A MINI PROJECT REPORT
ON

BI-DIRECTIONAL DIGITAL VISITOR COUNTER WITH AUTOMATIC LIGHT CONTROL USING IR SENSOR

Submitted in partial fulfillment of the requirements for the award of the degree of

BACHELOR OF TECHNOLOGY
IN
ELECTRICAL & ELECTRONICS ENGINEERING
BY

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DEPARTMENT OF ELECTRICAL &ELECTRONICS ENGINEERING

PRAGATI ENGINEERING COLLEGE
(AUTONOMOUS)

(Approved by AICTE, Permanently Affiliated to JNTUK, KAKINADA & Accredited by NAAC With 'A' Grade)

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CERTIFICATE

DEPARTMENT OF ELECTRICAL &ELECTRONICS ENGINEERING

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This is to certify that the Project Report entitled **"BI-DIRECTIONAL VISITOR COUNTER WITH AUTOMATIC LIGHT CONTROL USING IR SENSORS"** is being submitted by P S R APARNA (19A31A0218), S GOWTHAM (19A31A0248), K SRI LAKSHMI (19A31A0212), V SAI GANESH (19A31A0255), P SUSHMITHA RANI (20A35A0201) in partial fulfilment for the award of theDegree of **Bachelor of Technology** in Electrical & Electronics Engineering of Pragati Engineering College, for the record of bonafide work carried out by them.

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ABSTRACT

Wastage of electricity is one of the main problems which we are facing now a days. In our home, school, colleges or industries we see that fans /lights are kept on even if there is nobody present in the room or area. This happens due to negligence or because we forgot to turn lights off when we are in a hurry. To avoid all such situations, we have designed this project called **Bi-Directional Visitor Counter** with automatic light control. It is made to prevent unwanted electric power waste. It also counts the no. of persons entering and exiting the room by using sensors

This project describes a circuit which is used for controlling the room lights according to the count of persons in the room and simultaneously works as a security system when the camera is attached. When somebody enters into the room then the counter will be incremented accordingly the LED light in the room will be switched ON and when any one leaves the room then the counter will be decremented. The light will be only switched OFF when the room is vacant. The number of the LED lights will be ON according to the total number of persons inside the room and the count will be displayed.

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CHAPTER 1

INTRODUCTION

INTRODUCTION

1.1 INTRODUCTION

There is a necessity for automatic appliances in day today life. So developing an automatic circuits will be helpful. At present a user has to switch ON and OFF the lights according to his/her requirement. Since the user can switch on and off the lights as per their preferences so there is a chance of keeping the lights in on state even though it was not required. This may occur because of carelessness of user and so a large amount of power is wasted. The most commonly used lighting control system used in buildings may cause wastage of valuable energy. The energy loss is occurred when a light is ON in an area which is not being used currently at that particular time or when a light is ON even though sufficient lighting is available for work. This paper describes a microcontroller based model used to count the number of persons entering in a particular room and accordingly LEDs in the room will be ON and simultaneously send the picture of the person entering or leaving the room to the user for security purpose. Infrared sensors are used to count the number of persons. This circuit also serve as the security system by sending the picture of the person entering and leaving the room. The main purpose of our proposed system is to save energy by making the lights ON or OFF according to the presence of the person in a room, to reduce the efforts required to switch on the lights and for the security reasons.

We are in a world of digital transformation in every aspect technology is one common thing people depend upon. If we look back in the 1970s, people used to count visitors manually by counting them or they used a manual tally counter. But today we can see that many methods have been introduced to count people without the need of any presence. The sensors and cameras will simplify our job of counting the people. we just need to program them to perform the required task. The primary method of counting visitors include hiring people to stand and manually count the number of guests or workers who enter or exit from the venue or location. Even the tally counters are not user friendly and dot have many advantages. Therefore, these methods prove to be unreliable and come at a great cost.

1.2 LITERATURE REVIEW

There is more than one method to count the visitors. It ultimately depends on the intensity of people. The following papers were studied and analysed to understand the current scope of people detection:

Bruno F.Carvalho and others have suggested a method that utilizes sensors for detecting people. The ultrasonic sensor plays a dominant role in identifying objects and accurately calculates the distance between the sensor and the objects. The ultrasonic sensor constantly measures the distance of objects ahead, sending a signal through Trigger pin e receiving through Echo. Two ultrasonic sensors are placed side by side and an algorithm is devised to count the number of visitors entering the premises. They have also implemented another method which uses motion sensors to detect any motion of an object or a person and compared the two methods. Both the methods are successfully tested in an environment. But this method cannot detect more than one person at a time. If two persons pass through the system side by side, the system will detect only one person.

Jeong Woo Choi and others have proposed a method that uses IR-UWB radar sensors for counting people. IR- UWB radar uses an impulse signal that occupies wide bandwidth. It is a technology that transmits an impulse signal and recognizes various situations by processing multiple signals that are received after being reflected from multiple human and objects. The algorithm devised for this method is implemented using ARM Cortex-M4 and Raspberry Pi 2 modules. Two IR-UWB sensors with antennas are fixed to count the number of people. Though the system can detect multiple people at a time, it is not cost efficient. The sensors are high expensive in the market.

Another approach using IR sensors was proposed by Jothibasu M, Aakash B and others. IR sensors play a vital role in identifying objects. In this method, two IR sensors are placed adjacent to each other which detect the visitors. The logic behind the working of the counting process is simple, when the person crosses the sensor near the door and then to the sensor away, it recognizes as an increment in count. Apart from being a bi-directional counter, this method can be used to control home appliances and helps in consuming less electricity. This method cannot detect more than one person at a time. If two persons pass through the system side by side, the system will detect only one person.

Jingwen Li have designed an approach that uses Bag- Of-Features (BOF) model to count the number of pedestrians. The system can also select pedestrians and non-pedestrians samples automatically and update the classifier in real-time to make it more suitable for certain specific scene. The dataset used is CASIA pedestrian counting dataset and trained using SVM classifier. The system requires real time monitoring of the pedestrians via camera modules which are very expensive. Kartik Madhira and Aditya Shukla have proposed a method that uses image processing techniques to count human specific areas such as ATMs, retail shops, malls etc. The people counter solution was made using computer vision library OpenCV for Python computer language. The method achieved around 80-93% accuracy. The cameras were positioned in many angles to test the accuracy of the method.

The system requires real time monitoring of the persons via camera modules which are very expensive.

Shubham Mathur and others have come up with a method that uses image processing with sensor feedback for counting people entering or leaving a lab. Histogram of oriented gradients (HOG) technique was used for this method. The images are captured using Raspberry Pi fitted with a RaspiCam. A pair of PIR sensors is installed to instruct the system to capture the images. The data can be sent via Bluetooth to local servers for security purposes. An efficiency of 83% is achieved using this method. The equipment used in this system is very expensive. The sensors add extra cost to the system apart from camera module and Raspberry Pi.

Another method proposed by Dr.P.Satyanarayana and others involves the use of OPEN CV3 using python 3.5.2. The implementation goes on like the process of background subtraction on the incoming frames followed by the blob analysis using which the person can be detected and by using virtual lines, the count of the people entering and leaving a particular area can be evaluated. The system requires real time monitoring of the persons via camera modules which are very expensive.

