ANALOG PROJECT REPORT

SUBMITTED BY:

AYUSHI VERMA 2K19/EC/038

ARYAN 2K19/EC/032

SUBJECT: ANALOG ELECTRONICS-1 (EC201)

SUBMITTED TO: Prof. Rajeshwari Pandey

Department of Electronics & Communication Engineering Delhi Technological University,

Delhi Delhi-110042

November , 2020

Electronics & Communication Engg. Deptt.
DELHI TECHNOLOGICAL UNIVERSITY
(Formerly Delhi College of Engineering)
Shahbad Daulatpur, Bawana Road-Delhi-42

Certificate

I hereby certify that the Project titled "**AUTOMATED DOORBELL WITH VISITOR COUNTER MODULE**" which is submitted by, Department of Electronics & Communication Engineering, Delhi Technological University, Delhi is a record of the project work carried out by the students under my supervision.

Dr. Rajeshwari Pandey
SUPERVISOR

Electronics & Communication Engg. Deptt.
DELHI TECHNOLOGICAL UNIVERSITY
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Candidate's Declaration

We, hereby, declare that the work embodied in this project entitled "**AUTOMATED DOORBELL WITH VISITOR COUNTER MODULE**" submitted to the Department of Electronics & Communication Engineering, Delhi Technological University, Delhi is an authentic record of our own bonafide work and is correct to the best of our knowledge and belief. This work has been undertaken taking care of engineering ethics.

Names of the Students:

AYUSHI VERMA 2K19/EC/038

ARYAN 2K19/EC/032

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Acknowledgement

We express our sincere thanks to Prof. Yogesh Singh, Vice-Chancellor, Delhi Technological University, Delhi. We pay our deep sense of gratitude to Prof. N. S. Raghava (HOD) of ECE Department, Delhi Technological University, Delhi to encourage us to the highest peak and to provide us the opportunity to prepare the project. We feel to acknowledge our indebtedness and deep sense of gratitude to our guide Dr. Rajeshwari Pandey whose valuable guidance and kind supervision given to us throughout the course which shaped the present work as its show. We are immensely obliged to our friends for their elevating inspiration, encouraging guidance and kind supervision in the completion of this project.

Names of the Students:

AYUSHI VERMA 2K19/EC/038

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ABSTRACT

The project is to create an automated doorbell system with human detection, which can sense the presence of the person standing at the door, and automatically rings the doorbell without touching the bell.

This project is divided into two modules:

1. **Human Detection Module**: This module senses the presence of human using IR sensors, when hands are placed in front of it, and the buzzer rings, thus acting as an automated doorbell.

2. **Visitor Counter Module**: This module counts the number of times the hands are placed in front of the IR sensor, by making use of counter IC and Opam as a comparator thus can act as visitor counter.

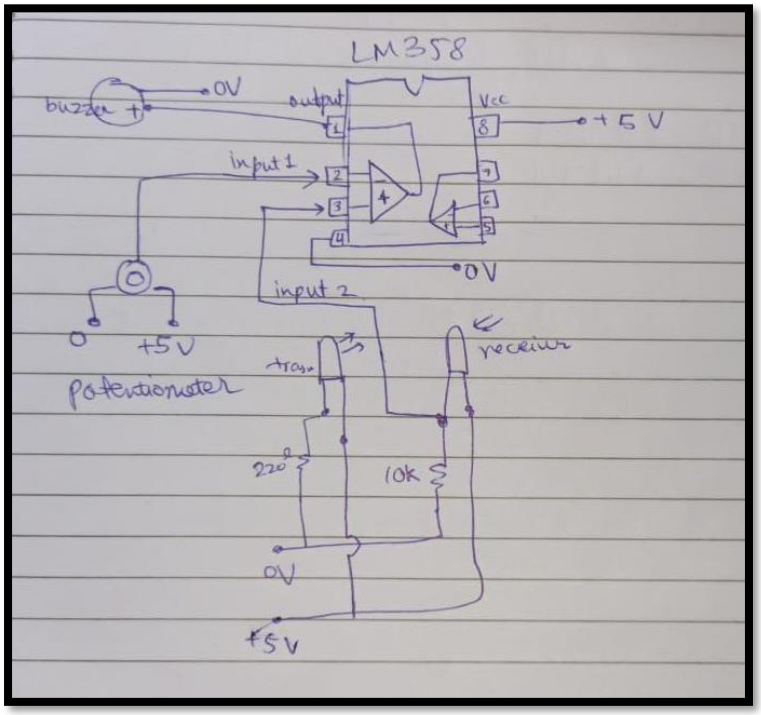
MODULE 1

AIM: To implement IR sensor module which detects human presence on placing hands in front of the IR sensors and rings the buzzer.

