

Intelligent Energy Saving System

Sonali Gopal Umbre¹ Komal Dipak Yadav² Priya Laxman Phad³ Namrata Shivsharan⁴ Mrs. Jyoti Dange⁵

^{1,2,3,4,5}Department of Electronics & Telecommunications Engineering
^{1,2,3,4,5}Atharva College Of Engineering Malad, Mumbai, India

Abstract— This application of Micro-controller for the Energy Conservation with Bidirectional Visitor Counter together known as intelligent energy saving system, is a reliable circuit that takes over the task of controlling the room light, temperature as well as counting number of persons in the room very accurately. When somebody enters in to the room the counter is incremented by one and the light, fan(load) in the room will be switched ON and when any one leaves the room then, the counter is decremented by one. The light, fans will only be switched off when all the persons in the room go out. Here total number of persons inside the room is displayed on LCD display. The microcontroller does the above job. It acts like the CPU of the whole system It receives the signals from the sensors, and this signal is operated under the control of software which is stored in ROM. Microcontroller AT89S52 continuously monitor the Infrared Receivers, LM35, PIR sensors, LDR. When any object passes through the IR sensor the Receiver will sense the obstruction and send the signal to the counter and further the Microcontroller does its operations saving energy, reducing cost while giving the same output and comfort to people.

Key words: Energy Conservation, Comfort of people, Cost reduction

I. INTRODUCTION

The objective of this project is to make a micro-controller based model to count the number of persons visiting a particular room and accordingly light up the room and fans in the room accordingly. Here we use sensor to detect the number of persons coming inside the room or leaving the room. In today's world, there is a continuous need for automatic appliances. The world is running fast and so the device or appliances should be. With the increase in standard of living, there is a sense of urgency for developing circuits that would ease the complexity of life. Also if at all one wants to know the number of people present in room so as not to know the percentage of congestion, this application proves to be helpful. as it employs, PIR sensors, passive infrared sensors to detect the presence of persons inside a room also temperature is controlled by using an temperature sensor LM35 and LDR for sensing natural light and hence switching the loads (lights, fan) accordingly

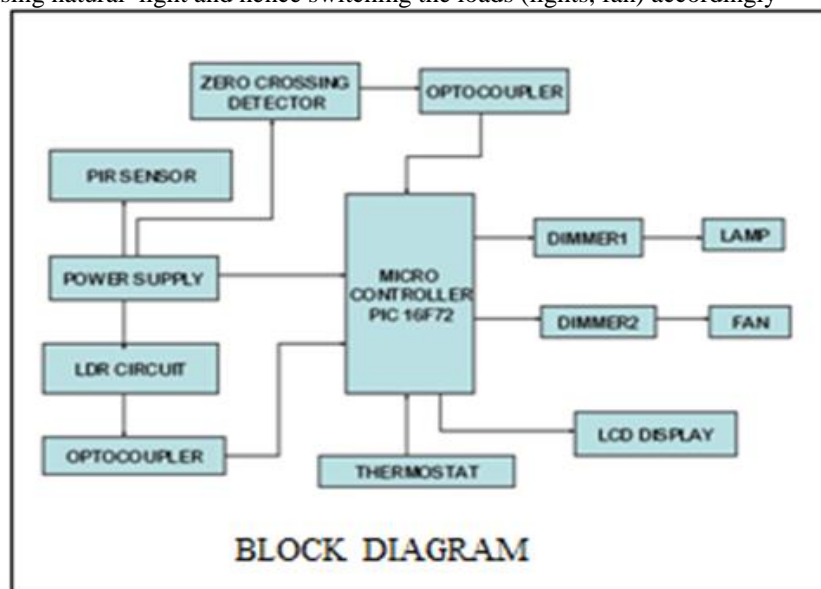


Fig. 1: Block Diagram

The above figure shows the block diagram for this micro-controller application. They mainly comprise of the Micro-controller, IR sensors, Relays, Seven segment display etc. They can be further elaborated as:-

A. Power Supply

Here we use +12V and +5V dc power supply. The main function of this block is to provide the required amount of voltage to essential circuits. +12V voltages is given to opto-coupler and TRIAC. To get the +5V dc power supply we have used here IC7805, which provides the +5Vdc regulated power supply. Also a transformer is used to step down a high voltage AC to a low voltage AC. The Rectifier is used to convert AC into a DC

