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## AUTOMATED TWO-WAY CONVEYOR WITH OVER LOAD ALERT

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**Abstract**— Every day, we use conveyor to move people and objects vertically in tall structures like hotels, workplaces, and shopping malls. It is a really useful tool that swiftly moves people to the floor they need. This automated conveyor with overload is designed primarily to guard against harm to the conveyor. When a person joins the conveyor, the sensors in this system detect it and automatically increment the counter. To show how many individuals are on the conveyor at any given time, this count is shown on the LCD display. An infrared sensor that faces away from the conveyor is used in the technique. The sensor detects when someone boards the conveyor and increments the counter, when they leave it decrements the counter. The Arduino receives all of this data. This buzzer begins to ring when the conveyor's permitted number of individuals exits. The belt only stops when there have been sufficient departures from the conveyor to reduce the counter number to zero.

**Keywords**—Arduino, IR Sensor, LCD Display.

### I INTRODUCTION

This device helps to indicate the conveyor's capacity, or how many people may be on it at any particular time. The gadget displays the number of people on a conveyor using a 7-segment display. Two sensor pairs from each pair are spaced apart in the opposite direction. Infrared sensor pairs are installed at the lift door as part of the system. These sensors open the door and increase the counter simultaneously when someone enters a conveyor. The receiver receives the signal and sends it to an Arduino after being targeted by the IR transmitter with IR beams. This input is processed by the microcontroller. Now the system counts the number of people in attendance, moving a counter forward with each entry and backward with each exit.

A buzzer on the gadget simulates an alert. When more people enter the conveyor than the conveyor's predefined limit, the buzzer begins to ring, and it stops only when the people inside the conveyor escape the conveyor. As a result, the counter is decreased, and when the counter reaches the predetermined limit of the conveyor, the buzzer stops sounding. This automated lift with overload alarm's primary objective is to keep the lift safe. Sensors recognize when someone enters the lift, and the counter is immediately increased. When the lift reaches its maximum capacity, this buzzer begins to ring. By using this method, it is easier to convey a lift's capacity, or the maximum number of passengers it can hold at once.

On a 7-segment display, the device shows how many passengers are in an elevator. Two sensor pairs from each pair are spaced apart in the opposite way. Infrared sensor pairs are installed at the lift door as part of the system.

### 1.1 INTRODUCTION TO EMBEDDED SYSTEM

A computer system designed specifically for one or a few specific activities, sometimes with real-time processing requirements, is known as an embedded system. It is normally a part of a larger apparatus that also includes mechanical and physical components. A general-purpose computer, like a personal computer, on the other hand, can carry out a number of functions depending on its programming.

Because they handle many of the common gadgets we use, embedded systems have grown in importance in recent years. Because the embedded system is concentrated on a certain set of functions, designers can optimise it to reduce product size and cost while increasing reliability and performance. To benefit from economies of scale, some embedded systems are mass-produced.

Small, portable gadgets like MP3 players and digital watches are examples of physically embedded systems, as are large, stationary installations like traffic lights, industrial controls, and nuclear power

Because many systems are programmable, the phrase "embedded system" is not well defined in general. For instance, handheld computers have some operating systems and microprocessors in common with embedded systems, but they are not truly embedded systems since they allow the addition of peripherals and the installation of additional software, which makes them more like desktop computers.

An embedded system is a combination of fixed or programmable computer hardware and software that was created especially for a specific sort of application device. In addition to the more visible cell phone and PDA, other potential hosts for an embedded system include industrial machinery, vehicles, medical equipment, cameras, home appliances, aeroplanes, vending machines, and toys. For programmable embedded systems, a programming interface is available, and programming embedded systems is a distinct field of expertise.

Windows XP and Java embedded Operating systems and language platforms that are examples of embedded systems are embedded. However, certain low-cost consumer electronics have minimal storage and extremely affordable microprocessors; therefore, the operating system and application are merged into a single program. Instead of being loaded into RAM (random access memory), as is the case with software on personal computers, the code is permanently kept in the system's memory.

## 1.2 APPLICATIONS OF EMBEDDED SYSTEM

We exist in an embedded world. You are surrounded by implants, and their flawless operation is essential to your survival. If you have a washing machine or microwave in your kitchen, a TV, radio, and CD player in your living room, as well as card readers, access controls, and palm devices at work, you may find it easier to carry out many of your duties. Aside from that, various controls tucked away in your car handle car functions between the bumpers, and you frequently ignore all of these devices.

