

Automatic Gadget Control System Using Arduino And PIR Sensor

Pathan Hajera Sharmin AyyubKhan, Shaikh Safoora Sadaf Shaikh Gayasoddin

Dr. Lenina SVB, Assistant Professor

Fellow WOS-C7,DST,INDIA

Department of Electronics and Telecommunications

Shri Guru Gobind Singhji Institute of Engineering and Technology

Nanded, Maharashtra State, India

Abstract— Automatic Gadget Control System using Arduino and PIR (Passive Infrared) Sensor can be used to turn ON and OFF the lighting system of home automatically by detecting the presence of human. This system can be used in garages, classrooms, staircases, bathrooms, etc. where there is no need of continuous light but only when there is a human. Also, there is no need to worry about electricity bills as the lights get OFF when there is no human and hence one need to pay the bills as per use. This paper proposed as about automatic gadget control system which automatically control the room lights using Arduino and PIR sensor. The main components used in this system are Arduino Uno, PIR sensor and Relay Module. Out of these components, the operation of system mainly depends on PIR sensor which helps in detecting human presence. Experimental results show that at least 50% of power can be saved by using the proposed system.

Keywords—Arduino Uno,PIR sensor,Relay, Room light

I. INTRODUCTION

Scientific inventions have made this world worth living. They have provided us comforts and luxuries. Technology has become an important and necessary part of our lives. In last few years, there is tremendous advancement in technology. So, human life becomes more dependent on these technologies. The invention of Electricity is one of the greatest of all its inventions. Electricity has become an indispensable part of human life. Electricity is considered as the soul or the life without which the entire world remains dead and dormant. To provide more comfort to human there is a technology called as Home Automation. When there is control of all household amenities and appliances together with the use of technology then it is termed as Home Automation. As non-renewable sources are decreasing day by day, there is need of conservation of energy. Electricity is the most important to all the activities of the modern society. Hence, wise use of non-renewable energy sources is must. Home Automation gives energy efficient room by observing and controlling different devices. Now a days, the issues related to energy become main problem. In this modern world people are in hurry and hence forget to turn OFF the lights and fans. In such a situation, this Automatic Gadget Control System which is a part of home automation saves electricity. On the basis of human presence in particular area of room, the electrical appliances can be switched ON or OFF automatically. This is the main advantage of this system.

The remaining paper is ordered as: Section 2 is about literature survey which gives information about research work. Section 3 is about hardware and software design of Automatic Gadget Control System. Section 4 gives the working of this system using Arduino and PIR sensor. Section 5 is the result, 6 is the conclusion and 7 is the future work.

II. LITRRATURE SURVEY

Literature survey is the study of already established systems and collection of information which helps in doing new tasks.

Vibhuti et al [1] proposed a system which operates with control of relays and with the use of WAGO PLC (Programmable Logic Controller) and Arduino Uno. Switching operation of devices such as tube light, fan, AC, etc. can be operated spontaneously by using PIR sensor and on the basis of environmental conditions. In real-time implementation, automatic control is done by sensor data and manual control is done by android application. But, difficulty in this paper is the controlling and monitoring of devices done by WAGO PLC and Arduino Uno both. These operations can be done by using only Arduino Uno.

Maslekar et al [2] proposed a smart lighting system in which Raspberry Pi has used. Raspberry Pi is monitoring lights and fans simultaneously. In the absence of person room lights and fans will automatically turns OFF. Energy is preserved by using this smart lighting system. The experimental results of this system have shown that 50% energy is conserved. But the difficulty is Raspberry Pi is more expensive than Arduino Uno.

Automatic Lighting and Control System for Classroom in which electrical light is controlled by Bluetooth, PIR sensor and relay. To switch ON or OFF the light Bluetooth module is connected to Arduino Uno which sends voice command from Arduino Uno by using the mobile android application. The experimental results have shown the 50% energy is conserved. But this paper can be implemented by removing the Bluetooth module as well [3].

In [4], the disquisitions speak about automatic room light system by using visitor counters operation. Depending upon the human presence, the room lights ON or OFF. There is no need of manual operation for switching. The PIR sensor is used to the human presence which is at the entrance of room. As visitor counter is used, there is increment in the counter when person enters in the room and this leads to turn ON the room light which is controlled by microcontroller program. If person exits the room, the counter decremented and this leads to turn OFF the lights. When all persons left the room then only lights in the room switched OFF. The difficulty in this system is that the door of room should not allow more than one person at a time.

Vahid et al [5] proposed a system whose control is depend on Arduino microcontroller, network communications and Modbus industrial protocol. Arduino Ethernet shield and a wireless router device is used to built the network communication. The specific Android application is used to load the Modbus program into mobile or Windows software named "mypro" and on Arduino board, Arduino code loaded through USB (Universal Serial Bus) cable. There is interconnection between Arduino Ethernet Shield and mobile through Ethernet cable and router. By connecting to router, user can control and monitor the appliances easily. The Table 1 summarizes the available methods in Literature survey.