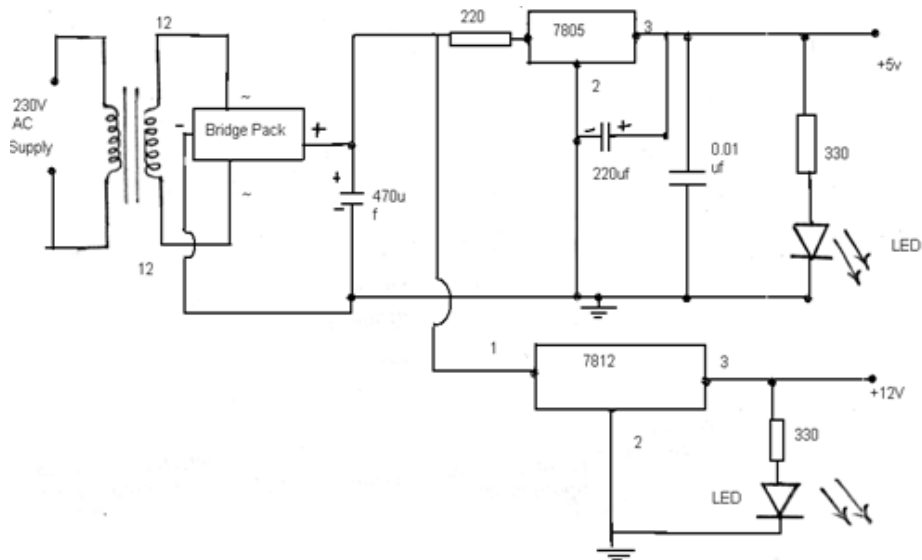


Fig. 2: Power Supply

B. IR Sensor

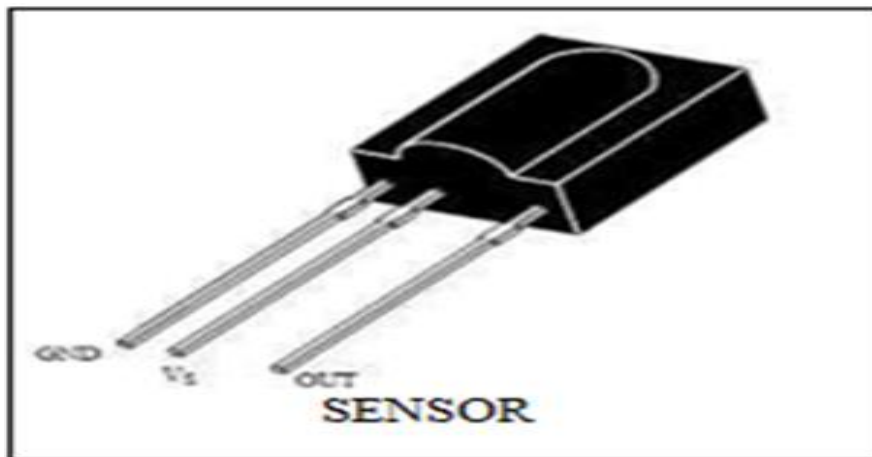


Fig. 3: Sensor

In this system we use IR sensors to detect the number of people going inside or coming outside. It is placed on the doors of a room or a hall. There are two parts of the sensor-Transmitter and the Receiver. When the person goes through the sensor there is objection and the receiver sends the signal to the Timer. We have implemented the person counter module using 2 transmitters and 2 receivers.

We use the Infra-Red transmitters as IRLED is infrared whose beams are not visible to human eyes and they are not easily triggered by other source Transmitters used are IRLEDs. We have used an IR sensor which is an active low device. It means it gives low output when it receives the Infrared rays. So when the IR rays are interrupted by any person then microcontroller will receive a high pulse from the IR receiver.

1) Features

- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Improved shielding against electrical field disturbance
- TTL and CMOS compatibility Output a active low
- Low power consumption
- High immunity against ambient light Continuous data
- Transmission possible (upto2400bps)
- Suitable burst length. 10cycles/burst

C. IC555 (Timer)



Fig. 4: IC 555(Timer)

This IC is used to generate the pulses. The LM555 is a highly stable device for generating accurate time delays or oscillation. Additional terminals are provided for triggering or resetting if we want. In the time delay mode of operation, the time is precisely controlled by one external resistor and capacitor. The circuit may be triggered and can be reset on falling wave forms, and the output circuit can source or sink upto 200mA of current or drive TTL circuits.

D. AT89S52 Microcontroller

It is a low-power, high performance CMOS 8-bit micro-controller with 8KB of Flash Programmable and Erasable Read Only Memory i.e. (PEROM). The device is manufactured using Atmel's High-Density non volatile memory technology and is this micro-controller is compatible with the MCS-51 instruction set and pinout. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non volatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89S52 is a powerful Microcontroller, which provides a highly flexible and cost effective solution to many embedded control applications. The AT89S52 provides some of the following specialist features like-Watch dog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial Port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down modes moves the RAM contents but it freezes the oscillator which disables all other chip functions until the next interrupt or hardware is reset.

