

Smart Class Automation

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Abstract: Today's world day automation is very much essential. Smart classroom is the representative of modern teaching. Now-a-days a smart fan and light is very much essential to the concept of "smart class". When it is hot, using a fan which is less expensive than compared to air conditioner. When an individual forgets to turn off the fan and light, it leads to the waste of electricity. So, they move on to automation. Most of the previous research paper explained that IR and PIR sensors act as the sensing sensors. The performance of IR sensor has poor tolerance to light reflection such as bright light object. The passive infrared sensor (PIR) has the drawback of temperature limit. So, in this project we have used ultrasonic sensor. The main advantage of ultrasonic sensors is that it does not have any range or zone like a PIR sensor. It is used to measure the distance between the human and predefined set point. The microcontroller and ultrasonic transducer HC-SR05 forms the basis of the circuit. The ultrasonic module sends signal to the object and pick up its echo and output a wave form processing and varies the intensity of the fan. Here these sensors are fixed in the overhead ceiling fan. These sensors can sense up to 360-degree circumference beneath the fan and a thermostat is used to maintain the temperature in the room. This paper also describes about the remote controller fan on pressing the OPEN and CLOSE switch.

Keywords: HC-SR04, MLS, PIR, Smart fan.

1. Introduction

The classroom automation system is developed by the automatic switching of light and fan. Our country has developed in different season. The temperature will be above 40 degree Celsius in most regions during summer. It becomes very uncomfortable to live without a fan. In fact, a fan plays a major role in our households. For many people fan is the standard way of cooling down. Sometimes the individuals forget to turn off the light when they are out and this leads to wastage of electricity. Thus, we have decided to initiate a system that could save the electricity by automatic switching on and off the fan and light. Here this section had a glance on its previous researches [1] Adelakun, Adebiyi A., et al., automatic room light controlled using PIR sensor. Where PIR is used to detect the presence of human. [2] Ahmed, Mahmud Shehu, et al., it represents a simple design and implementation of a remote-controlled fan regulator. it enables the user to operate a fan regulator from approximately 10 meters away. [3] Burhanuddin Bharmal et al., LDR based light detection circuit d temperature sensor based fan of off controller circuit [4]. Indeevar Reddy et al., they proposed using IR and LDR sensor

for automation of lights and fans using Arduino with Internet of Things for smart homes [5]. Keeratiburt Kanchanasatian Here the author used DHT22 temperature sensors were used to monitor the temperature. HC-SR04 ultrasonic sensors were used to detect the users [6]. Mishra R, e t al., they works on the development of automatic person detection system to control electrical fan and lights using Microcontroller 16F887A. [7] Nikita Bagali, et al., Here the author used Raspberry Pi and IR sensor [8]. Shimi S.L et al proposed a system which operates with control of relays and with the use of WAGO PLC (Programmable Logic Controller) and Arduino Uno. [9] Suresh S it is about automatic room light system by using visitor counters operation [10]. Vahid et al proposed a system whose control is depend on Arduino microcontroller, network communications and Modbus industrial protocol.

2. Existing system

The existing system work consists of automatic device control system which used to control the light control using Arduino and PIR sensor shown in Fig. 1. The components used in this system are Arduino Uno, PIR sensor and relay module. Here the system mainly depends on PIR sensor which helps in detecting human presence. The Relay Module which allows Arduino, Raspberry Pi or other Microcontrollers to control big electrical loads.

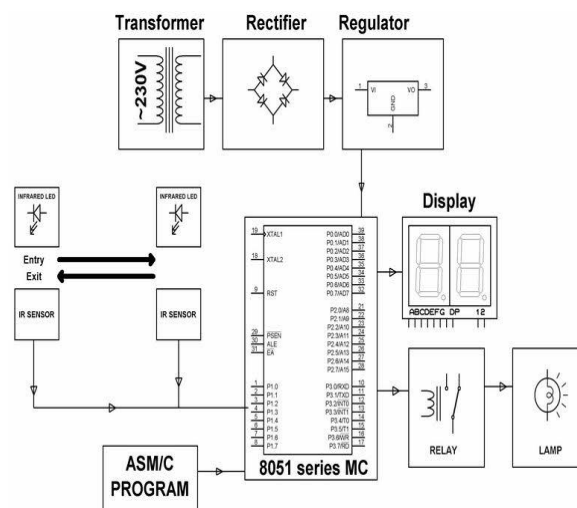


Fig. 1. Block diagram of existing system

In this working process the Arduino Uno and PIR sensor plays an important role. Where the lights in the room will turn ON automatically by detecting a human presence. The light of the room is OFF because PIR Sensor's becomes low when there is no presence of human. The lights will turn ON when the PIR Sensor will become HIGH because of person enters the room. The relay will be activated by Arduino Uno. The total number of persons inside the room is displayed on the seven segment displays.

3. Proposed System

The principle of our proposed system is based on ultrasonic sensors. It is also known transducers which work on the broader principle of radar or sonar. Active ultrasonic sensors generate high frequency sound waves and it measures the time interval between transmission of the signal and reception of the echo. This principle helps us in acquiring the distance between the object and the transmitter module.

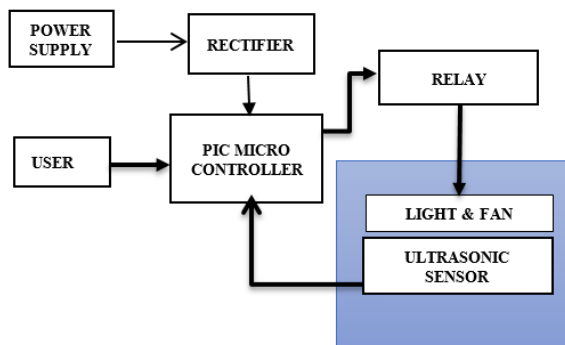


Fig. 2. Block diagram of proposed system

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 fig. 2.

