disquisitions discuss automatic light source system by mistreatment traveler counters operation. relying upon the human presence, the space lights ON or OFF. there's no want of manual operation for change. The PIR sensing element is employed to the human presence that is at the doorway of area. As traveler counter is employed, there's increment within the counter once person enters within the area and this results in activate the space light-weight that is controlled by microcontroller program. If person exits the space, the counter decremented and this results in shut down the lights. once all persons left {the area|the space|the area} then solely lights within the room changed. the issue during this system is that the door of area mustn't enable over one person at a time.

Vahid et al [5] projected a system whose management is depend upon Arduino microcontroller, network communications and Modbus industrial protocol. Arduino LAN defend and a wireless router device is employed to designed the network communication. the particular humanoid application is employed to load the Modbus program into mobile or Windows code named "mypro" and on Arduino board, Arduino code loaded through USB (Universal Serial Bus) cable. there's interconnection between Arduino LAN defend and mobile through coax and router. By connecting to router, user will management and monitor the appliances simply.

SYSTEM COMPONENTS DESCRIPTION
The automatic gadget control system consists of different hardware components that can be used for sensing, processing and controlling of appliances. These hardware components are discussed below:

A. PIR Sensor as Sensing Unit
The sensing unit is used to get input parameters from surrounding which is required for automation. For particular area of room, the following points must be kept in mind to perform operation in good order:
➢ Continuous changes in human motion
➢ Capability
➢ Sparing (Economical)

Here, the sensing unit used is PIR (Passive Infrared) sensor which is as shown in given Figure 1.
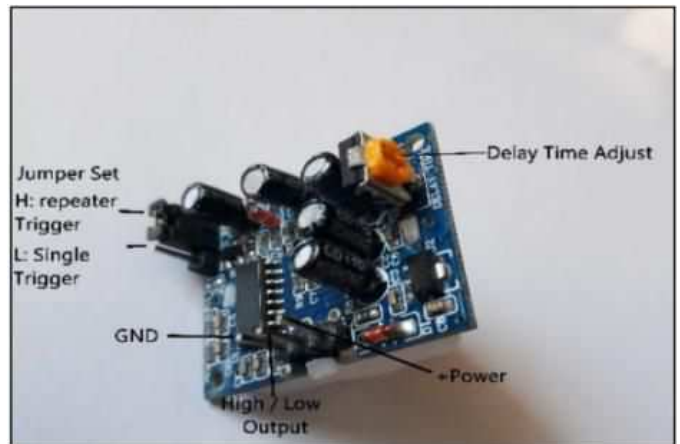
This PIR sensor is "Passive Infrared", which is also called as "Pyroelectric", or "IR motion" sensors. The working of PIR sensor is to detect the motion of a person when person comes in the sensing range of the sensor. The specialty of this sensor is it is little, affordable, low power, easy to use and do not exhaust. Hence, this sensor is used in many home automation appliances.

### B. Arduino Uno As Processing Unit
Arduino Uno is a microcontroller in which ATmega328 microprocessor is used which is shown in the Figure 2.
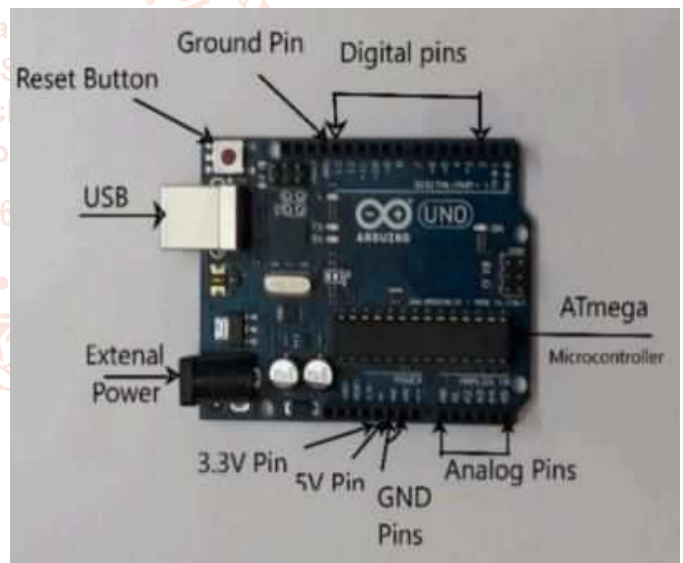
It has 6 analog input pins and 14 digital input or output pins which can be used as PWM (Pulse Width Modulation) outputs. It has its own programming language. The crystal oscillator frequency of this microcontroller is 16MHz. It has USB cable which can simply connect with computer, power barrel jack, reset button and ICSP (In Circuit Serial Programming). Each pin of the Arduino Uno is operated at 5V.The programming language of this microcontroller is not complex.