COMPONENTS USED:

- Breadboard
- 10k Potentiometer
- LM358 (Voltage Comparator)
- Buzzer
- IR receiver LED
- IR transmitter LED
- 9V battery
- Jumper wires
- 220ohm resistors
- 1k resistors

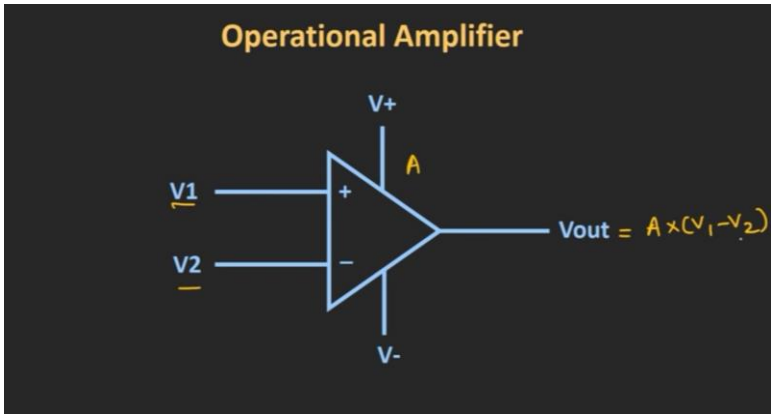
CIRCUIT DIAGRAM:

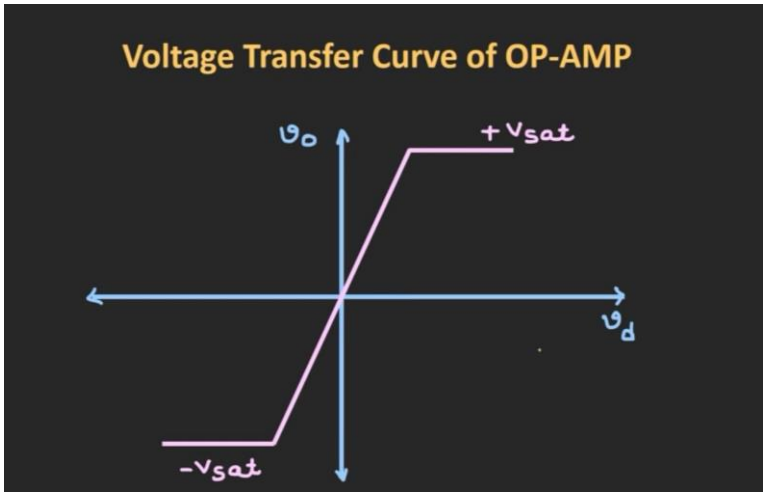


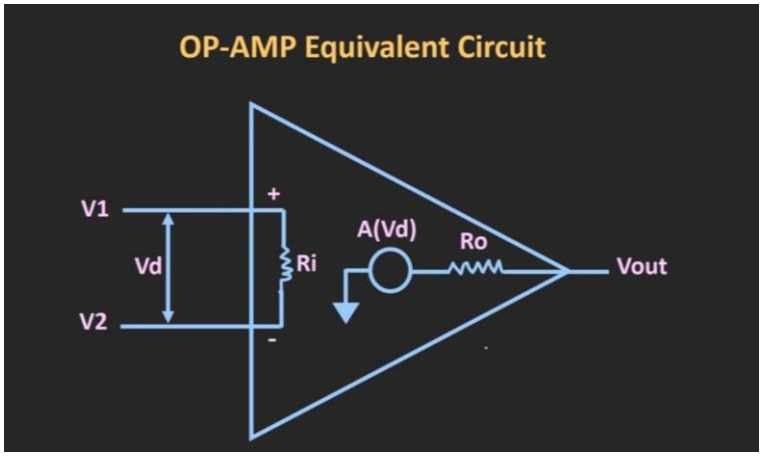
THEORY FOR COMPONENTS USED:

1. OPERATIONAL AMPLIFER

An operational amplifier is an integrated circuit that can amplify weak electric signals. An operational amplifier has two input pins and one output pin. Its basic role is to amplify and output the voltage difference between the two input pins.

