

A Report on

**Touchless Doorbell**

For

**Mini Project 1-a (REV- 2019 'C' Scheme) of Second Year, (SE Sem-III)**

In

**Electronics & Telecommunication Engineering**

By

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Under the guidance of

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**UNIVERSITY OF MUMBAI**  
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**Vivekanand Education Society Institute of Technology**

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# **1. INTRODUCTION:**

## **1.1 NEED:**

- Doorbell is one of the most common devices being used in our daily life. The bell needs physical contact for its operation. Such physical devices have high probability to transmit viruses
- Getting rid of the "touch" element of the doorbell certainly makes it usable in the current situation.
- Hence Touchless Doorbell can be a viable and easy-to-implement solution to this problem.

## **1.2 DEFINITION:**

Touchless Doorbell is an application of photo device along with electronic components to activate a bell on proximity to the circuit

# **2. LITERATURE SURVEY:**

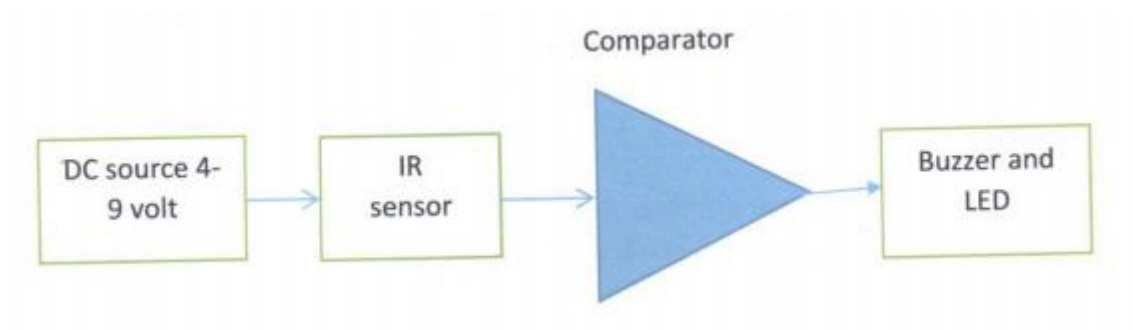
- LDR sensors work on the principle of photoconductivity and are used to detect light and change the operation of a circuit dependent upon the light levels.
- IR transmitters and Receiver pair as a module can be used in security applications, proximity sensors, distance measurement applications, etc.
- Other than Touchless Doorbell, IR sensors and LDR sensors are used in edge detection robots, heat detectors, water level alarms, etc.

# **3. PROBLEM STATEMENT:**

- Given the current COVID situation, there's an increased focus to build electronic products that avoid human contact in day-to-day-life.
- DoorBell is one of such devices which requires human contact for every visitor needing entry to our home
- There is a high priority need to look at a solution that can avoid contact to the bell, yet serve the purpose of alerting the home members of visitor at door