David Beymer proposed a method that involves 3D stereo vision. The stereo system performs real-time 3D reconstruction by employing table lookup to map from image coordinates and isparities to 3D. Based on the 3D coordinates, the scene is (1) segmented by filtering out pixels outside the volume of interest, and (2) reprojected to a top- down, orthographic view. Finally, people are detected and tracked in the orthographc reprojection using a Gaussian mixture model and Kalman filtering. The system requires real time monitoring of the persons via camera modules which are very expensive.

1.3 PROJECT OBJECTIVE

This project is not linked to a specific application or a specific operating environment, but it can be easily implemented wherever such an application is needed. This circuit uses a microcontroller which ensures the flexibility of the circuit, due to which this circuit can be easily integrated or assembled with other modules or circuits where ever required. All the components required are readily available in the market and the circuit is easy to build. The significant feature of this project is that it decides the entry and exit of visitors from a single door bell.

The aim of the project is to count the objects (persons) entering and leaving the room and also switch the room accordingly. If we consider an office or a conference hall or any other room, we need to turn on the light whenever anybody enters the room. This is true even in the day time at some places like conference halls or offices where a good brightness levels are desired. Also, the lights should be turned off by the last person leaving the room. The problem is, when the first person is entering a room, he should search for switch bound and then for the right set of switches among hundreds of switches corresponding to light fans, etc of the conference hall. This is a daunting task while leaving the hall, we cannot guarantee that the last person turn off the lights. Even if he attempts to do it, he again faces the problem the first person had faced. We should not expect them to do that work going through the switching rigmaroles.

To avoid this problem, we have made a circuit which automatically switches ON/OFF the room light depending on the number of people in the room. This circuit keeps track of number of visitors. If the number of visitors is greater than zero, then it turns ON all the lights. Else, it turns OFF all the lights automatically/ it does not require any manual intervention

CHAPTER 2

PROJECT DETAILS

2.1 BLOCK DIAGRAM

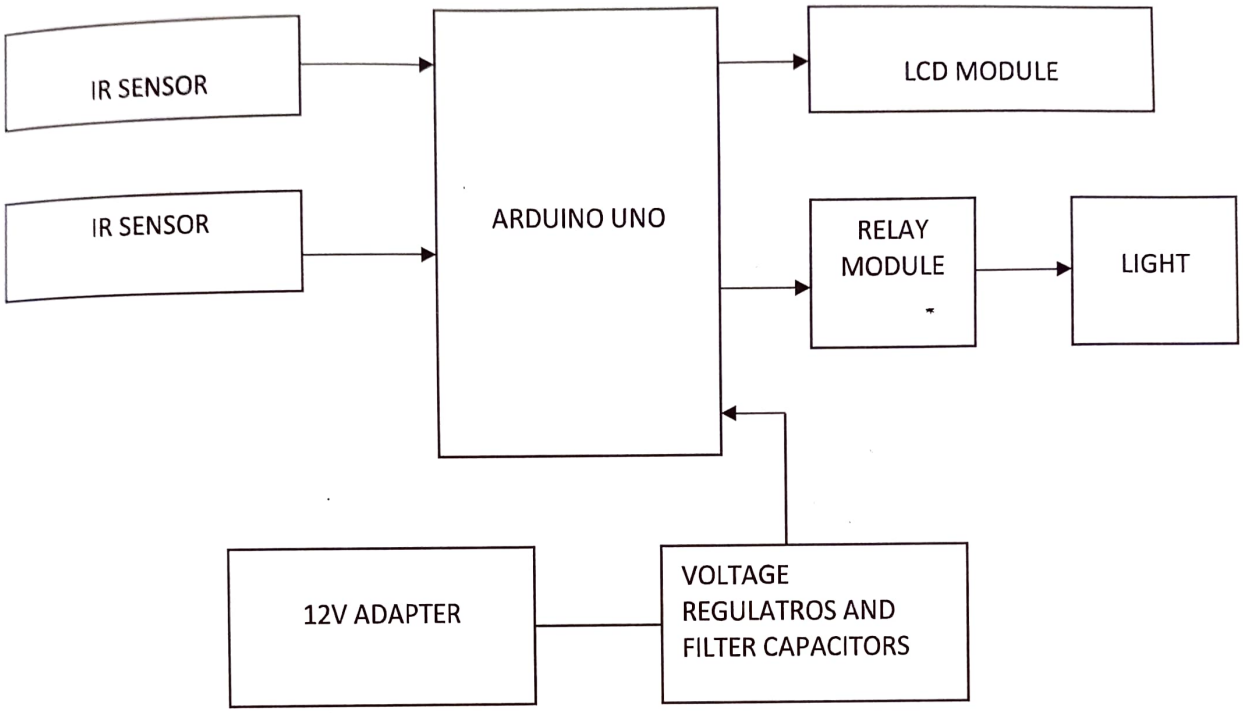

Fig 2.1: - Block Diagram

2.2 CIRCUIT DIAGRAM

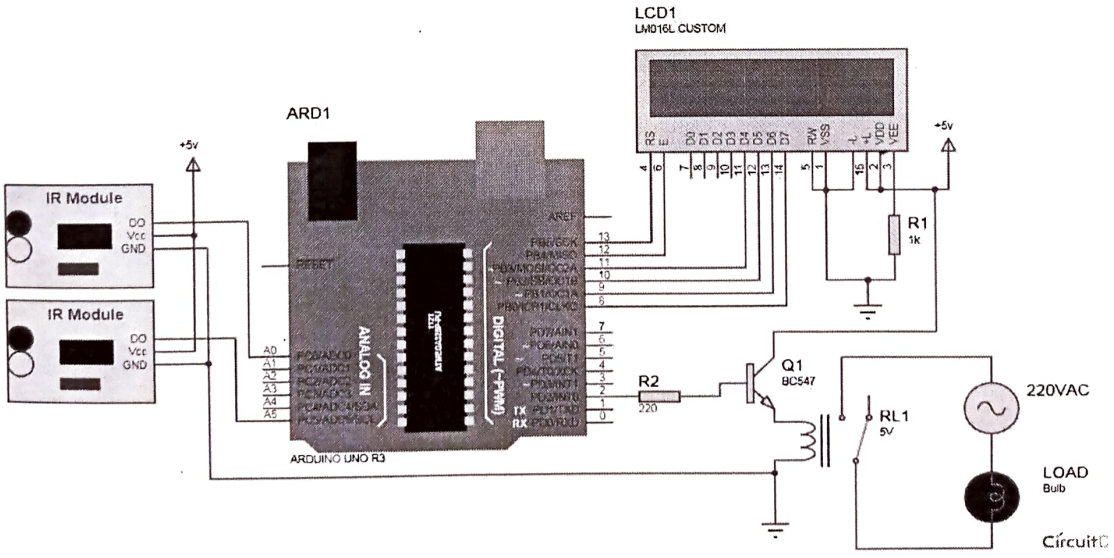

Fig 2.2: - Circuit Diagram

2.3 COMPONENTS REQUIRED IN THE PROJECT

Hardware Requirements

- Arduino UNO
- LCD Module
- IR Sensor
- 12V Adapter
- 12V Relay
- Voltage Regulators
- Filter Capacitors
- Other Components

Software Requirements

- Arduino IDE Compiler
- Embedded C Programming Language

CHAPTER 3

COMPONENTS DESCRIPTION

3.1 ARDUINO UNO

Arduino is common term for a software company, project, and user community that designs and manufactures computer open-source hardware, open-source software, and microcontroller-based kits for building digital devices and interactive objects that can sense and control physical devices.