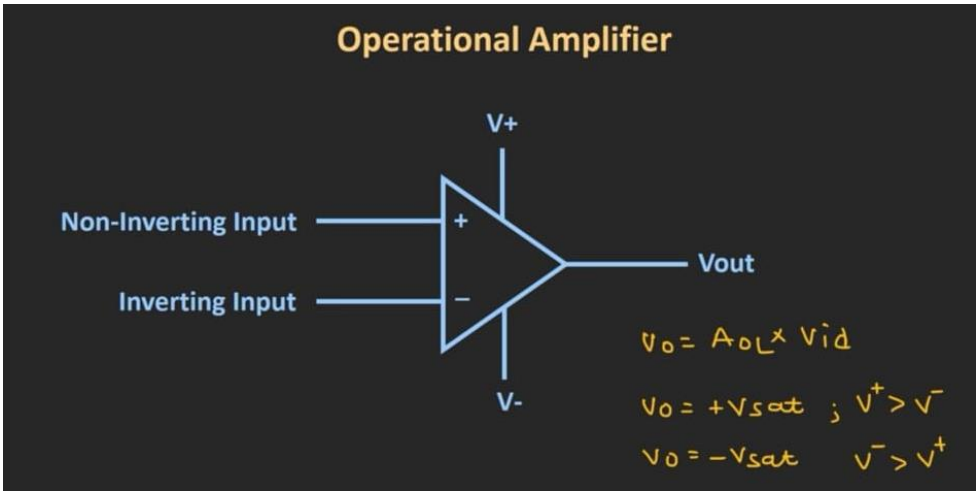


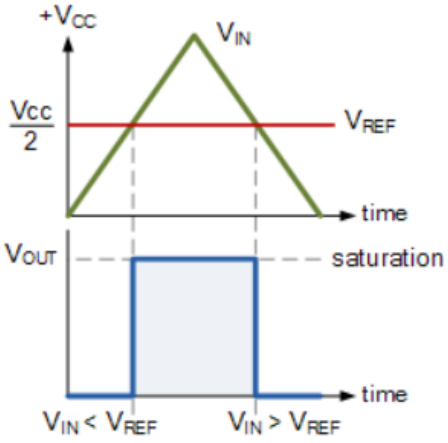




FUNCTION OF OPAMP AS A POSITIVE VOLTAGE COMPARATOR:

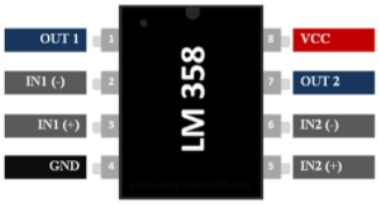
The basic configuration for the positive voltage comparator, also known as a non-inverting comparator circuit detects when the input signal, VIN is ABOVE or more positive than the reference voltage, VREF producing an output at VOUT which is HIGH as shown.





Dual Op-Amp IC:

LM358 is a dual op-amp IC integrated with two op-amps powered by a common power supply. It can be considered as one half of LM324 Quad op-amp which contains four op-amps with common power supply. The differential input voltage range can be equal to that of power supply voltage. The default input offset voltage is very low which is of magnitude 2mV.



OP-AMP 741 Specification

Parameters	Value
Input Impedance	2 MΩ
Output Impedance	75 Ω
Open-loop Gain	10^5
Offset Voltage	1 mV
Slew Rate	0.5 V/µS
CMRR	70-90 dB

2. IR LEDS

IR LED emits infrared light, means it emits light in the range of Infrared frequency. We cannot see Infrared light through our eyes, they are invisible to human eyes. The wavelength of Infrared (700nm – 1mm) is just beyond the normal visible light. Everything which produce heat, emits infrared like our human body.

