iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 7 **Issue:** V **Month of publication:** May 2019

DOI: https://doi.org/10.22214/ijraset.2019.5453

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177
Volume 7 Issue V, May 2019- Available at www.ijraset.com

Application of Arduino using PIR Sensor and Relay for Automation

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Abstract: ***Home automation system achieved great popularity in the last 10 year and it increases the comfort of life. In this paper an overview of future home automation systems is discussed. Nowadays most home automation systems consist of a smart phone and microcontroller and arduino. A smart phone application is used to control and monitor the home appliances using different type of communication techniques. In this paper the working principle of different type of wireless communication techniques such as Wi-Fi, Bluetooth and GSM and PIR sensor with arduino are studied and their features are compared with each other so the users can choose their own choice of technology to build home automation system. Moreover in this proposed system we discuss about PIR sensor technique using arduino for automation.***
Index Terms: Arduino,PIR Sensor,Relay,Power Supply.

I. INTRODUCTION

The technology which performs a process without human assistance is known as Automation. .Automation uses various control system for operating various equipment like machinery, boiler, oven, aircraft, telephone network and some other application. Automation includes wide range of applications from a household control system to large industrial control system. Automation is a technique which operates or control a process with the help of electronic devices resulting in less human involvement. As the need of automation system increases day by day, many industrialist and researchers are working to develop most efficient automatic system to operate and control different machine based on the requirement. With the help of automation the use of electricity become more economical.

This paper introduces automation system employed for computer lab of electrical engineering department. The purpose of proposed system is energy saving. A computer lab is a lab whose energy consumption depends on human presence. The main aim of proposed system is that the light and fans of the lab should remains ON in the human presence otherwise should remain OFF. This system is designed using various devices like PIR sensor, Arduino, relay,DC power supply and various electronic component like transistor,diode,etc. The proposed system avoid unnecessary energy consumption and helps in energy saving.

Nomenclature	
KWh	kilo-watt hour.
KW	kilo-watt
AC	alternating current
Wh	watt hour
PIR	passive infra red sensor

II. LITERATURE REVIEW

Daeho Kim et al. worked on smart LED lighting system by using Infrared and Ultrasonic sensors together. Here they proposed a model which continuously tracks the human motion. Output based on the human tracking data which is obtained by these sensors are responsible for determining the On-Off control of the LED lighting

Michele Mango et al. proposed a low cost, adaptable sensor based smart lighting system which makes use of PIR sensors and motion sensors for automation.

III. METHODOLOGY

The proposed system is designed using various devices like PIR sensor, Arduino, relay,DC power supply and various electronic component like transistor,diode,etc. Arduino smaller than usual board contains ATmega328 microcontroller, It is a 8 bit microcontroller, which is utilized to control the system. In which PIR sensor distinguish the presence of a human in the zone and send flag to Arduino Mini, arduino will turn ON the lights, fans or electrical machines, after at regular intervals arduino check the yield of the sensor and whenever yield is high then it won't turn OFF the electrical apparatuses and whenever yield is low

then it results damaging of the electrical apparatuses. The range of used PIR sensor is upto 6 meters. Fig 1. Shows the proposed system.

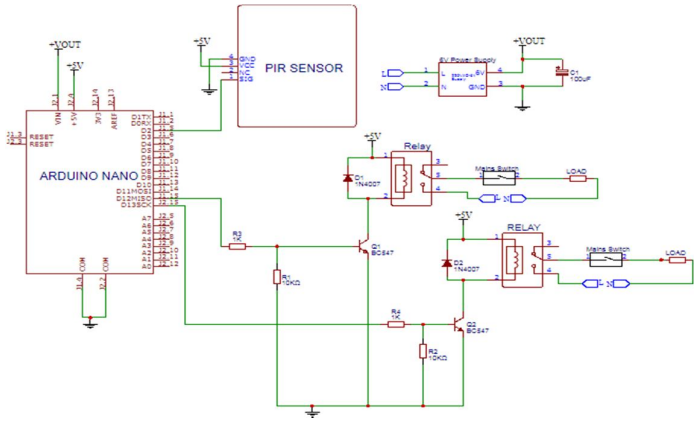

Fig 1:Circuit Diagram of Proposed system

IV. WORKING

The Automation of computer lab using Arduino and PIR Sensor is a simple projectwhich works on human motion. The lights and fan in the lab will automatically turn ON upon detecting a human motion and stay turned ON until the person has left or there is no motion. Whenever PIR sensor detects any body movement, its OUTPUT pin becomes HIGH, which applies the triggering voltage to the base of the transistor, transistor get ON, and current started flowing through the coil. Coil in Relay gets energies and create electromagnetic field, which attracts the lever and COM and NO get connected. This allows a much larger current (220v AC) to flow, which turns ON the bulb.Bulb ON duration can be control by setting up PIR sensor.