1) Features

- 8KB Reprogrammable flash
- 32 Programmable I/O lines.
- 6 bit Timer/Counter—3.
- 8 Interrupt sources
- Power range: 4V–5.5V
- Endurance: 1000 Writes/Erase cycles
- Fully static operation: 0Hz to 33MHz
- 3 level program memory lock
- Power off flag
- Full duplex UART serial channel
- Low power idle and power down modes
- Interrupt recovery from power down modes 256KB internal RAM
- Dual data pointer

E. PIR Sensor

A PIR detector is a motion detector that senses the heat emitted by a living body. These are often fitted to security lights so that they will switch on automatically if approached. They are very effective in enhancing home security systems.

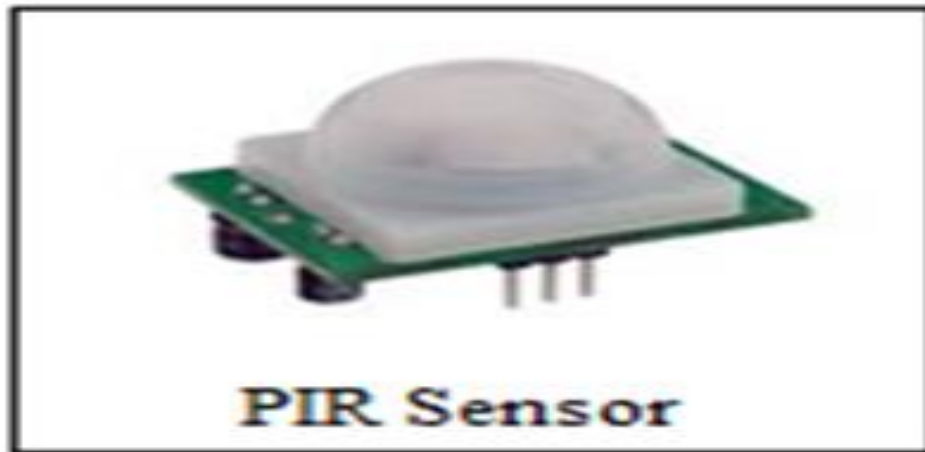


Fig. 5: PIR Sensor

F. Light Dependent Resistor(LDR)

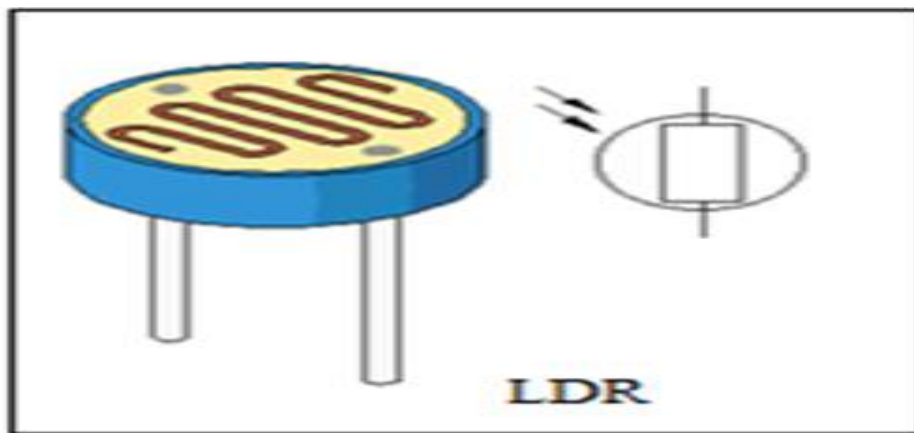


Fig. 6: LDR

LDRs or Light Dependent Resistors are very useful especially in light/dark sensor circuits. Normally the resistance of an LDR is very high, sometimes as high as 1000 000 ohms, but when they are illuminated with light resistance drops dramatically. Electronic opto sensors are the devices that alter their electrical characteristics, in the presences of visible or invisible light. The best-known devices of this type are the light dependent resistor (LDR), the photo diode and the phototransistors. Light dependent resistor as the name suggests depends on light for the variation of resistance.