Table 1. Summary of Literature Survey

<i>Sr. No.</i>	<i>Title</i>	<i>Technology Used</i>
1.	Implementation of Smart Class Room Using WAGO PLC	WAGO PLC and Arduino Uno [1]
2.	Smart Lighting System using Raspberry Pi	Raspberry Pi [2]
3.	Automatic Lighting And Control System For Classroom	PIR sensor, relay and Bluetooth module [3]
4.	Automatics Room Light Controller with Visitor Counter	Infrared(IR) Transmitter, IR Receiver Microcontroller, Bidirectional Visitor counter, section Display Automatic Room Light controller section LCD Display, Relay Darlington pair [4]
5.	Low-Cost Home Automation Using Arduino and Modbus Protocol	Communication Protocol, Arduino Uno [5]

III. 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.

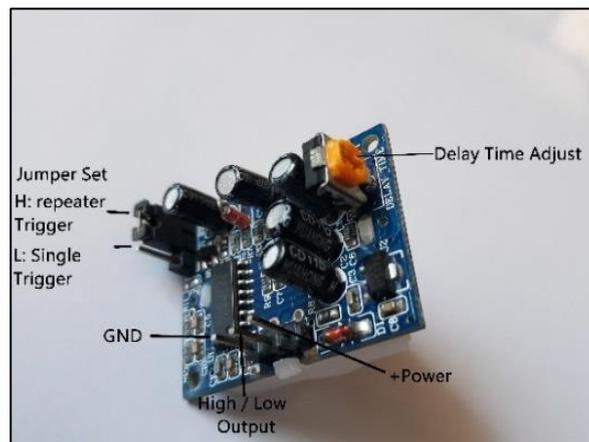


Figure 1. PIR sensor

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.

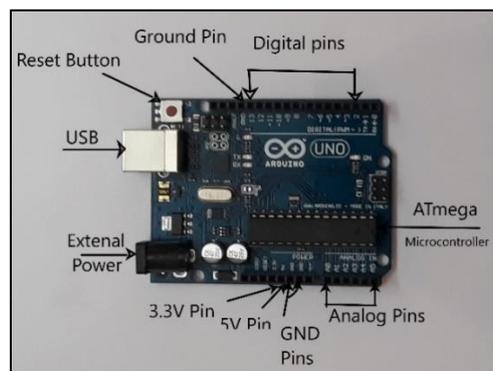


Figure 2. Arduino Uno

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.

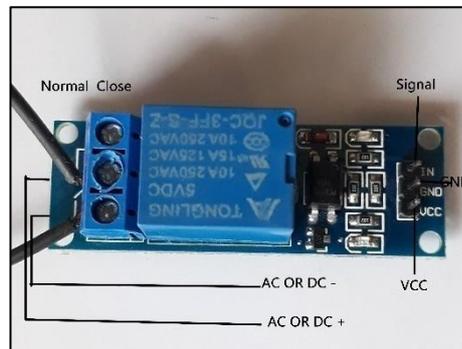


Figure 3. Relay Module

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.

IV. 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 by 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.

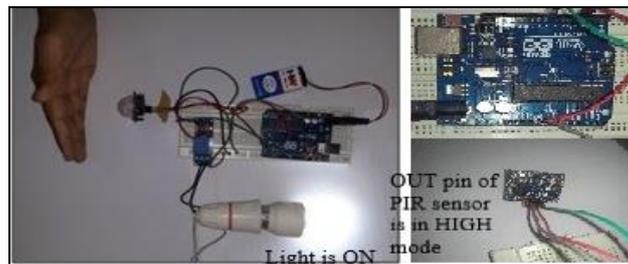


Figure 5. After detection by PIR sensor

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.

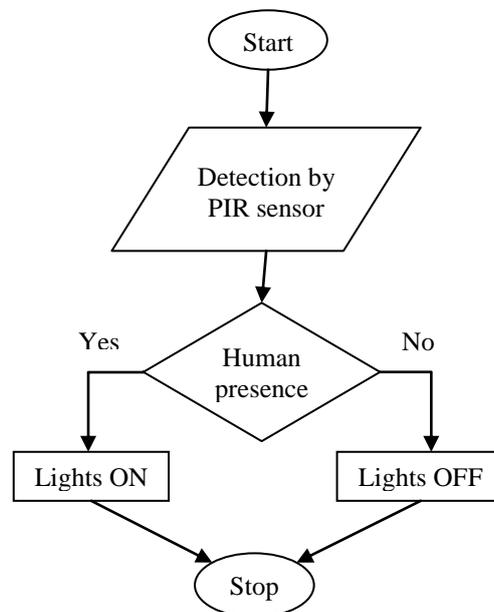


Figure 6. Flowchart of Automatic Light System

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

V. 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. The Table 2 shows the units consumed in 4 days.

Table 2. Practical Readings

Status	Date	Hours	Opening Readings	Closing Readings	Units consumed per hour
Before Installation	20/08/2018	12	3822.4	3822.6	0.2
	21/08/2018	12	3822.6	3822.8	0.2
After Installation	22/08/2018	12	3822.8	3822.9	0.1
	23/08/2018	12	3822.9	3823.0	0.1

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 pie chart it is observed that there is saving of almost 50% power consumption.