The project is based on microcontroller board designs, produced by several vendors, using various microcontrollers. These systems provide sets of digital and analog I/O pins that can interface to various expansion boards (termed *shields*) and other circuits. The boards feature serial communication interfaces, including Universal Serial Bus (USB) on some models, for loading programs from personal computers. For programming the microcontrollers, the Arduino project provides an integrated development environment (IDE) based on a programming language named Processing, which also supports the languages C and C++.

The first Arduino was introduced in 2005, aiming to provide a low cost, easy way for novices and professionals to create devices that interact with their environment using sensors and actuators. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats, and motion detectors.

Arduino programs may be written in any programming language with a compiler that produces binary machine code. Atmel provides a development environment for their microcontrollers, AVR Studio and the newer Atmel Studio.

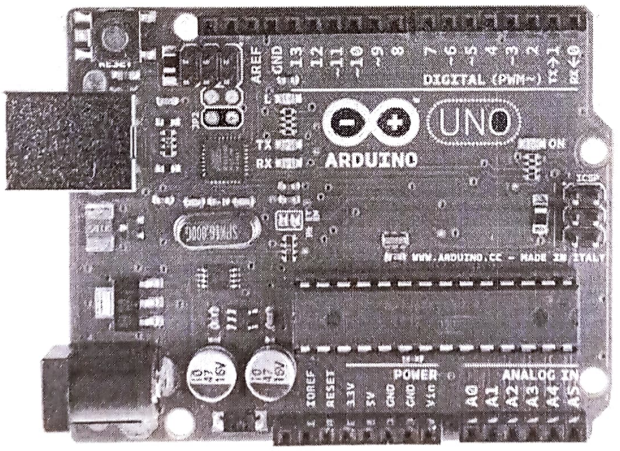

Fig 3.1: - Arduino Uno

ARDUINO UNO - Details

The Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.

TECHNICAL SPECIES

Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limit)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328P) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz
Length	68.6 mm
Width	53.4 mm
Weight	25 g

Table-1: Technical Species

ARDUINO IDE

The Arduino **integrated development environment (IDE)** is a cross-platform application (for Windows, macOS, Linux) that is written in the programming language Java. It is used to write and upload programs to Arduino compatible boards, but also, with the help of 3rd party cores, other vendor development boards.

The source code for the IDE is released under the GNU General Public License, version 2. The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub *main()* into an executable cyclic executive program with the GNU tool chain, also included with the IDE distribution. The Arduino IDE employs the program *argued* to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

Prerequisites

Before you start proceeding with this tutorial, we assume that you are already familiar with the basics of C and C++. If you are not well aware of these concepts, then we will suggest you go through our short tutorials on C and C++. A basic understanding of microcontrollers and electronics is also expected.

3.2 IR SENSOR MODULE

Infrared technology addresses a wide variety of wireless applications. The main areas are sensing and remote controls. In the electromagnetic spectrum, the infrared portion is divided into three regions: near infrared region, mid infrared region and far infrared region.

The wavelengths of these regions and their applications are shown below.

- Near infrared region — 700 nm to 1400 nm — IR sensors, fiber optic
- Mid infrared region — 1400 nm to 3000 nm — Heat sensing
- Far infrared region — 3000 nm to 1 mm — Thermal imaging

The frequency range of infrared is higher than microwave and lesser than visible light.

For optical sensing and optical communication, photo optics technologies are used in the near infrared region as the light is less complex than RF when implemented as a source of signal. Optical wireless communication is done with IR data transmission for short range applications.

An infrared sensor emits and/or detects infrared radiation to sense its surroundings.

Infrared sensors can be passive or active. Passive infrared sensors are basically Infrared detectors. Passive infrared sensors do not use any infrared source and detects energy emitted by obstacles in the field of view. They are of two types: quantum and thermal. Thermal infrared sensors use infrared energy as the source of heat and are independent of wavelength. Thermocouples, pyroelectric detectors and bolometers are the common types of thermal infrared detectors.

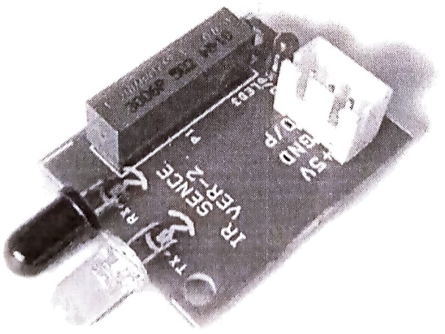

Fig 3.2(a): - IR Sensor Module

Principle of Working

The principle of an IR sensor working as an Object Detection Sensor can be explained using the following figure. An IR sensor consists of an IR LED and an IR Photodiode; together they are called as Photo – Coupler or Opto – Coupler.

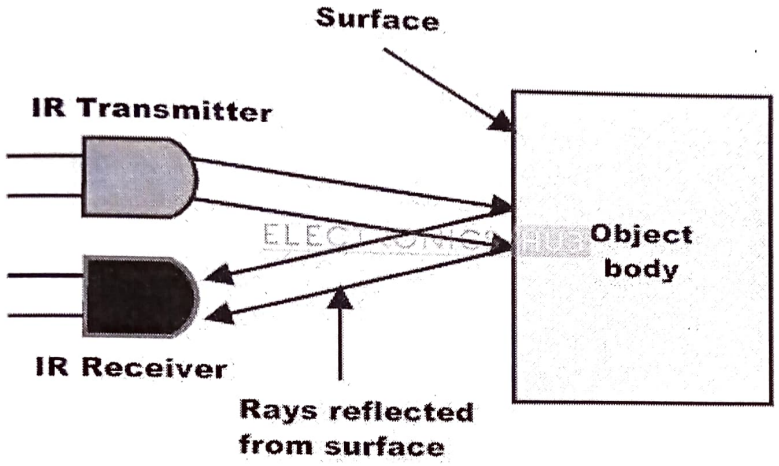

Fig 3.2(b): - IR Sensor Principle of Working

When the IR transmitter emits radiation, it reaches the object and some of the radiation reflects back to the IR receiver. Based on the intensity of the reception by the IR receiver, the output of the sensor is defined.

IR SENSING CIRCUIT

A typical IR sensing circuit is shown below.