# **4. MINI PROJECT DESIGN ( PRINCIPLE AND WORKING):**

#### 4.1 BLOCK DIAGRAM:

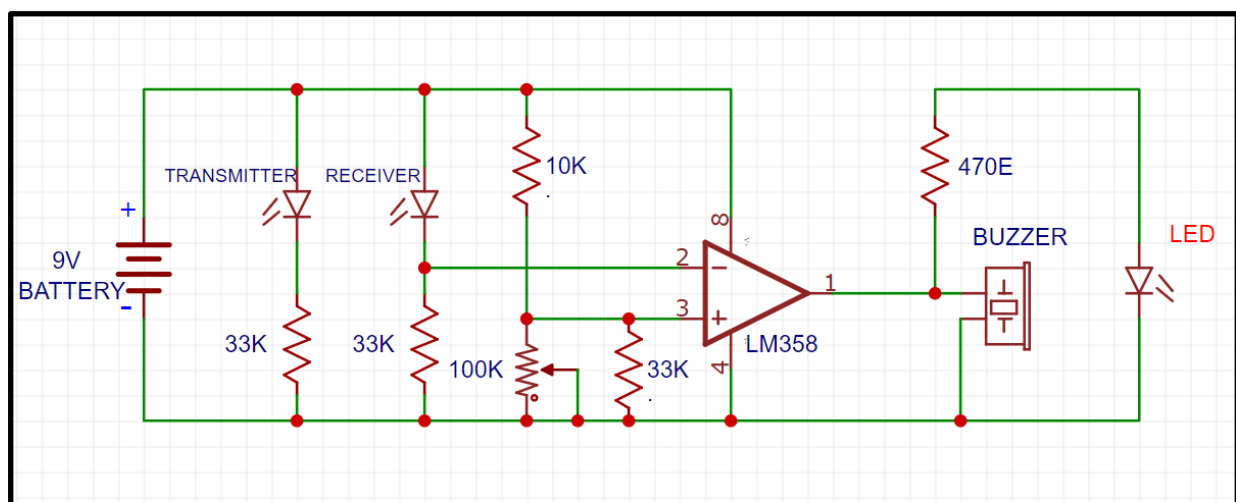


#### 4.2 BLOCK DIAGRAM DESCRIPTION:

- Touchless Doorbell Block diagram shown above gives a general idea of arrangement of parts and flow of the circuit.
- DC source powers the IR sensor pair and a stable output is sent to the Comparator in regular intervals on time.
- The comparator then sends its output to the Buzzer and LED by taking irregularities of IR sensor output in consideration.

#### 4.3 CIRCUIT DIAGRAM AND WORKING:

- **Circuit Diagram:**



- **Working:**

- 1) The principle used in the touchless doorbell is photoconductivity.

- 2) When there is no obstacle i.e when light falls on the LDR, then the electrons in valence band of the material go to conduction band, therefore its conductivity increases and resistance decreases
- 3) As resistance decreases, voltage at inverting terminal increases
- 4) When Inverting voltage  $>$  Non inverting voltage, output of OPAMP is 0 and the buzzer does not ring and LED does not glow.
- 5) When there is an obstacle placed on the LDR, then the conductivity of the material reduces and resistance increases to a considerable extent
- 6) As soon as resistance increases voltage at inverting terminal decreases and hence the buzzer rings and led glows

## **5. COMPONENTS/TOOL TO BE USED**

### **5.1 Components**

- 1) Resistors (470 ohm, 1k ohm, 10k ohm)
- 2) IR Transmitter
- 3) Photoresistor
- 4) LM358 OP-amp IC
- 5) Variable Resistor (10k ohm)/Potentiometer
- 6) LED
- 7) DC Source/ Battery (9V)
- 8) Buzzer
- 9) Single Stranded Wires
- 10) 8 Pin IS Socket
- 11) Solder Wire
- 12) Soldering Iron
- 13) GPP
- 14) Battery Connector
- 15) Multimeter

#### **5.1.1 IR Transmitter**

- An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. These types of sensors measure only infrared radiation, rather than emitting it that is called a passive IR sensor.
- The IR Receiver will receive this modulated signal and demodulates it and sends it to the OPAMP



### **5.1.2 LM358 OP-amp IC**

- The LM158 series consists of two independent, high gain, internally frequency compensated operational amplifiers which were designed specifically to operate from a single power supply over a wide range of voltages.
- Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage.



### **5.1.3 Potentiometer/ Variable Resistor 100k ohm**

- Potentiometer can provide a variable resistance by simply varying the knob on top of its head
- Classified into two parameters one is their Resistance (R-ohms) itself and the other is its Power (P-Watts) rating.



#### **5.1.4 8 Pin Ic Socket**

- IC base allows easy replacement of IC eliminating the risk of damage from overheating during soldering & desoldering process.
- These IC bases protect IC from damage due to heat while soldering.



#### **5.1.5 Solder Wire**

- Solder is a metal alloy usually made of tin and lead which is melted using a hot iron.



- The iron is heated to temperatures above 600 degrees fahrenheit which then cools to create a strong electrical bond.



### 5.1.6 Soldering Iron

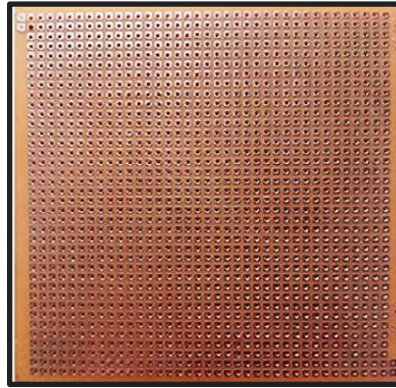
- It supplies heat to melt solder so that it can flow into the joint between two workpieces.
- A soldering iron is composed of a heated metal tip and an insulated handle. Heating is often achieved electrically, by passing an electric current through a resistive heating element.