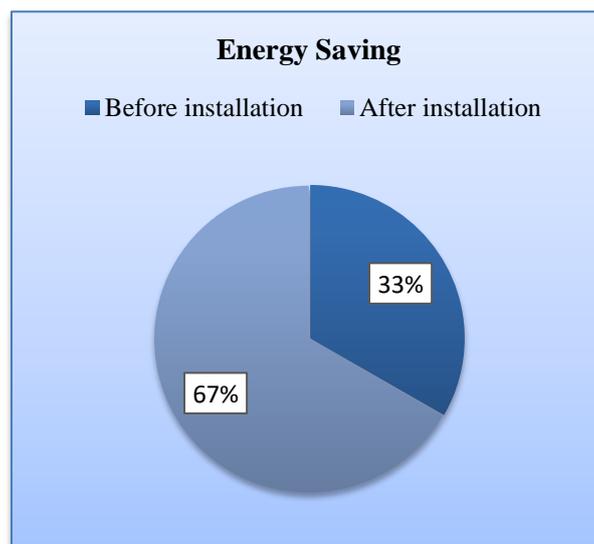


Figure 7. Pie chart – Energy Saving

VI. 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.

VII. 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.

REFERENCES

- [1] Vibhuti and Shimi S.L., "Implementation of Smart Class Room Using WAGO PLC", Proceedings of the Second International Conference on Inventive Systems and Control (ICISC) 2018, Coimbatore, pp. 807-812.
- [2] A. Maslekar, K. Aparna, K. Mamatha and T.Shivakumara, "Smart Lighting System using Raspberry Pi", International Journal of Innovative Research in Science and Technology, Vol.4(7), 2015, pp.5113-5121I.
- [3] Suresh S, H.N.S.Anusha, T.Rajath, P.Soundarya and S.V.PrathyushaVudatha. "Automatic Lighting And Control System For Classroom" 2016 International Conference on ICT in Business Industry & Government (ICTBIG).
- [4] "Automatics Room Light Controller with Visitor Counter", Available from <http://www.projectsof8051.com/automaticroom-light-controller-with-visitor-counter>
- [5] Vahid Hassanpour, Sedighe Rajabi, Zeinab Shayan, Zahra Hafezi, Mohammad Mehdi Arefi , "Low-Cost Home Automation Using Arduino and Modbus Protocol", 5th International Conference on Control, Instrumentation and Automation (ICCIA), Shiraz, 2017, pp. 284-289.
- [6] <https://components101.com/microcontrollers/arduino-Uno>

ACKNOWLEDGEMENT

I would like to express my special thanks to **Dr. Lenina S.V.B**, as she has given full support and guide for this work. I would like to thank **TEQIP Coordinator Dr. A. V. Nandedkar** and **Director Dr. Y.V. Joshi, SGGSI&T**, Vishnupuri, Nanded, Maharashtra, for support and permitted us to work on paper.

BOIGRAPHIES



Miss. Pathan Hajera Sharmin AyyubKhan, is a student of B. Tech. Final Year, Department of Electronics and Telecommunication Engineering, Shri Guru Gobind Singhji Institute of Engineering and Technology, Nanded, Maharashtra, India.



Miss. Shaikh Safoora Sadaf Shaikh Gayasoddin, is a student of B. Tech. Final Year, Department of Electronics and Telecommunication Engineering, Shri Guru Gobind Singhji Institute of Engineering and Technology, Nanded, Maharashtra, India.



Dr. Lenina SVB, Ph.D., is an Assistant professor, Department of Electronics and Telecommunication Engineering, Shri Guru Gobind Singhji Institute of Engineering and Technology, Nanded, Maharashtra, India. She has been in the profession of teaching at university level for more than a decade. Earlier, she has also worked at various institutes in India. Besides, she has also received a number of recognitions in her academic career including the Woman Scientist-C (WOS-C) Fellowship from the Department of Science and Technology, India. Dr. Lenina has a life membership of several professional bodies, including Indian Society for Technical Education (ISTE), Institution of Engineering and Technology (IET) and Institute of Electrical and Electronics Engineers (IEEE: IEEE Membership Number: 94310317). She is a registered Indian Patent Agent (INPA 2625). She has authored many Journals, Conference Papers, Books and Book Chapters. She is a yoga practitioner too. Her research and teaching interests include Image Processing, Biometrics, Filter Design, Higher Order Spectral Analysis and Signal Processing, Intellectual Property Rights.