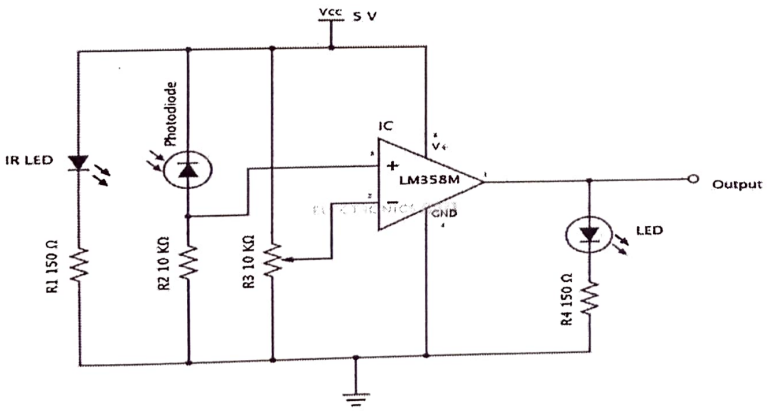

Fig 3.2(c): - IR Sensing Circuit

It consists of an IR LED, a photodiode, a potentiometer, an IC Operational amplifier and an LED.

IR LED emits infrared light. The Photodiode detects the infrared light. An IC Op – Amp is used as a voltage comparator. The potentiometer is used to calibrate the output of the sensor according to the requirement.

When the light emitted by the IR LED is incident on the photodiode after hitting an object, the resistance of the photodiode falls down from a huge value. One of the input of the op – amp is at threshold value set by the potentiometer. The other input to the op-amp is from the photodiode's series resistor. When the incident radiation is more on the photodiode, the voltage drop across the series resistor will be high. In the IC, both the threshold voltage and the voltage across the series resistor are compared. If the voltage across the resistor series to photodiode is greater than that of the threshold voltage, the output of the IC Op – Amp is high. As the output of the IC is connected to an LED, it lightens up. The threshold voltage can be adjusted by adjusting the potentiometer depending on the environmental conditions.

The positioning of the IR LED and the IR Receiver is an important factor. When the IR LED is held directly in front of the IR receiver, this setup is called Direct Incidence. In this case, almost the entire radiation from the IR LED will fall on the IR receiver. Hence there is a line-of-sight communication between the infrared transmitter and the receiver. If an object falls in this line, it obstructs the radiation from reaching the receiver either by reflecting the radiation or absorbing the radiation.

3.3 DIODES

A diode is an electronic component with two electrodes (connectors). It allows electricity to go through it only in one direction.

Diodes can be used to convert alternating current to direct current (Diode bridge). They are often used in power supplies and sometimes to decode amplitude modulation radio signals (like in a crystal radio). Light-emitting diodes (LEDs) are a type of diode that produce light.

Today, the most common diodes are made from semiconductor materials such as silicon or sometimes germanium.

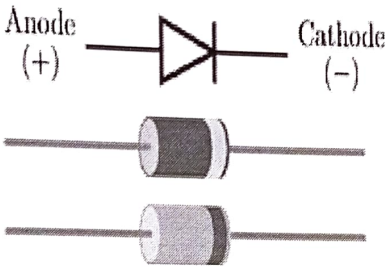

Fig 3.3: - Diode

Construction

Semiconductor diodes are made of two types of semiconductors connected to each other. One type has atoms with extra electrons (called the n-side). The other type has atoms that want electrons (called the p-side). Because of this, the electricity will flow easily from the side with too many electrons to the side with too few. However, electricity will not flow easily in the reverse direction. Silicon with arsenic dissolved in it makes a good n-side semiconductor, while silicon with aluminum dissolved in it makes a good p-side semiconductor, but other materials can also work.

The connector to the n-side is called the cathode, the connector to the p-side is called the anode.

Function of a diode

Positive voltage at p-side

If you give positive voltage to the p-side and negative voltage to the n-side, the electrons in the n-side will want to go to the positive voltage at the p-side and the holes of the p-side will want to go to the negative voltage at the n-side. Because of this, current flow is able to exist, but it takes a certain amount of voltage to get this started (very small amount of voltage is not enough to get the

electric current to flow). This is called the cut-in voltage. The cut-in voltage of a silicon diode is at about 0.7 V. A germanium diode needs a cut-in voltage at about 0.3 V.

Negative voltage at p-side

If you instead give negative voltage to the p-side and positive voltage to the n-side, the electrons of the n-side want to go to the positive voltage source instead of the other side of the diode. Same thing happens on the p-side. So, current will not flow between the two sides of the diode. Increasing the voltage will eventually force electric current to flow (this is the break-down voltage). Many diodes will be destroyed by a reverse flow but some are made that can survive it.

Applications of Diodes

- Radio demodulation
- Power conversion
- Over-voltage protection
- Logic gates
- Temperature measurements

3.4 ELECTROLYTIC CAPACITOR

An electrolytic capacitor is a type of capacitor that uses an electrolyte to achieve a larger capacitance than other capacitor types. An electrolyte is a liquid or gel containing a high concentration of ions. Almost all electrolytic capacitors are polarized, which means that the voltage on the positive terminal must always be greater than the voltage on the negative terminal.

The benefit of large capacitance in electrolytic capacitors comes with several drawbacks as well. Among these drawbacks are large leakage currents, value tolerances, equivalent series resistance and a limited lifetime. Electrolytic capacitors can be either wet-electrolyte or solid polymer. They are commonly made of tantalum or aluminum, although other materials may be used.

Supercapacitors are a special subtype of electrolytic capacitors, also called double-layer electrolytic capacitors, with capacitances of hundreds and thousands of farads. This article will be based on aluminum electrolytic capacitors. These have a typical capacitance between 1μF to 47mF and an operating voltage of up to a few hundred volts DC.

Aluminum electrolytic capacitors are found in many applications such as power supplies, computer motherboards and many domestic appliances. Since they are polarized, they may be used only in DC circuits.

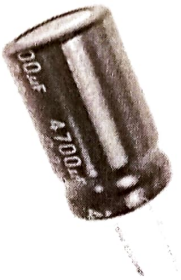

Fig 3.4: - Electrolytic Capacitor

Characteristics

Capacitance drift

The capacitance of electrolytic capacitors drifts from the nominal value as time passes, and they have large tolerances, typically 20%. This means that an aluminum electrolytic capacitor with a nominal capacitance of 47μF is expected to have a measured value of anywhere between 37.6μF and 56.4μF. Tantalum electrolytic capacitors can be made with tighter tolerances, but their maximum operating voltage is lower so they cannot be always used as a direct replacement.

Polarity and safety

Due to the construction of electrolytic capacitors and the characteristics of the electrolyte used, electrolytic capacitors must be forward biased. This means that the positive terminal must always be at a higher voltage than the negative terminal. If the capacitor becomes reverse-biased (if the voltage polarity on the terminals is reversed), the insulating aluminum oxide, which acts as a dielectric, might get damaged and start acting as a short circuit between the two capacitor terminals. This can cause the capacitor to overheat due to the large current running through it. As the capacitor overheats, the electrolyte heats up and leaks or even vaporizes, causing the enclosure to burst. This process happens at reverse voltages of about 1 volt and above. To maintain safety and prevent the enclosure from exploding due to high pressures generated under overheat conditions, a safety valve is installed in the enclosure. It is typically made by making a score in the upper face of the capacitor, which pops open in a controlled manner when the capacitor overheats. Since electrolytes may be toxic or corrosive, additional safety measures may need to be taken when cleaning after and replacing an overheated electrolytic capacitor.

There is a special type of electrolytic capacitors for AC use, which is designed to withstand reverse polarization. This type is called the non-polarized or NP type.