You have been inundated with information about these embedded controllers in a number of locations in recent days. Various magazines and newspapers are continuously disseminating information about the most recent technology, new devices, and rapid apps, leading you to assume that these

integrated items rule your fundamental survival.

search databases. These desktop PCs are designed to do a variety of jobs and applications. To get the requisite computational power, you must first install the necessary software. As a result, today's desktop computers can do a wide range of tasks. Embedded controllers, on the other hand, carry out the functions for which they were created. Embedded controllers are usually created by engineers with a particular goal in mind.

These controllers are therefore worthless. An embedded controller, in theory, is a set of microprocessor-based hardware and software that has been programmed to perform a certain function. Designers may now choose from a variety of microprocessors and microcontrollers. Even experienced designers may be overwhelmed by the many options, especially in 8-bit and 32-bit. Choosing the correct microprocessor may be a challenging initial step, and it is becoming more difficult as new devices are introduced on a regular basis.

Intel's 8031 architecture is the most popular and commonly Utilised in the 8-bit category. Due to the popularity of this family of semiconductors, several semiconductor manufacturers have developed new products based on them. Semiconductor manufacturers are still releasing products based on the 8031 core, even after 25 years.

## 1.3 MICROCONTROLLERS FOR EMBEDDED SYSTEMS

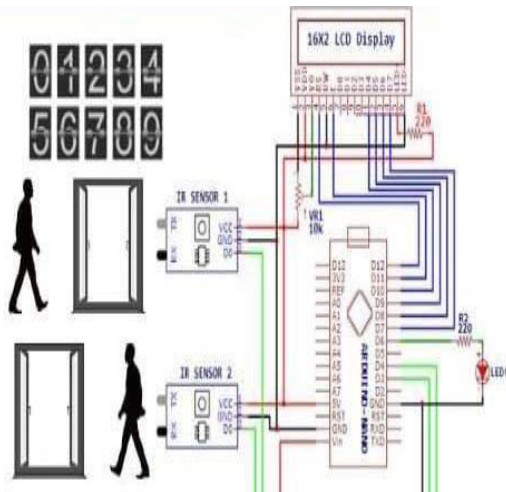
The phrase "embedded system" appears frequently in microprocessor-related literature. In embedded system products, microprocessors and microcontrollers are commonly employed. A microprocessor (or microcontroller) is used in an embedded system product to perform a specific job. An embedded system is a printer because its CPU only has one function: to take data and print it. Consider a computer equipped with a Pentium processor. A personal computer may be used for a variety of tasks, including word processing.

Consider a computer that has a Pentium CPU. Word processors, print servers, bank teller terminals, video games, network servers, and Internet terminals are examples of PC applications

controller, sound card, CD-ROM drives, and other internal or external components are all included in an x86 PC.

Each of these peripherals comprises a microprocessor that is dedicated to a single function. Every mouse, for example, has a microcontroller that detects its location and transmits data to the PC.

## II PROPOSED METHOD



**Figure 1:** Bidirectional Visitor Counter

When a visitor approaches the entry gate, the IR sensor-1 detects an obstruction and sends a low (0) signal to the output pin. After reading this value, the Arduino runs the code to start counting at 1. When another visitor (obstacle) is detected by IR sensor-1, the Arduino increases the count by 1+. The Arduino estimates the total number of entering visitors in this manner by adding +1 to the count each time a visitor passes through this gate.

**Figure 3:** Block Diagram



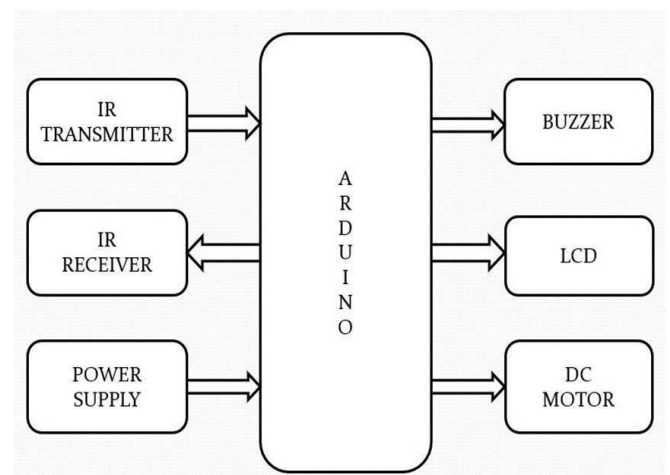
**Figure 2:** Conveyor Door

This method is excellent for counting the number of people in an auditorium or hall for a lecture to prevent overcrowding.