G. Opto-Coupler

Opto-coupler is a device that uses a short optical transmission path to transfer a signal between elements of a circuit, typically a transmitter and a receiver, while keeping them electrically isolated — since the signal goes from an electrical signal to an optical signal back to an electrical signal, electrical contact along the path is broken. A common implementation involves a LED and a phototransistor, separated so that light may travel across a barrier but electrical current may not. When an electrical signal is applied to the input of the opto-isolator, its LED lights, its light sensor then activates, and a corresponding electrical signal is generated at the output. Unlike a transformer, the opto-isolator allows for DC coupling and generally provides significant protection from serious overvoltage conditions in one circuit affecting the other. With a photodiode as the detector, the output current is proportional to the amount of incident light supplied by the emitter.

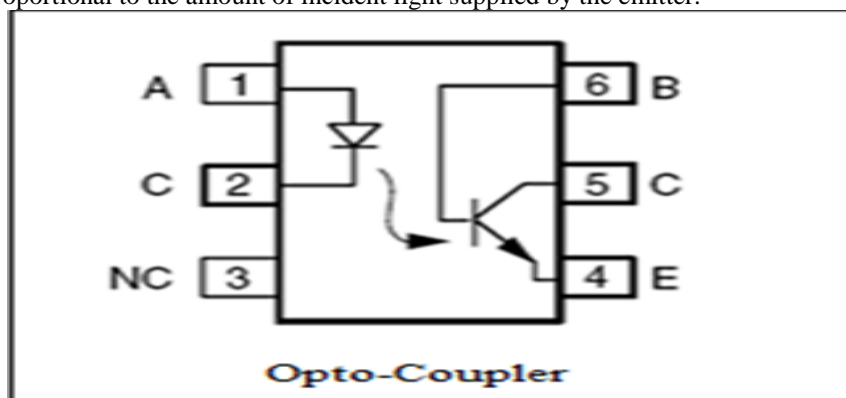


Fig. 7: Opto-Coupler

1) Features

- Interfaces with common logic families
- Input-output coupling capacitance < 0.5 Pf
- Industry Standard Dual-in line 6-pin package
- 5300 V RMS isolation test voltage.

H. Voltage Regulator

The three-terminal positive regulator are available in the TO-220/D-PAK package and with several fixed output voltages making them useful in a wide range of applications.



Fig. 8: Voltage Regulator

Each type employs internal current limiting, thermal shut down and safe operating area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current. Although designed primarily as fixed voltage regulators. These devices can be used with external components to obtain adjustable voltages and currents.

1) Features

- Output Current upto 1A
- Output Voltages of 5,6,8,9,10,12,15,18,24 V
- Thermal Overload Protection Short Circuit Protection
- Output Transistor Safe Operating Area Protection

I. LCD (Liquid Crystal Display)

LCD is a type of display used in digital watches and many portable computers. LCD displays utilize two sheets of polarizing material with a liquid crystal solution between them. An electric current passed through the liquid causes the crystals to align so that light cannot pass through them. LCD technology has advanced very rapidly since its initial inception over a decade ago for use in lap top computers. Technical achievements has resulted in brighter displays, higher resolutions, reduce response times and cheaper manufacturing process.