V. TOOLS

A. Arduino

The Arduino Mini contains Atmega 328 microcontroller. Atmega 328 has 32KB of memory for putting away code and it has 2KB of SRAM and 1KB of EEPROM. Board accompanies two recurrence forms we have utilized 16 Mhz frequency of the microcontroller.

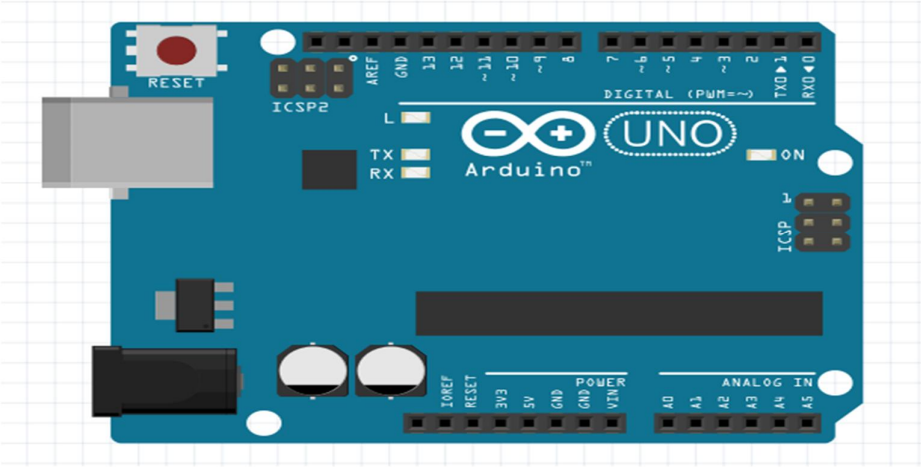

Fig 2:Pin Configuration of Arduino Uno

B. PIR SENSOR (Passive Infrared Sensor)

This Passive Infrared Sensor (PIR) module is utilized for movement identification. It requires 10-60 seconds of settling time before beginning its task. It comprises of electric sensor that identifies movement by estimating change in the infrared dimensions produced by the items . It can identify movement up to 6 meters. Fig.3 demonstrates the module utilized in our framework.

Fig 3: PIR SENSOR

C. Relay Module

Fig. 4 shows the relay module used in our system. This relay module is 5V active low module. It is capable to control the various electrical appliances with large amount current.

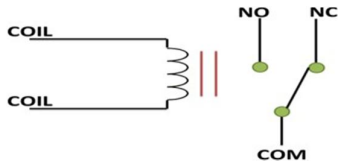

Fig 4: Relay Module

D. Power Supply

As per shown in fig 5. In the input of the power supply there is a power transformer. From the block diagram, the basic power supply is content four elements of a transformer, a rectifier, a filter, and a regulator put together with each other. The output of the dc power supply is used to provide a constant dc voltage across the given load.

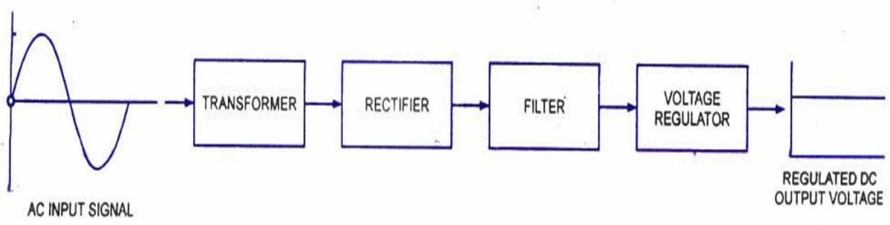

Fig 5: Block Diagram Of Regulated Power Supply

VI. RESULT

In normal working condition (before automation) we connect the energy meter in main supply and measure the monthly consumption of lab. And calculate the bill of computer lab and Using proposed system we calculate same data for a month.
After that calculate the annual light bill for lab and difference is shown as follows

A. CASE I: Before Automation of Computer Lab

The proposed system is design for switching ON/OFF of light and fan load based on human motion. The computer lab is having 4 numbers of tube lights with rating of 40 watts and 4 numbers of fans of 60 watt.
Energy consumption of lab is as follow.
Total working hour of college (daily) = 8 Hr
In which daily two practical are session of 2 Hrs are conducted in computer lab. i.e Total working Hrs = 4Hr
Remaining 4hr lab is free of load but student do work and sometime fails to turn OFF the light and fan.
so total consumption of lab = 1.8 unit per day
In every month approximate working days=20day
Total consumption per month= 1.8KWhr*20 day=36000Whr =36KWH ..... (Per month)

B. CASE II : After Automation

Total consumption of lab = 1.23 unit per day
In every month approximate working days = 20day
Total consumption per month= 1.23 KWhr * 20 day=24.6KWhr ..... (Per month)
Average saving of the lab per month = Total reading before automation - total reading after automat
Average saving of the lab per month = 36- 24.6

Average saving of the lab per month =11.4 units =12 unit per month
Yearly saving = unit per month *12 month
=12*12 = 144 units
Billing Rate for commercial Building = 9.1 Rs per unit So the average saving per year in Rs = 9.1 *144
=1310 Rs per year

Table : Result Table

Case of working	With conventional system	With proposed system
Automation	36 units	24 unit
Annual Bill	3931.2 Rs.	2620.8 Rs.