The LCD monitor displays the number of people who have left the room. To keep track of who enters and departs the room, an infrared sensor is utilised. It receives signals from sensors and is controlled by software stored in ROM. This method makes use of a bi-directional counter, which means it works in both ways. It raises by one when someone enters the room and reduces by one when they leave.

## III SYSTEM BLOCK DIAGRAM

**Figure 3:** Block Diagram



The IR sensor-2 detects an obstruction when a visitor passes through the exit gate and delivers a low (0) signal to the output pin. After reading this value, the Arduino runs the code to do a 1+ count. When the IR sensor-2 detects another visitor (obstacle), the Arduino increases the count by 1+. As a result, each time a visitor goes through this gate, the Arduino calculates the total number of outgoing visitors.

It is a device with a built-in microcontroller. This block consists of two sets of infrared sensors that detect object motion: an IR sensor transmitter and an IR sensor receiver. IR sensors are employed in this design to detect the individual entering the conveyor. The LCD is used to show the number of people entering the room or conveyor, with a one-digit increase displayed when someone enters and a one-digit decrease displayed when someone leaves. The buzzer emits an alarm when the system overloads or exceeds the limit. And this block is made up of a DC motor that is utilised to close the door automatically when it is overloaded or exceeds the count.

### 3.1 BLOCK DIAGRAM WORKING PRINCIPLE

This device helps to indicate the conveyor's capacity, or how many people may be on it at any particular time. The gadget displays the number of people on a conveyor using a 7-segment display. Two sensor pairs from each pair are spaced apart in the opposite direction. Infrared sensor pairs are installed at the lift door as part of the system. These sensors open the door and increase the counter simultaneously when someone enters a conveyor. The receiver receives the signal and sends it to an Arduino after being targeted by the IR transmitter with IR beams. This input is processed by the microcontroller. The system now counts the number of people present, advances a counter with each arrival, and decrements it with each exit.

The device's buzzer simulates an alert. The buzzer begins to sound when more people join the conveyor than the conveyor's predetermined limit, and it stops only when the individuals inside the conveyor exit the conveyor. The counter is reduced, and the buzzer stops ringing when it is less than or equal to the conveyor's specified

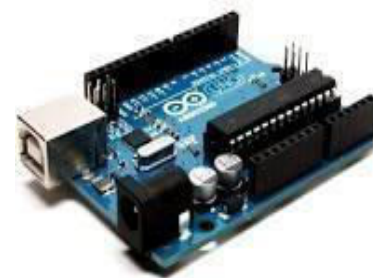
limit. The major goal of this automated lift with overload alert is to keep the lift safe.

The counter is automatically increased when someone enters the lift because sensors recognise it. When there are more people in the lift than allowed, this buzzer begins to ring. By using this method, it is easier to convey a lift's capacity, or the maximum number of passengers it can hold at once.

### 3.2 ARDUINO UNO (ATMEGA328P)

Arduino single-board microcontroller was developed to make it easier to employ electronics in applications spanning numerous fields of study. The hardware is a simple open-source hardware board built around an 8-bit Atmel AVR microprocessor.

An 8-bit Atmel AVR microcontroller, along with other parts that aid in circuit integration and programming, makes up an Arduino board. The way connections are exposed by default on the Arduino is a crucial feature because it enables the CPU board to be connected to a variety of interchangeable add-on modules known as shields. A boot loader and a compiler for a common programming language make up the



microcontroller's software.