C. Relay as Controlling Unit

A relay is an electrically operated device as shown in Figure 3.
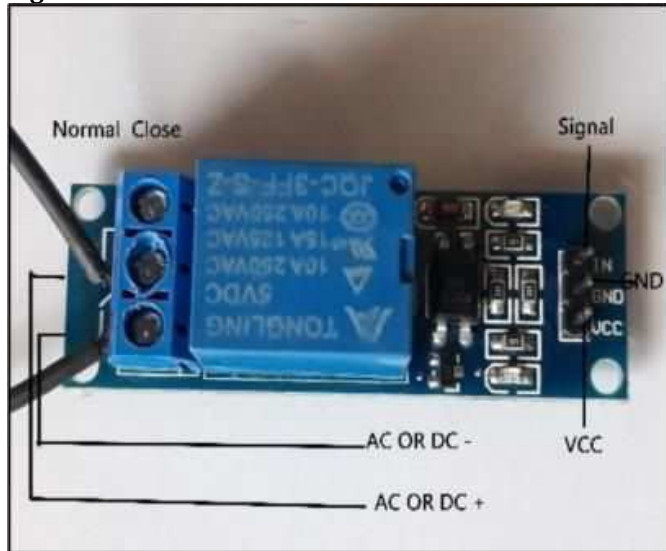
A relay is a digital switch that controls much higher currents and voltages. This device is widely used in power protection. The benefits of this device are small in size, stability and long-time reliable and it can be also used for both ac and dc systems. Relay has three terminals that are normally closed terminal, normally open terminal and common terminal. It has three pins GND, VCC and input signal.

D. Software Used

Software used to control this system is Arduino IDE (Integrated Development Environment). This software is used to write the program and compile it to the Arduino Uno board. Therefore, the arduino software commands control the arduino board, sensing devices and another circuitry.

WORKING OF THE SYSTEM

Arduino is a microcontroller which provides open source platform to perform software and hardware operations.

This is an advantageous project as Arduino Uno and PIR Sensor is used thereby lights in the room will turn ON automatically by detecting a human motion and stay turned ON as long as the person remain present in the room.

At the beginning, when no human is present in the room, the PIR Sensor's OUT pin is in the LOW mode. Hence, light of the room is OFF as shown in Figure 4.
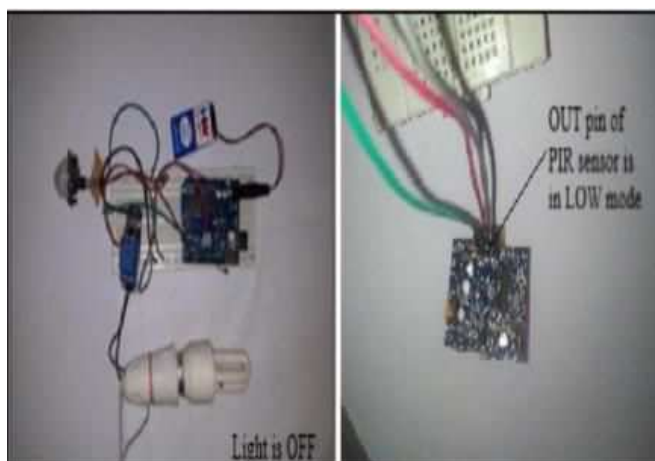

Figure 4.Before Detection Of PIR Sensor

The output of the PIR Sensor goes HIGH as the person enters the room. PIR Sensor detects the Infrared (IR) radiation in the room. The Digital pin 8 of Arduino Uno is used to connect the Data OUT pin of PIR Sensor. When this becomes HIGH, the activation of relay takes place by Arduino Uno. So that relay pin is in the LOW mode; because relay is an active LOW device. Now, the lights will turn ON. This light maintains its state as ON as far as there is motion in the room as shown in Figure 5.
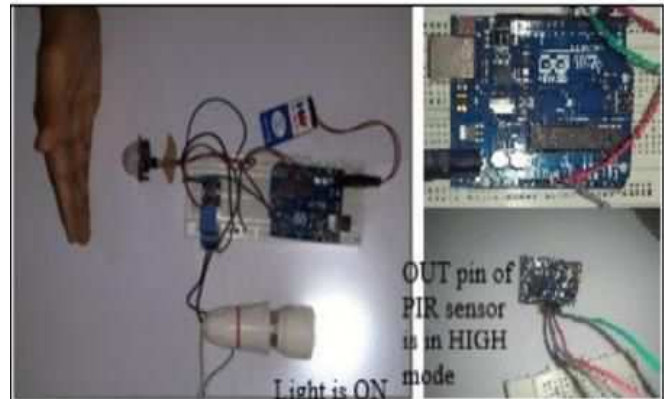