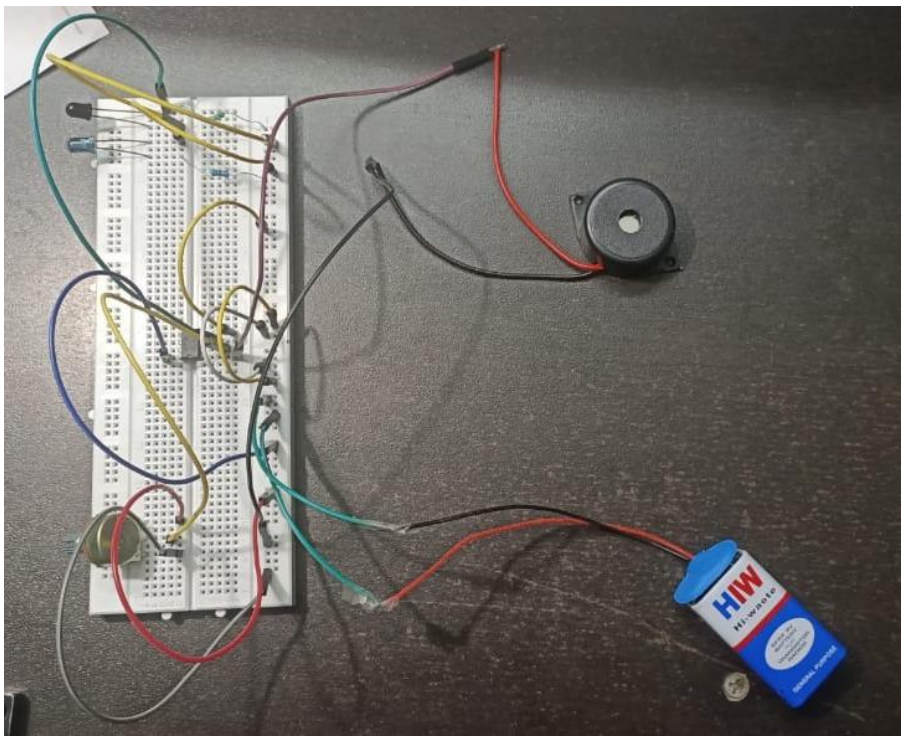
3. Photo-diode:

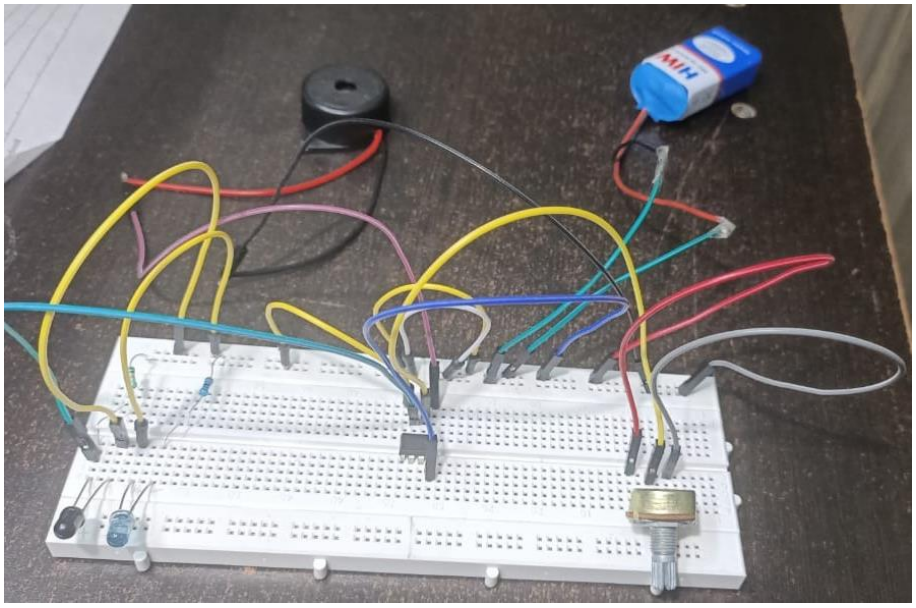
Here Photo diode is used to capture reflected light of IR LED.
A semiconductor diode that, when exposed to light, generates a potential difference or changes its electrical resistance.

A Photo diode is a reverse biased silicon or germanium pn junction in which reverse current increases when the junction is exposed to light.
When no light is incident on the pn junction of photo diode, the reverse current is extremely small. This is called DARK CURRENT.

When light is incident on the pn junction of the photo diode there is a transfer of energy from the incident light (photons) to the atoms in the junction .this will create more free electrons (and more holes) these additional free electrons will increase the reverse current.This electrical energy can be recorded as voltage drop fluctuations by using a series resistor in the outer circuit and taking voltage readings across it.

HARDWARE PHOTOS:





VIDEO LINK:

https://youtu.be/s4K-kZ9LLgU

This is an enlisted video uploaded on youtube which contains a brief explanation and working of module-1 of the project.

MODULE-2

AIM: To implement visitor counter circuit using IR sensor module and counter IC.