**Figure 4:** Arduino UNO

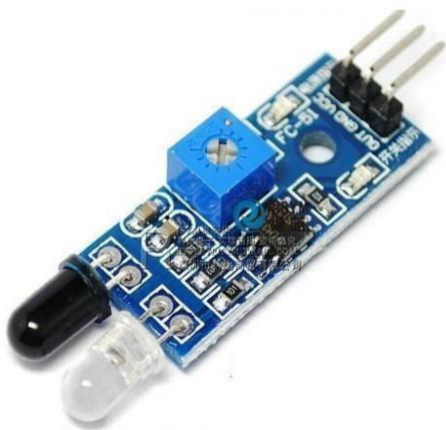
An 8-bit Atmel AVR microcontroller, along with additional tools for circuit integration and programming, is the core of an Arduino board. The way connections are exposed by default on the Arduino is a crucial feature because it enables the CPU board to be connected to a variety of interchangeable add-on modules known as shields. A boot loader and a compiler for a common programming language are included in the microcontroller's software. The hardware reference design is available online at the Arduino website under a Creative Commons Attribution- Share Alike 2.5 licence. For a range of hardware variants, additional design and production data are accessible. The user-friendly and

straightforward user interface of Arduino has allowed it to be employed in countless projects and applications.

Although other solutions make it easier to work with microcontrollers, Arduino has significant benefits for educators, students, and interested hobbyists. When compared to other microcontroller systems, Arduino boards are very inexpensive

### 3.3 IR SENSOR (Infrared Ray Sensor)

An electrical component known as an infrared sensor (IR sensor) uses IR radiation to produce or detect specific properties in its environment. The heat and motion of a target can also be detected and measured by these sensors. The IR sensor circuit is a crucial part of many electrical devices. The visionary senses that humans use to perceive borders are comparable to this type of sensor.



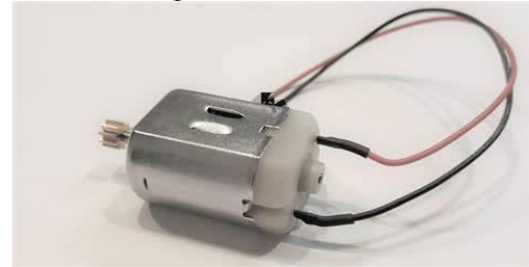
**Figure 5:** IR Sensor

This sensor has an infrared photodiode and an infrared LED that can be combined to create an optocoupler or photocoupler. The physics laws used in this sensor include plank radiation, Stephan Boltzmann, and Wein's displacement. A transmitter that emits infrared light is an infrared LED.

This LED appears to be a typical LED, but it actually produces radiation that cannot be seen with the naked eye. An infrared transmitter is the main tool used by infrared receivers to find radiation. Photodiodes can be used to create infrared receivers. Unlike regular photodiodes, IR photodiodes can only detect IR light. Voltage, wavelength, packaging, and other parameters all contribute to the classification of infrared receivers.

### 3.4 DC MOTOR

Direct current is the electrical energy that enters a direct current motor and is converted to mechanical revolution. A direct-current motor converts electrical energy from direct current into mechanical energy. In a certain section of its torque speed characteristics, a series motor is suited for lift operation.



**Figure 6:** DC Motor

possible to connect the field winding and armature in parallel or in series. The link may occasionally be both parallel and serial. Whether or not the rotor is brushed is another difference between DC motors. In brushless DC motors, the rotor receives electricity from brushes. The rotor of a brushless DC motor is permanently magnetised. Each application calls for a certain kind of DC motor because they are so widespread and used in so many diverse settings.

The left-hand rule determines which way the force is moving. Due to their comparable construction, DC motors and DC generators can be used interchangeably. For large electrical applications like steel mills and electric trains, direct current (DC) is converted from alternating current (AC) since it performs better in terms of speed and torque. In industrial settings, three-phase induction motors and DC motors are equally prevalent. There are many uses for DC motors since they offer a larger starting torque than induction motors. Small and compact, with exceptional rotational control and high efficiency, brushed direct current motors are also available. Due to the absence of brush wear, brushless DC motors last a very long time, are easy to repair, and are silent.

DC motors are widespread because they are used for a range of purposes and jobs. Their uses range from supplying mechanical energy to a large printing press to powering a bedroom ceiling fan. When the field coil of the DC motor is turned on, a magnetic field develops in the air gap.

The direction of the magnetic field generated is determined by the armature radii. The magnetic field "enters" the armature at the north pole of the field coil, and it "exits" the armature at the south pole.

energy from the rotating portion of the motor to the external load's stationary state. Between an electromagnet's north and south poles is where the armature of the magnet is located.

### 3.5 BUZZER

The main goal is to create sound from an audio source. Direct current (DC) voltage is typically used to power it, and it is frequently employed in timers, alarm clocks, printers, computers, and other linked devices. Depending on the design, it might emit sounds like alarms, music, bells, and sirens.