3.5 LCD 2 X 16 MODULE

A liquid-crystal display (LCD) is a flat-panel display or other electronic visual display that uses the light-modulating properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are used in a wide range of applications including computer monitors, televisions, instrument panels, aircraft cockpit displays, and signage. They are common in consumer devices such as DVD players, gaming devices, clocks, watches, calculators, and telephones, and have replaced cathode ray tube (CRT) displays in nearly all applications. They are available in a wider range of screen sizes than CRT and plasma displays, and since they do not use phosphors, they do not suffer image burn-in. LCDs are, however, susceptible to image persistence.

The LCD screen is more energy-efficient and can be disposed of more safely than a CRT. Its low electrical power consumption enables it to be used in battery-powered electronic equipment more efficiently than CRTs. It is an electronically modulated optical device made up of any number of segments controlling a layer of liquid crystals and arrayed in front of a light source (backlight) or reflector to produce images in color or monochrome.

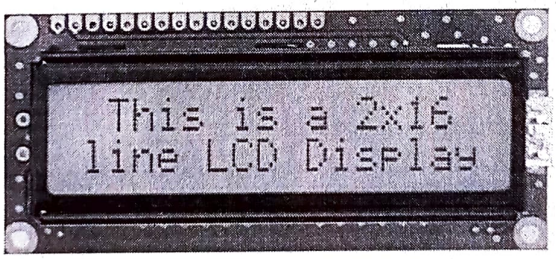

Fig 3.5: - LCD Display

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

3.6 LED – LIGHT EMITTING DIODE

A **light-emitting diode (LED)** is a two-lead semiconductor light source. It is a p–n junction diode, which emits light when activated.[4] When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, and the color of the light (corresponding to the energy of the photon) is determined by the energy band gap of the semiconductor.

An LED is often small in area (less than 1 mm^2) and integrated optical components may be used to shape its radiation pattern.[5]

Appearing as practical electronic components in 1962,[6] the earliest LEDs emitted low-intensity infrared light. Infrared LEDs are still frequently used as transmitting elements in remote-control circuits, such as those in remote controls for a wide variety of consumer electronics. The first visible-light LEDs were also of low intensity, and limited to red. Modern LEDs are available across the visible, ultraviolet, and infrared wavelengths, with very high brightness.

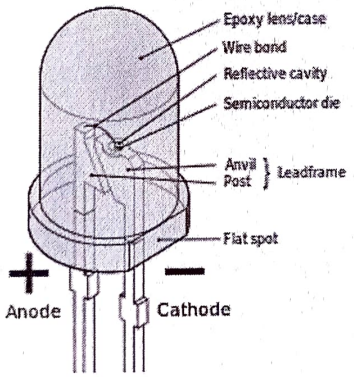

Fig 3.6(a): - LED

Early LEDs were often used as indicator lamps for electronic devices, replacing small incandescent bulbs. They were soon packaged into numeric readouts in the form of seven-segment displays, and were commonly seen in digital clocks.

Types

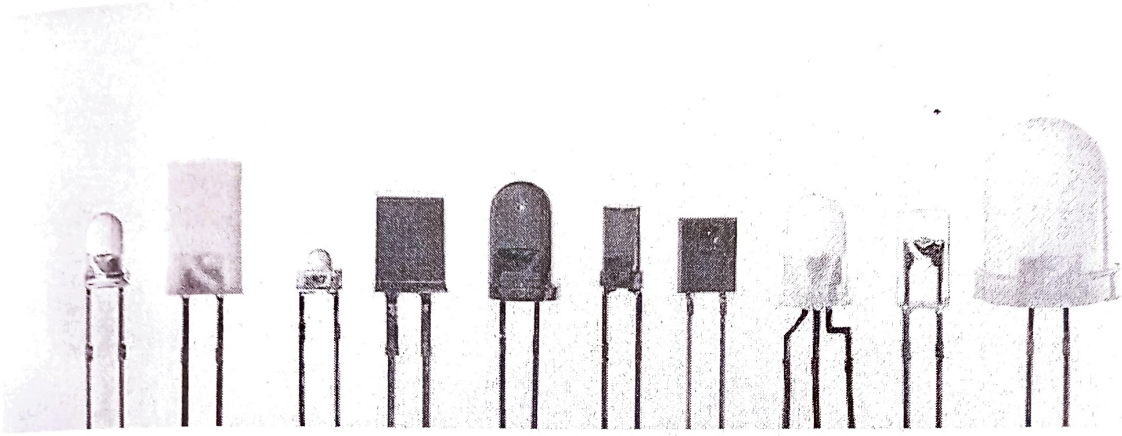

Fig 3.6(b): - Led Types

The main types of LEDs are miniature, high-power devices and custom designs such as alphanumeric or multi-color

Miniture

These are mostly single-die LEDs used as indicators, and they come in various sizes from 2 mm to 8 mm, through-hole and surface mount packages. They usually do not use a separate heat sink. Typical current ratings range from around 1 mA to above 20 mA. The small size sets a natural upper boundary on power consumption due to heat caused by the high current density and need for a heat sink.

Common package shapes include round, with a domed or flat top, rectangular with a flat top (as used in bar-graph displays), and triangular or square with a flat top. The encapsulation may also be clear or tinted to improve contrast and viewing angle.

Researchers at the University of Washington have invented the thinnest LED. It is made of two-dimensional (2-D) flexible materials. It is three atoms thick, which is 10 to 20 times thinner than three-dimensional (3-D) LEDs and is also 10,000 times smaller than the thickness of a human hair. These 2-D LEDs are going to make it possible to create smaller, more energy-efficient lighting, optical communication and nano lasers.[118]

There are three main categories of miniature single die LEDs:

Low-current

Typically rated for 2 mA at around 2 V (approximately 4 mW consumption)

Standard

20 mA LEDs (ranging from approximately 40 mW to 90 mW) at around:

- 1.9 to 2.1 V for red, orange, yellow, and traditional green
- 3.0 to 3.4 V for pure green and blue
- 2.9 to 4.2 V for violet, pink, purple and white

Ultra-high-output

20 mA at approximately 2 or 4–5 V, designed for viewing in direct sunlight

5 V and 12 V LEDs are ordinary miniature LEDs that incorporate a suitable series resistor for direct connection to a 5 V or 12 V supply.

Applications of LED

LED uses fall into four major categories:

- Indicators and signs
- Lighting
- Data communication and other signaling
- Sustainable lighting
- Energy consumption
- Light sources for machine vision systems

3.7 RELAY

A **relay** is an electrically operated switch. Many relays use an electromagnet to mechanically Operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

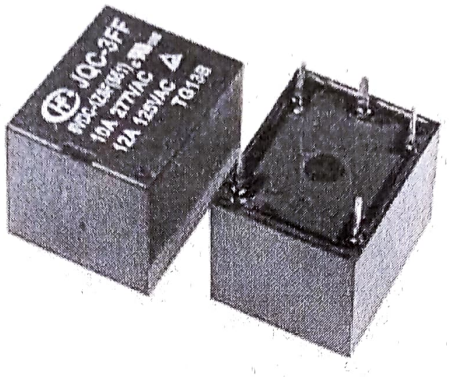

Fig 3.7: - Relay

A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contactor. Solid-state relays control power circuits with no moving parts, instead using a semiconductor device to perform switching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called "protective relays".