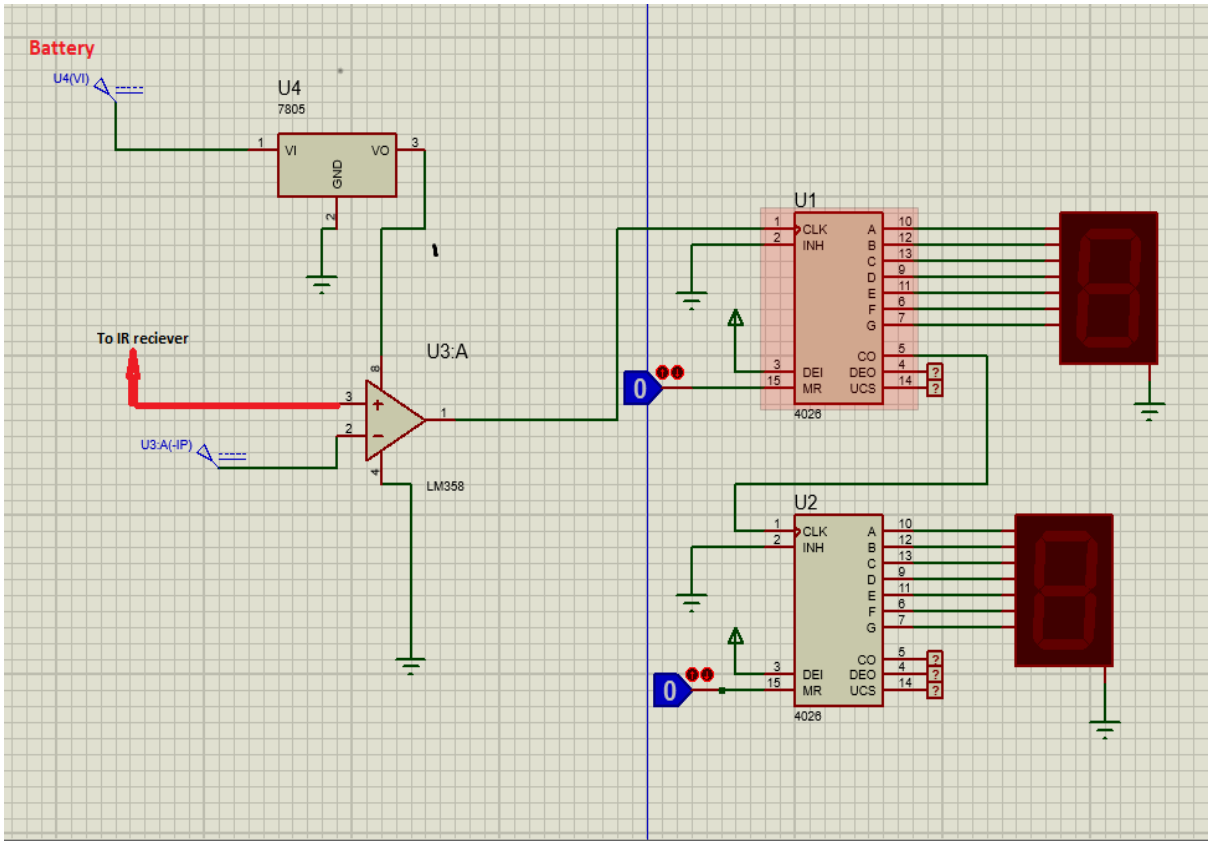
ABSTRACT:

1. Output of voltage comparators is HIGH(5V) when IR sensor receives infrared rays and voltage across the sensor goes above the threshold .
2. The output of the comparators is fed to the counter circuit (implemented using 4026 IC), which counts the number of times the output is high/ steps moved.
3. The output of the counter circuit is displayed on 7 segment display common cathode display.

Components used:

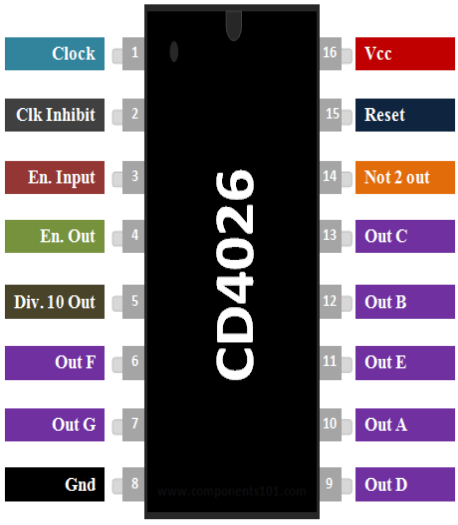
- CD 4026
- IC LM 358N
- RESISTORS (10K AN 1K)
- POTENTIOMETRE (10K)
- CONNECTING WIRES
- 7 SEGMENT DISPLAY
- PUSH BUTTON
- BREADBOARD

Circuit Diagram:



CD4026 IC

The **IC CD4026** is an IC which can perform the function of both a counter as well a **7-segment Drive**r. One single IC can be used to count form zero (0) to nine (9) directly on a Common Cathode type 7-segment display. The count can be increased by simply giving a high clock pulse; also more than one digit (0-9) can be created by cascading more than one **CD4026 IC**.