**Figure 7:**  
Buzzer

It features two positive and negative pins. The '+' symbol or a longer terminal denotes the positive terminal. Working current, driving mode (DC or square wave), and so on are key parameters. The buzzer is a tool that transforms audio into sound signals and then produces sound. Direct current (DC) power is usually used to power it. It is frequently employed as a sound device in alarm clocks, computers, printers, and other electronic devices.

### 3.6 LIQUID CRYSTAL DISPLAY

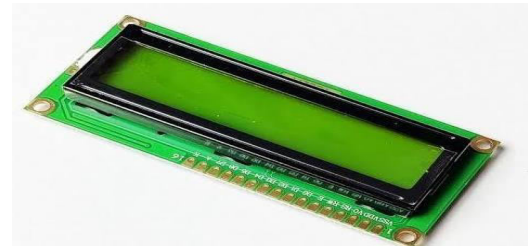
The acronym for liquid crystal display is LCD. LCD is widely replacing LEDs (seven-segment LEDs or other multi-segment LEDs) for the following reasons: The declining prices of numbers, text, and images may all be displayed. LEDs, on the other hand, can only display numbers and a few characters. Incorporation of a refreshing controller into the LCD, reducing the CPU's

responsibility for refreshing the LCD. The CPU, on the other hand..

These parts cannot be actuated by conventional ICs since they are used with microcontrollers. On a tiny LCD panel, they are used to display a variety of messages.

**Figure 8:** LCD Module

The type presented here is the one that is most commonly used in practice because of its low cost and variety of applications. It is run by a Hitachi HD44780 microprocessor and has a two-line, 16-character message



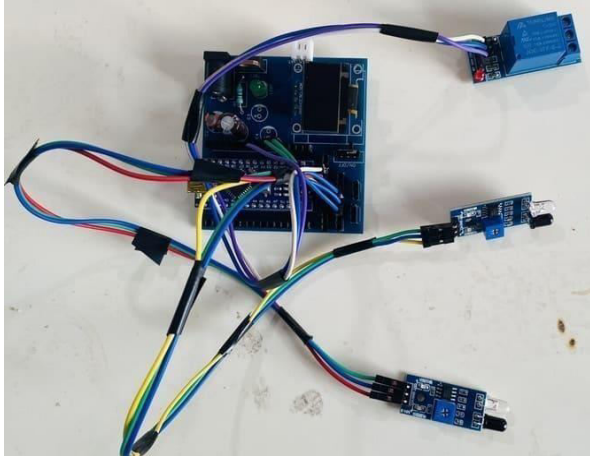
display capability. The display includes, among other things, all alphabets, Greek letters, punctuation, and mathematical symbols. Additionally, it is possible to display custom symbols that the user has made. The automatic message shifting (left and right), pointer appearance, illumination, and other critical elements are investigated.

In brief, LCDs are lighted by a backlight, and pixels are electronically switched on and off while spinning polarised light using liquid crystals. Each pixel has a polarising glass filter in front and behind it, with the front filter having a 90-degree angle. The liquid crystals between the two filters can be electrically turned on and off. LCDs can feature either a passive or active-matrix display grid. The passive matrix LCD is constructed from a grid of conductors, with pixels placed at each grid intersection. A current is provided through two grid conductors to adjust the illumination for any pixel. As a result, the current on an active-matrix display may be switched on and off more often, increasing screen refresh time.

After counting and calculating all numbers the Arduino sends data to the 16x2 LCD Display. The LCD Display shows the total number of entering visitors, the total number of exiting visitors, and the total number of visitors currently present inside the place. Character LCD Displays are built in standard configurations such as 8x1, 20x2 and 40x4.

## IV. RESULTS AND OUTPUT

The visitor counter project counts the number of individuals in the room as well as those who enter and exit it.



**Figure 9:** Entire kit

## V. CONCLUSION

This project allows the student to experiment with and comprehend an infrared sensor. Create logic to count how many individuals enter and depart a room. It is always beneficial to understand how to write Arduino code with the Arduino IDE! It's a good and enjoyable endeavour. This counter is bidirectional, which means it may be used in both directions. That is, when someone walks into the room, the counter raises, and when they depart, the counter falls. Outside the room, an LCD screen displays this figure.

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