3.8 VOLTAGE REGULATORS

A **voltage regulator** is designed to automatically maintain a constant voltage level. A voltage regulator may be a simple "feed-forward" design or may include negative feedback control loops. It may use an electromechanical mechanism, or electronic components. Depending on the design, it may be used to regulate one or more AC or DC voltages.

Electronic voltage regulators are found in devices such as computer power supplies where they stabilize the DC voltages used by the processor and other elements. In automobile alternators and central power station generator plants, voltage regulators control the output of the plant. In an electric power distribution system, voltage regulators may be installed at a substation or along distribution lines so that all customers receive steady voltage independent of how much power is drawn from the line.

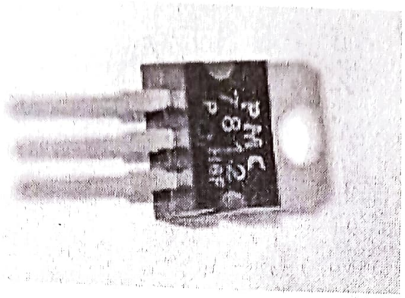

Fig 3.8: - Voltage Regulator

The **78xx** (sometimes **L78xx**, **LM78xx**, **MC78xx**...) is a family of self-contained fixed linear voltage regulator integrated circuits. The 78xx family is commonly used in electronic circuits requiring a regulated power supply due to their ease-of-use and low cost. For ICs within the family, the *xx* is replaced with two digits, indicating the output voltage (for example, the 7805 has a 5-volt output, while the 7812 produces 12 volts). The 78xx line are positive voltage regulators: they produce a voltage that is positive relative to a common ground. There is a related line of **79xx** devices which are complementary negative voltage regulators. 78xx and 79xx ICs can be used in combination to provide positive and negative supply voltages in the same circuit.

78xx ICs have three terminals and are commonly found in the TO-220 form factor, although they are available in surface-mount, TO-92, and TO-3 packages. These devices support an input voltage anywhere from around 2.5 volts over the intended output voltage up to a maximum of 35 to 40 volts depending on the model, and typically provide 1 or 1.5 amperes of current (though smaller or larger packages may have a lower or higher current rating).

Advantages

- 78xx series ICs do not require additional components to provide a constant, regulated source of power, making them easy to use, as well as economical and efficient uses of space. Other voltage regulators may require additional components to set the output voltage level, or to assist in the regulation process. Some other designs (such as a switched-mode power supply) may need substantial engineering expertise to implement.
- 78xx series ICs have built-in protection against a circuit drawing too much current. They have protection against overheating and short-circuits, making them quite robust in most applications. In some cases, the current-limiting features of the 78xx devices can provide protection not only for the 78xx itself, but also for other parts of the circuit.

7805 is a **voltage regulator** integrated circuit. It is a member of 78xx series of fixed linear voltage regulator ICs. The voltage source in a circuit may have fluctuations and would not give the fixed voltage output. The **voltage regulator IC** maintains the output voltage at a constant value. The xx

in 78xx indicates the fixed output voltage it is designed to provide. 7805 provides +5V regulated power supply. Capacitors of suitable values can be connected at input and output pins depending upon the respective voltage levels.

Pin Description:

Pin No	Function	Name
1	Input voltage (5V-18V)	Input
2	Ground (0V)	Ground
3	Regulated output; 5V (4.8V-5.2V)	Output

Table 2: - Pin Description

3.9 RESISTOR

A **resistor** is a passive two-terminal electrical component that implements electrical resistance as a circuit element. Resistors act to reduce current flow, and, at the same time, act to lower voltage levels within circuits. In electronic circuits, resistors are used to limit current flow, to adjust signal levels, bias active elements, and terminate transmission lines among other uses. High-power resistors, that can dissipate many watts of electrical power as heat, may be used as part of motor controls, in power distribution systems, or as test loads for generators. Fixed resistors have resistances that only change slightly with temperature, time or operating voltage. Variable resistors can be used to adjust circuit elements (such as a volume control or a lamp dimmer), or as sensing devices for heat, light, humidity, force, or chemical activity.

Resistors are common elements of electrical networks and electronic circuits and are ubiquitous in electronic equipment. Practical resistors as discrete components can be composed of various compounds and forms. Resistors are also implemented within integrated circuits.

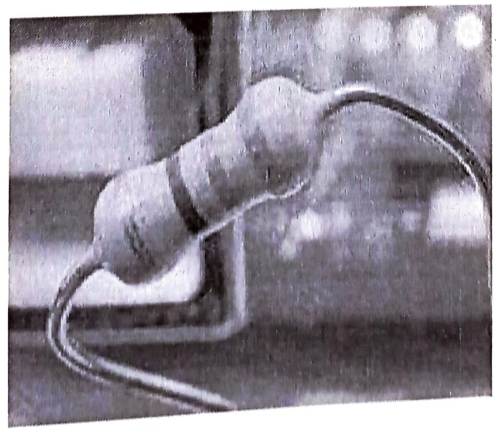

Fig 3.9: - Resistor

Types of Resistors

Resistors come in a variety of shapes and sizes. They might be through-hole or surface-mount. They might be a standard, static resistor, a pack of resistors, or a special variable resistor.

Termination and mounting

Resistors will come in one of two termination-types: through-hole or surface-mount. These types of resistors are usually abbreviated as either PTH (plated through-hole) or SMD/SMT (surface-mount technology or device).

Through-hole resistors come with long, pliable leads which can be stuck into a breadboard or hand-soldered into a prototyping board or printed circuit board (PCB). These resistors are usually more useful in breadboarding, prototyping, or in any case where you'd rather not solder tiny, little 0.6mm-long SMD resistors. The long leads usually require trimming, and these resistors are bound to take up much more space than their surface-mount counterparts.

The most common through-hole resistors come in an axial package. The size of an axial resistor is relative to its power rating. A common ½W resistor measures about 9.2mm across, while a smaller ¼W resistor is about 6.3mm long.

Surface-mount resistors are usually tiny black rectangles, terminated on either side with even smaller, shiny, silver, conductive edges. These resistors are intended to sit on top of PCBs, where they're soldered onto mating landing pads. Because these resistors are so small, they're usually set into place by a robot, and sent through an oven where solder melts and holds them in place.

SMD resistors come in standardized sizes; usually either 0805 (0.8mm long by 0.5mm wide), 0603, or 0402. They're great for mass circuit-board-production, or in designs where space is a precious commodity. They take a steady, precise hand to manually solder, though!

CHAPTER 4
PROJECT WORKING

4. WORKING PRINCIPLE

The proposed system is mainly divided into five important sections and they are Sensor, Controller, Counter display, Gate and Power supply. At first the sensor will observe an interruption and provide an input signal to the controller which will run the counter. The counter is incremented or decremented depending on the entry or exit of the person in a particular room and counting is displayed on a 16x2 LCD through the controller.