VII. CONCLUSION

This project gives us an idea to detect the motion using PIR sensor. This project can be used in home or offices. This is also cost efficient. Thus by this attempt of ours circuit can be used as protecting device and can be used for security also. It can be used as a kind of antitheft device. It is very much cost efficient and can be used easily and efficiently. Which is resulting in energy saving.

VIII. FUTURE SCOPE

In home automation we use many way like

A. We use IoT for automation
B. We do automation using CAN bus controller
C. using GPS system.
D. Using Raspberry Pi
E. Cloud base home automation system.

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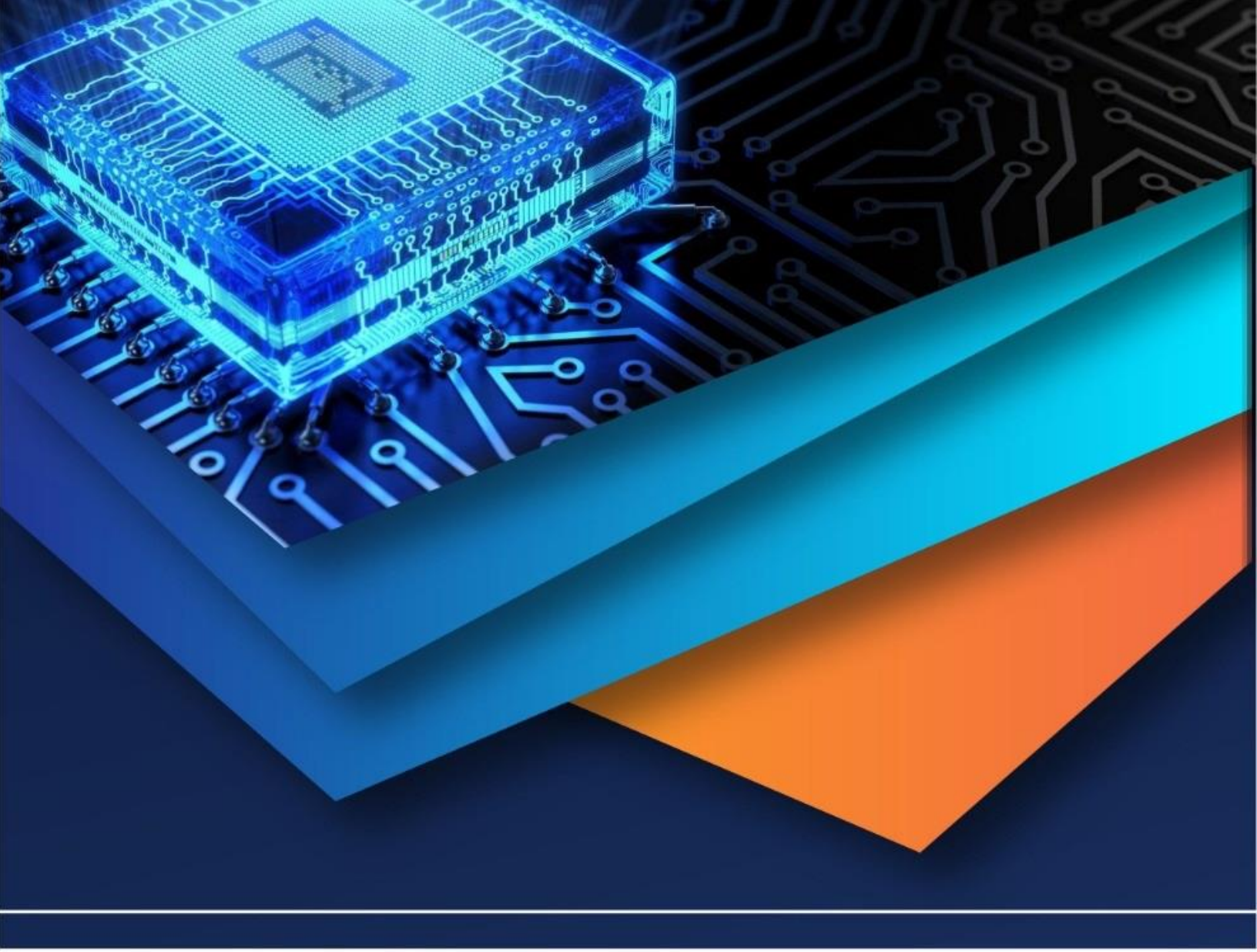

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