Figure 5.After Detection Of PIR Sensor

If the person exits the room or takes a nap, the motion in front of sensor stops and there will be no changes in the IR radiations. Therefore, Data OUT pin of PIR sensor will be in LOW mode. This leads to turn OFF the relay. So, relay now is in the HIGH mode. Hence, room light will be turned OFF.
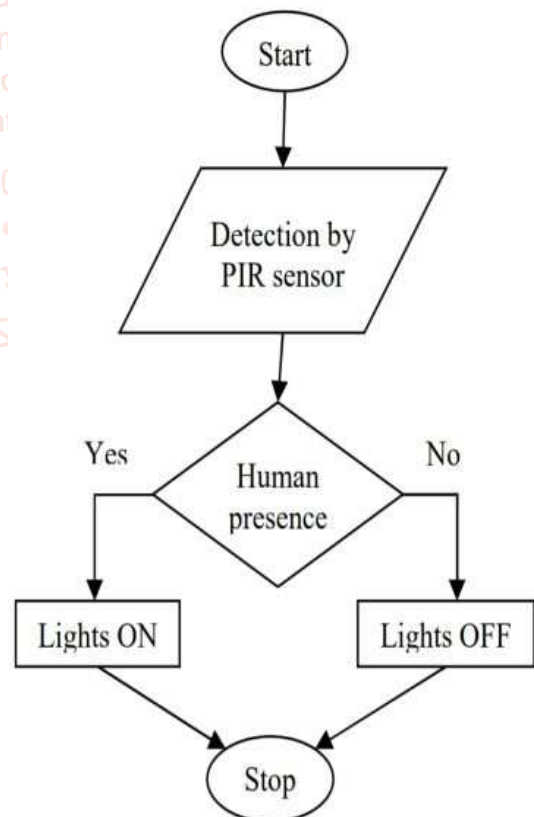

Figure 6.Flow Chart of Automatic Light System

The working of Automatic gadget control system is as shown in below Flowchart in Figure 6.

RESULTS

The design of automatic gadget control system is used to turn ON and OFF the room lights automatically by detecting

the human presence in the room. There is no need to press the button every time when person enters in the room. To effectively carry out the operation of this system there was use of an energy meter which is connected to the system to measure the power consumption before and after the system installation. To observe the readings a 7W bulb was used.
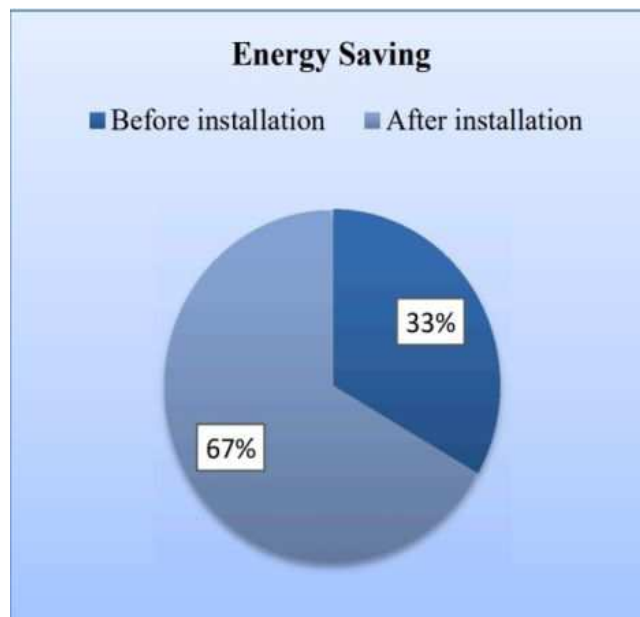

Figure 7. Pie Chart-Energy Saving

From Figure 7 pie chart shows that there is reduction in the power consumption which is on the basis of the difference in the percentages of energy consumption before and after implementation of automatic gadget control system. Hence, from Table 2 and from piechart it is observed that there is saving of almost 50% power consumption.

CONCLUSION

The paper has introduced the idea of automated homes and proposed a method which saves power consumption by system. This Automated Gadget Control System having the interconnections between the home appliances and sensors for controlling and monitoring the device. Automated home is a vast system that having multiple technologies and its applications that can be used to provide control and security of the homes easily.

FUTURE WORK

There are many technologies that can be used in automatic lighting systems to make the system more accurate.

To make the system more professional GSM (Global System for Mobile) module can be used to get notifications.

There are some sensors that can be used to control and secure the home. For example, pressure sensor used to detect the occupancy which will be placed outside the door.

Image processing can also be used to detect a person's presence by using digital camera.

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