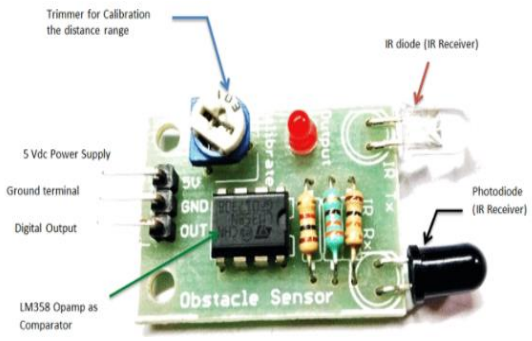
CD4026 Pin Configuration

Pin Number	Pin Name	Description
1	Clock (CLK)	The counting happens when this clock pulse goes high , this pin is normally connected to 555 timer or other uC to produce a pulse
2	Clock Inhibit (INH)	Connected to the Ground (low) of the circuit, to enable clock pin
3	Enable Input (DEI)	This pin is connect to +5V (high) to enable the output pins (Out A to Out G)
4	Enable Output (DEO)	This is an output which always stays high, this pin will be only if more than one CD4026 IC is used (cascaded)
5	Divide by 10 (CO)	This is the carry over output pin; it produces a pulse after counting till 9. This pin will be only if more than one CD4026 IC is used (cascaded)
6,7,9,10,11,12,13	Out A,B,C,D,E, F,G	These are the decoded output pins which should connected to 7-Segment display.
8	Ground	The ground pin should be connected to ground of circuit
14	Not 2 out (UCS)	This is Ungated C segment pin. This is an output pin which will be rarely used when division is required.
15	Reset	This input pin when made high (+5V) will reset the count to 0.
16	Vcc	This pin powers the IC, typically +5V is used.

IR sensor module:

The 5 VDC supply input is given to the VCC pin and the supply negative is connected to the GND terminal of the module. When no object is detected within the range of the IR receiver, the output LED remains off.

When an object is detected within the range of the IR sensor the LED glows.

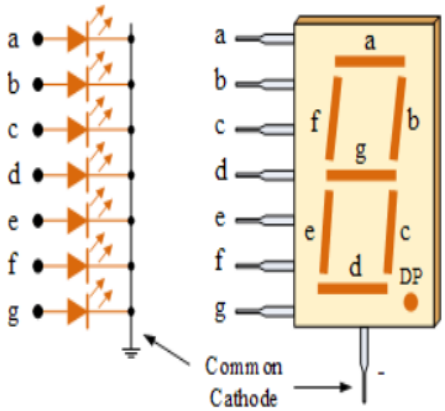


Pin Configuration

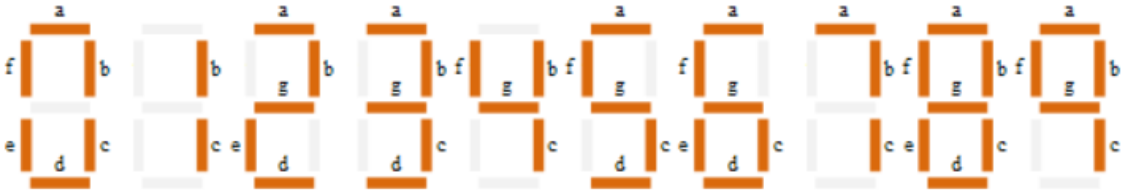
Pin Name	Description
VCC	Power Supply Input
GND	Power Supply Ground
OUT	Active High Output

The Common Cathode Display(CC)

In the common cathode display, all the cathode connections of the LED segments are joined together to logic “0” or ground. The individual segments are illuminated by application of a “HIGH”, or logic “1” signal via a current limiting resistor to forward bias the individual Anode terminals.