4. Working

The basic block diagram of proposed system with ultrasonic sensor based smart fan and light control. The HCSR04 ultrasonic sensor module is used to sense the presence of human in the class. The HC-SR04 ultrasonic module has a ranging distance from 2cm to 500cm with a resolution of 0.3cm. It requires a voltage supply of 5V and a standby current of less than 2mA. The module transmits an ultrasonic signal, receives its echo and measures the time duration between the two events and generates a waveform.

A. Relay driver circuit

A relay driver circuit is a circuit which can drive, this block has the potential to drive the various controlled devices. In this

block mainly we are using the transistor and the relays. One relay driver circuit we are using to control the light. Output signal from AT89S52 is given to the base of the transistor, which we are further energizing the particular relay or operate, a relay so that it can function appropriately in a circuit.

B. Microcontroller (16F877A)

This powerful (200 nanosecond instruction execution) yet easy-to-program (only 35 single word instructions) CMOS FLASH-based 8-bit microcontroller packs Microchip's powerful PIC® architecture into 40 packages. The PIC16F877A features 256 bytes of EEPROM data memory, self-programming, an LCD, 2 Comparators, 8 channels of 10-bit Analog-to-Digital (A/D) converted. PIC microcontrollers (Programmable Interface Controllers), are electronic circuits that can be programmed to carry out a vast range of tasks. They can be programmed to be timers or to control a production line and much more.

C. Ultrasonic sensor

An ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back shown in Fig 3. By recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the object.

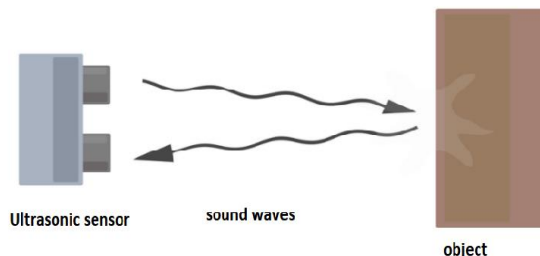


Fig. 3. Diagram of ultrasonic sensor operation

5. Conclusion

This paper proposes the usage of ultrasonic sensor-based fan in home/class automation. Traditional usage of PIR/IR sensors was studied and their disadvantages were noted such as their poor tolerance to light reflections or in fact the temperatures limit issues. So ultrasonic sensors are used in this paper to reduce these disadvantages.

References

- [1] Adalakun, A, Adewale, Adeyinka A and Abdulkareem, Ademola and Olowoleni, J. O. (2014) "Automatic Control and Monitoring of Electrical Energy Consumption Using PIR Sensor Module". International Journal of Scientific & Engineering Research, 5 (5). pp. 493-496.
- [2] J. U. Duncombe, "Infrared navigation—Part I: An assessment of feasibility," IEEE Trans. Electron Devices, vol. ED-11, no. 1, pp. 34–39, Jan. 1959.
- [3] Mahmud Shehu Ahmed, Abubakar Sadiq Mohammed, Temitope George ONIMOLE, Paul Obafemi ATTAH "Design and Construction of a Remote-Controlled Fan Regulator". Leonardo Electronic Journal of

- Practices and Technologies ISSN 1583-1078 Issue 9, July-December 2006, Page: 55-62.
- [4] D. B. Payne and J. R. Stern, "Wavelength-switched passively coupled single-mode optical network," in Proc. IOOC-ECOC, 1985, pp. 585–590.
- [5] Burhanuddin Bharmal, Aniruddha Shahapurkar, Akshay Aswalkar "Automatic Home Lighting solutions using Human Detection, Sunlight Intensity and Room Temperature", International Research Journal of Engineering and Technology (IRJET) Volume: 04 Issue: 06, June 2017, Page 691.
- [6] Nilesh A. Lakade¹, Rajat Patel, Pinak Panchal (2019) "Intelligent Lighting System for Classrooms and Mall using IoT". International Research Journal of Engineering and Technology (IRJET). Volume: 06 Issue: 06, Page 3223.
- [7] Kanchanasatian, Keeratiburt. "Automatic Speed Control and Turning ON/OFF for Smart Fan by Temperature and Ultrasonic Sensor". IOP Conference Series: Materials Science and Engineering. Vol. 325, No. 1. IOP Publishing, 2018.
- [8] Mishra, R., Raza, S., Zulquarnain, R. A., and Kumar, P. (2013)." Development of automatic person detection system to control Ac fan and room lights". International Journal of Innovative Research in Science, Engineering and Technology, 2(3).
- [9] Nikita Bagali, Geeta Navalyal, "Sensor-Based Automatic Fan Controlling System and Power Consumption Analysis" International Journal of Advanced Research in Computer and Communication Engineering Vol. 5, Issue 6, June 2016.
- [10] 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.
- [11] Suresh S, H. N. S. Anusha, T. Rajath, P. Soundarya and S. V, Prathyusha Vudatha. "Automatic Lighting and Control System for Classroom" 2016 International Conference on ICT in Business Industry & Government (ICTBIG).
- [12] Vahid, Lenina S. V. B, "Automatic Gadget Control System Using Arduino and PIR Sensor." International Conference on Research Trends in Engineering, Applied Science and Management (ICRTESSM-2018) on 4th November 2018.