Arduino Uno controller board is used to process the entire system. IR sensor module is used to detect the Entry and Exit of the Gates. To Power this entire System we have 12V Adapter based Power Supply. 1N4007 diode based full wave rectifier circuit is used rectify 12V AC voltage to 12V Dc Voltage.

Voltage Regulator 7805 and 7812 are used to produce constant 5V and 12V DC Output. These Voltages are used by Arduino, LCD Module, and other Minor Circuit. Filter Capacitors are used to produced Constant and filtered DC Voltage. The count is displayed on LCD by the controller. If there is at least 1 person is inside the hall, an LED will glow otherwise is off

CHAPTER 5

RESULT & FUTURE SCOPE

5.1 RESULT

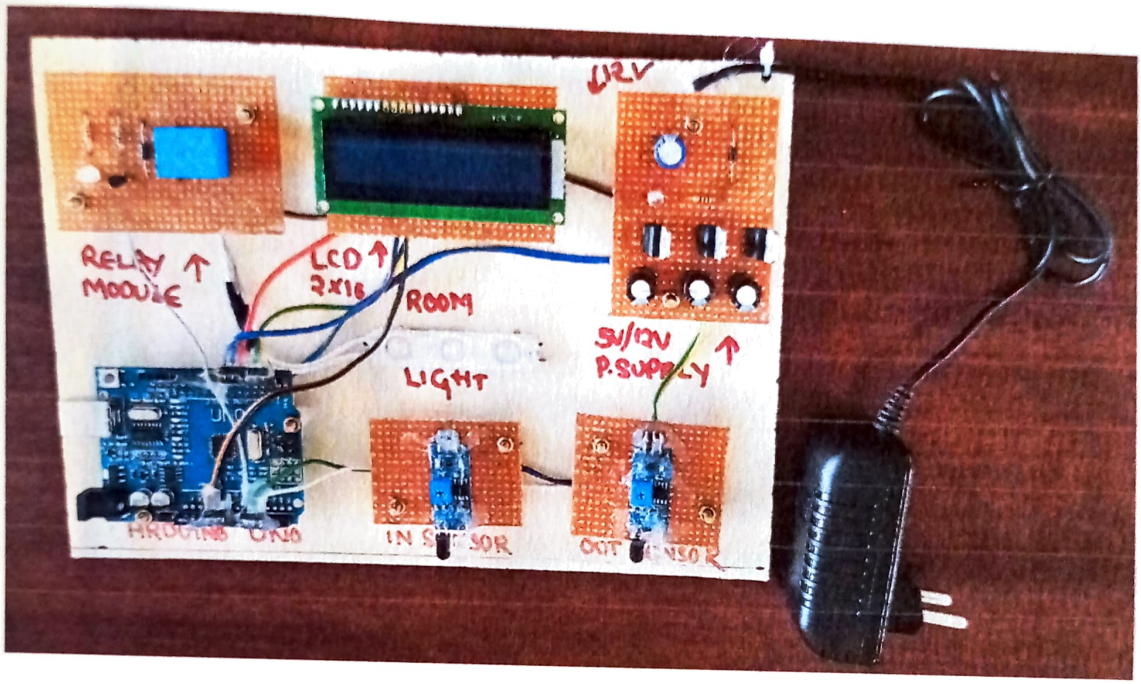

Fig 5.1(a): - Prototype of Bi-Directional Visitor Counter

The proposed system is mainly divided into 5 important sections and they are **SENSOR, CONTROLLER, COUNTER DISPLAY, GATE and POWER SUPPLY**

Here the IR Sensor Module is used to detect the entry and exit of the gates. To power this entire system we have 12V adapter based power supply counting is displayed on a 16 x 2 LCD through the controller

Voltage regulator 7805 and 7812 are used to produce constant 5V and 12V DC output filter capacitors are used to produce constant and filtered DC Voltage the count is displayed on LCD by the controller

The main purpose of our proposed system is to save energy by making the lights ON or OFF according to the presence of the person in a room, to reduce the efforts required to switch on the lights and for the security reasons

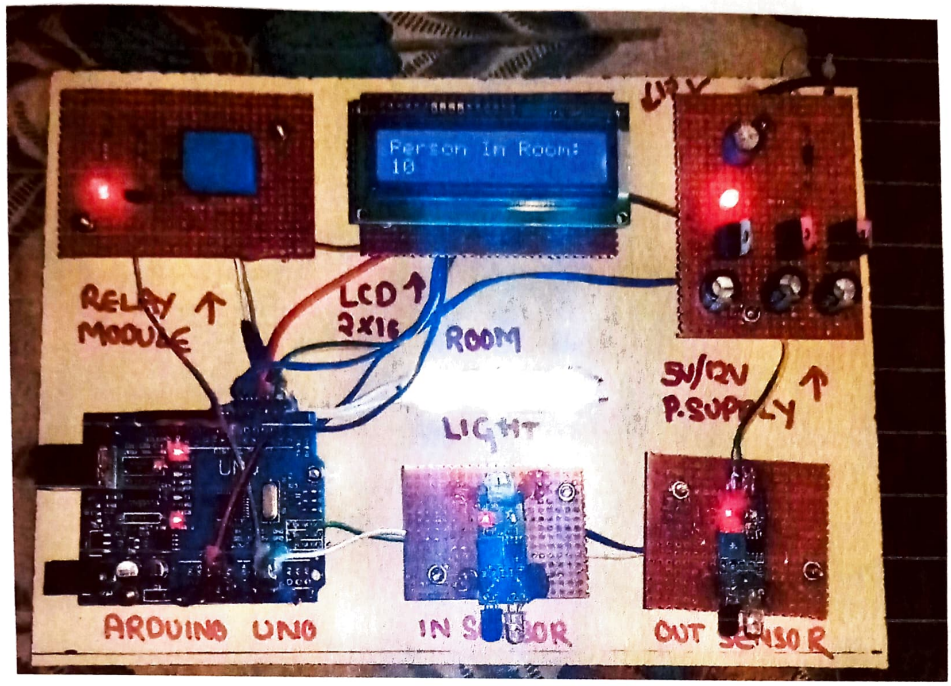

Fig 5.1(b): - LCD Display Showing The Count Of Number Of Persons In Room

IN today's world, there is a continuous need for automatic appliances. The objective of this project is to make a controller-based model to count number of persons visiting particular room and accordingly lights up the room automatically

Here we are using sensor and controller to count the no of persons in the room and display it on the LCD

At first the sensor will observe an interruption and provide an input signal to the controller which will run the count

If sensor 1 senses a person, it informs the controller that a person has entered so that controller can increment the count. At the same time it gives a delay of 1 sec so that the person can cross the sensor 2 and the count is maintained correctly

If there is at least 1 person is inside the hall, LED will glow.