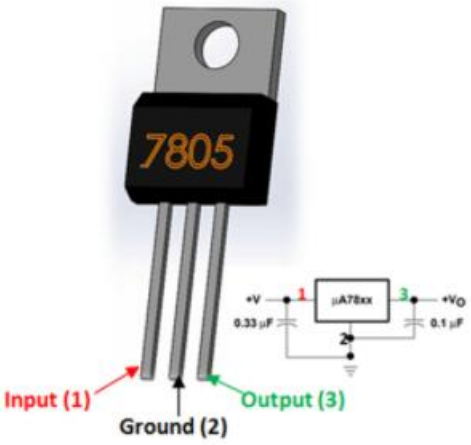


7-segment Display



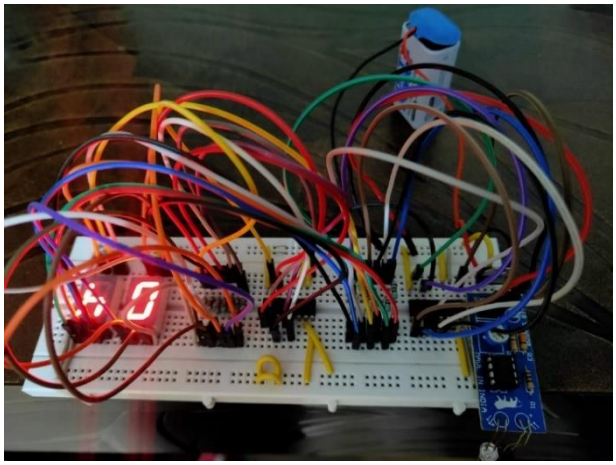
ZENER DIODE:

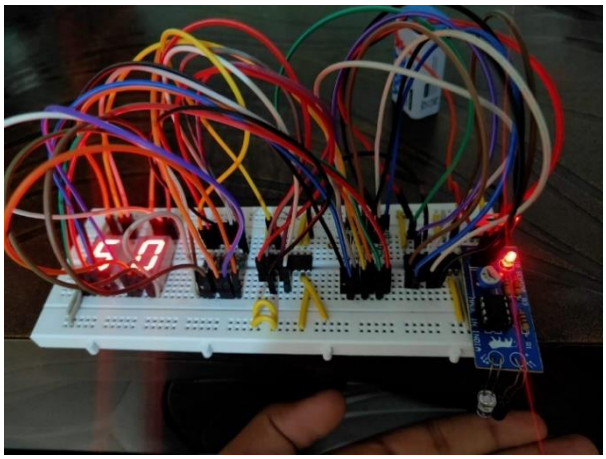
A 7805 zener diode is used as a voltage regulator to stablise the voltage from a 9V battery to an output voltage of 5V which is suitable for working of ICs.

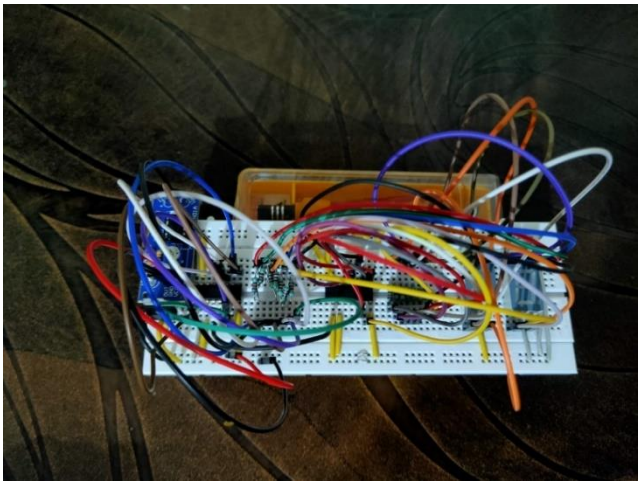


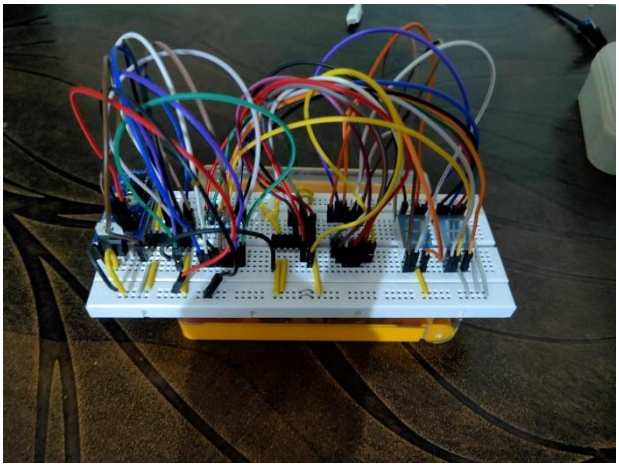
Pin Number	Pin Name	Description
1	Input (V+)	Unregulated Input Voltage
2	Ground (Gnd)	Connected to Ground
3	Output (Vo)	Outputs Regulated +5V