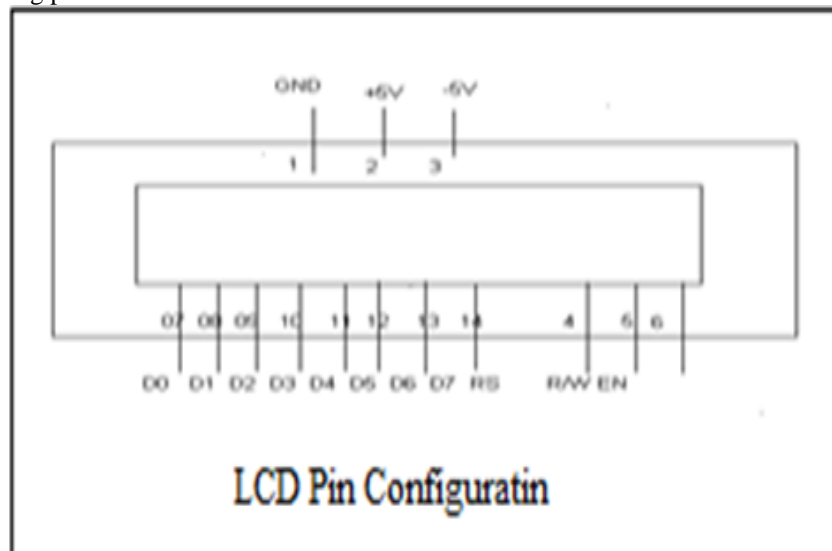


Fig. 9: LCD Pin Configuration

1) Flow Chart For Bidirectional Visitor Counter

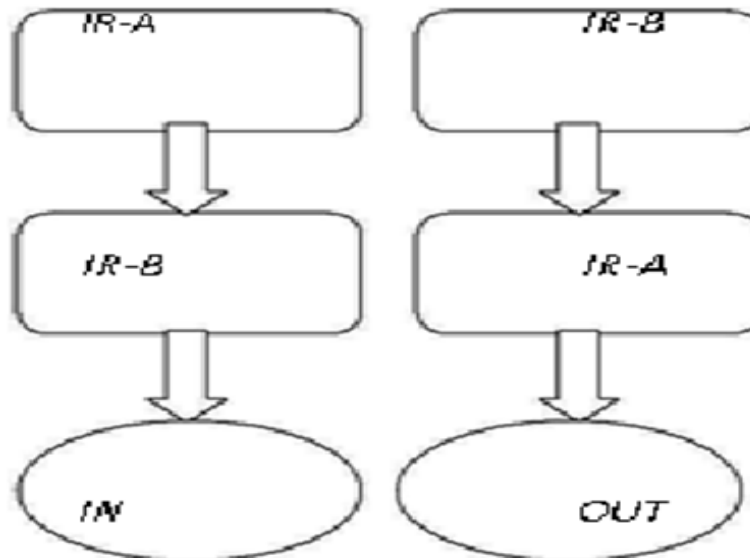


Fig. 10: Flow Chart for Bidirectional Visitor Counter

If IN+OUT \Rightarrow OFF
 If IN=OUT \Rightarrow ON

The above flow chart describes the working of this Application of Micro-Controller. The 2 sensors are to be put at the entrance. When the Ath IR sensor is interrupted the Micro-controller will look for the Bth IR sensor. That is if Ath sensor is interrupted 1st and then the Both sensor then it is said that the person is going inside. And vice-a-versa. Now the counter will send the pulse to the micro-controller, also keeps an check on PIR sensor for sensing the number of persons in the room.

Observations can be done by studying the 2 following cases:-

Case 1: No person present in the room

Idealy, in this case all the devices such as light fan should be made off. there can be various ways to detect the human presence such as "laser and photo diodes", Simple infrared waves , etc but these techniques uses point to point transmission and detection, hence to cover the whole room many sets of transmitter and receivers would be required, which will in turn increase systems cost and complexity. Another option is to use a PIR sensor, which senses human motion at an angle of 270 degrees with the range of approximately 10 feets. This suits the application well, reducing the cost and complexity, and provides easy installation.

Case 2: Limited number of persons present in the room

Switching is divided as follows

- persons 1 - 3 --- max 1 light 1 fan
- persons 4 - 7 --- max 2 lights 2 fans
- persons > 7 --- max all loads

II. APPLICATIONS

This project can be used in various rooms like seminar hall, conference hall where the capacity of room is limited and should not be exceeded. Project will display actual number of persons inside the room.

Automatic Room light and temperature Controller with Visitor Counter can be used in classrooms, study rooms and library in colleges.

This project can also be used in our home because as many times it happens that we come out of our bedroom or hall or kitchen and we forget to turn off the lights.

This project can be used in Cinema halls, multiplex, malls as well as in temples to count the number of person entering inside. So that these places should not get overcrowded to avoid congestion. We can fix the limit of people going inside and once the count is shown we will stop people from entering to avoid any troubles or even mishaps.

III. ADVANTAGES

- Energy Conservation is the most prime advantage of this project. It saves large amount of energy and also it saves money.
- Human efforts to count the number of person are eliminated.
- It automatically counts the number of people inside a particular room or hall.

IV. FUTURE DEVELOPMENT

- Voice Alarm System can be added with installed to indicate that “the room is full and no one can enter further”
- An GPS system can be employed to update the owner about the persons present and faulty loads if present.

V. CONCLUSION

This method of Energy Conservation will work more efficiently. It not only saves energy but it also proves to be beneficial financially. Thus with the help of the Micro-controller we can save large amount of energy also here, opto-coupler and TRAIC is used which minimizes the consumption as compared to .It also makes the room or hall more automated. We can also use for many other purposes like for attendance.

REFERENCES

A. Books

- [1] The 8051 microcontroller and embedded systems: By Muhammad Ali Mazidi
- [2] Myke Predko: “Handbook of Microcontrollers”, Amazon, 1887.
- [3] Jacob Millman Christos C. Halkias.: “Electronic Devices And Circuits”, Tata McGraw-Hill Publishing Company Ltd. Sep, 2003.
- [4] Bahadur, B.: “Liquid Crystals- Applications and Uses”, Litton Systems Canada, 1992

B. Journals Referred

- [5] Innovation: Magazine of Research & Technology,2000
- [6] Microcontroller solutions.