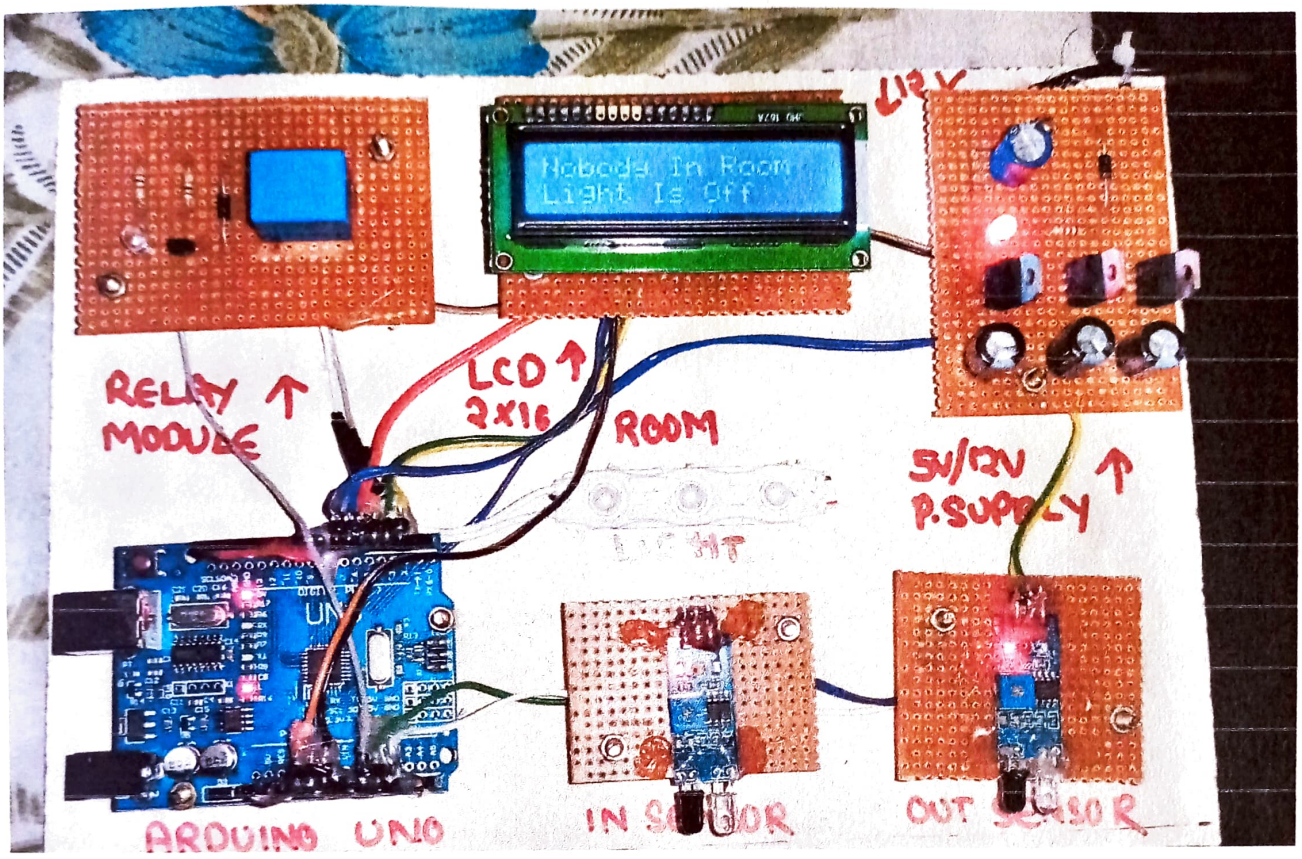

Fig 5.1(c): - LCD Display Showing That Nobody is in the room then light will remains off

Wastage of electricity is one of the main problem which we are facing now a days. In our home, school, colleges or industries we see that fan/lights are kept on even if there is no body present in the room or area

This happens due to negligence or because we forgot to turn lights off when we are in a hurry. It is made to prevent unwanted electric power waste. When a person exists, the sensor 2 informs the controller to decrement the count. Similarly It also provides a delay of 1 sec to maintain count properly and light will remain off.

The count is displayed on LCD by the controller. If there is no one inside the hall, LED will remain off.

5.2 APPLICATIONS

- School and Colleges
- Offices and Corporate Buildings
- House and Function Halls
- Public gathering Areas

5.3 ADVANTAGES

- Low Cost and Easy to implement
- Saves Energy by switching off light if no Person Available
- Fully Automatic System to count number of persons in Rooms

5.4 DISADVANTAGES

- When anybody in the room and we need to switch off the power then we've to do manually. So, in the case we fail to automatically control the light.
- It can detect any objects not only human motion.
- If there are multiple doors for the same room, the project becomes quite complex.

5.5 CONCLUSION

This paper describes a circuit which is used for controlling the room lights according to the count of persons in the room and simultaneously works as a security system when the camera is attached. When somebody enters into the room then the counter will be incremented accordingly the LED light in the room will be switched ON and when any one leaves the room then the counter will be decremented. The light will be only switched OFF when the room is vacant. The number of the LED lights will be ON according to the total number of persons inside the room and the count will be displayed

In today's world, there is continuous need automatic appliances will be increase in standard of living. Also if someone wants to know the number of persons present in a room, the circuit prove to be helpful. This project is useful in developing countries and this project has a bright future. This project helps us to control the light of a room automatically and counts the number of persons / visitors entering and leaving the room. By using the circuit and proper supply we can implement various applications such as fans… etc

5.6 FUTURE SCOPE

1.By using this circuit and proper power supply we can implement various applications, such as fans, tube lights, etc.
2.By modifying this circuit and using two relays we can achieve a task of opening and closing the door
3.Voice alarm system can be added to indicate that the room is full & persons can't enter inside
4.We can send this data to a remote location using a mobile or internet

5.7 REFERENCES

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3.www.adrunio.cc
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APPENDIX

```
#include<LiquidCrystal.h>

LiquidCrystal lcd(6, 7, 2, 3, 4, 5);

#define in A1

#define out A2

#define relay A0


int count=0;


void IN()

{

   count++;

   lcd.clear();

   lcd.print("Person In Room:");

   lcd.setCursor(0,1);

   lcd.print(count);

   delay(1000);

}


 void OUT()

 {

  if(count>0)
```

```
  {
   count--;
    lcd.clear();
    lcd.print("Person In Room:");
    lcd.setCursor(0,1);
    lcd.print(count);
    delay(1000);
  }
}
void setup()
{
  pinMode(A1,INPUT); // IR SENSOR
  pinMode(A2,INPUT); // IR SENSOR
  pinMode(A0,OUTPUT); // RELAY
  digitalWrite(A0,LOW);



  lcd.begin(16, 2);
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("  BI DIRECTION  ");
  lcd.setCursor(0, 1);
  lcd.print("VISITOR  COUNTER");
```

```
 delay(1000);


 lcd.clear();
 lcd.setCursor(0, 0);
 lcd.print("     USING     ");
 lcd.setCursor(0, 1);
 lcd.print("   IR SENSORS   ");
 delay(1000);


 lcd.clear();
 lcd.print("Person In Room:");
 lcd.setCursor(0,1);
 lcd.print(count);
}



void loop()
{
 if(digitalRead(in)== LOW)
 IN();
 if(digitalRead(out) == LOW)
 OUT();
```

```
if(count<=0)
 {
  lcd.clear();
  digitalWrite(relay, LOW);
  lcd.clear();
  lcd.print("Nobody In Room");
  lcd.setCursor(0,1);
  lcd.print("Light Is Off");
  delay(200);
 }
  else
  digitalWrite(relay, HIGH);
 }
```