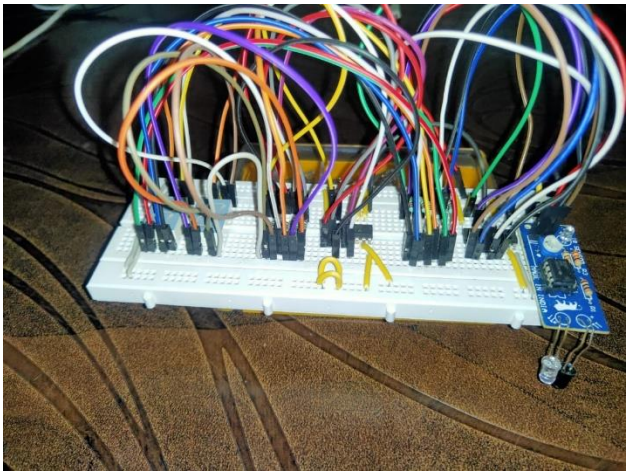
HARDWARE PHOTOS:

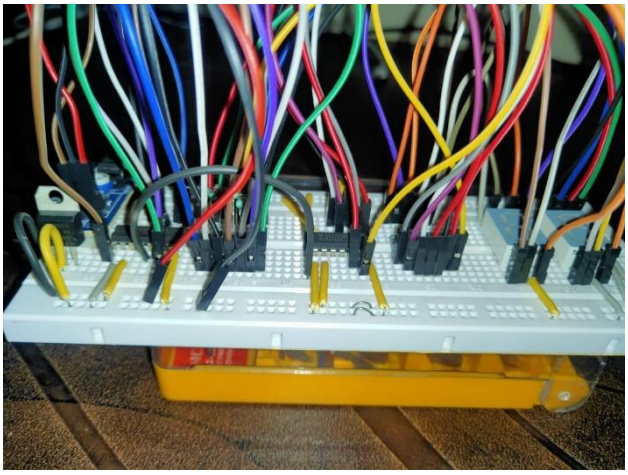


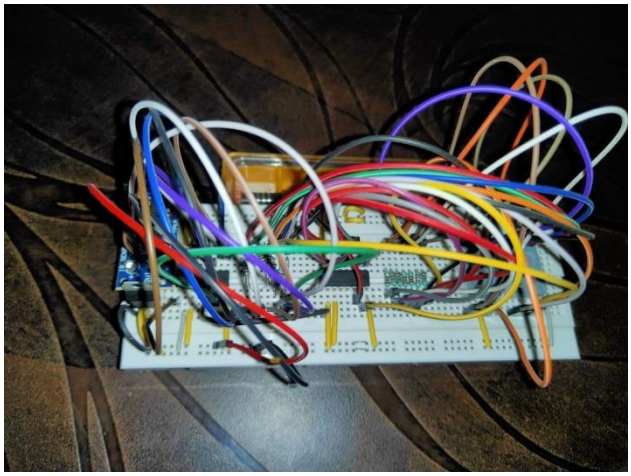












VIDEO LINK:

https://drive.google.com/folderview?id=11vrDVjKN9-5HbVx2wtB1m_YLatGa3zas

CONCLUSION OF THE PROJECT:

- It can be used to count the no of persons entering a cinema hall, auditorium or any public place.
- It can be simply used as a touchless doorbell, which can count number of guests.
- The IR sensor can be replaced with any other module to count many other quantities, eg: footsteps by using a accelerometer.

REFERENCES:

- https://www.google.com/url?sa=t&source=web&rct=j&url=https://components101.com/ic-cd4026-pinout-circuit-datasheet&ved=2ahUKEwjk5ZStnJntAhXafn0KHdc1Dq4QtwIwEnoECAYQAQ&usg=AOvVaw2yXkZfl0PahzXjn6yZnzgy
- https://www.google.com/url?sa=t&source=web&rct=j&url=https://www.digikey.in/en/maker/blogs/zener-diode-basic-operation-and-applications&ved=2ahUKEwj98Pi6nJntAhWRA3IKHV-2AaAQFjAjegQIJxAB&usg=AOvVaw1tTiGNzh1nNQ1AE-iyU-PX
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