### 5.1.7 General purpose PCB

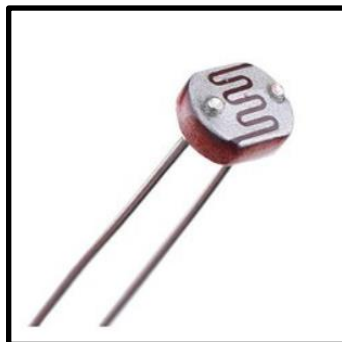
- PCB's are widely used to embed circuits randomly for running of hardware

- General purpose PCB is printed board, the circuit traces are prepared using chemicals and just a small soldering is required to place just the components on the desired places.



### 5.1.8 Photoresistor

- A photodiode is a semiconductor device that converts light into an electrical current.
- The current is generated when photons are absorbed in the photodiode.



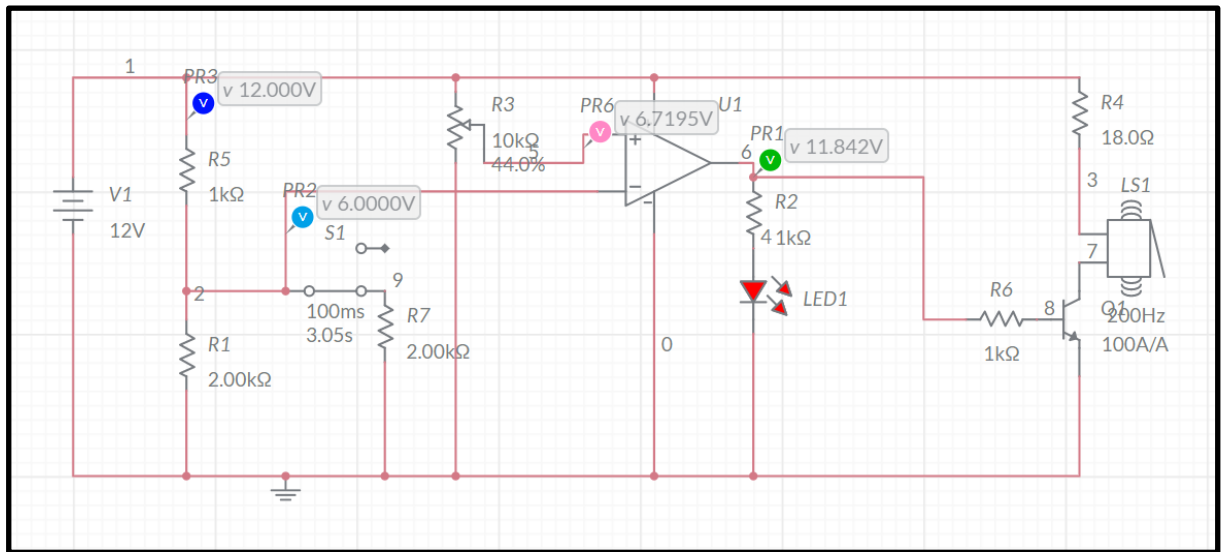
## 5.2 Software

The software used is multisim NI Multisim (formerly MultiSIM) is an electronic schematic capture and simulation program which is part of a suite of circuit design programs.

Following is the approach followed for simulation of the circuit -

1. Drag drop all the major components and make connections as per the schematic
2. Since IR transmitter and receiver cannot be simulated use a timed switch to replace the photo components
3. Set the time of switch to around 3 seconds to match the obstacle presenting time by user

4. Click on “Run Simulation”
5. Expected output is that the Buzzer should sound till the time the timed switch is active causing the voltage at non-inverting terminal to drop



**Fig 5.2.1**

## 6. PROPOSED EXECUTIONS STEPS

### 6.1 Implemented Steps for GPP

1. Component placement planning:  
The components need to be carefully planned on GP PCB so that the jumpers are minimum. Also the components should be evenly distributed with IC in the centre
2. IC Socket: IC socket should be used so that the voltages could be measured and then the IC can be inserted into the socket. In case of any damage to IC, use of socket ensures ease of replacement without desoldering
3. Soldering: The soldering should be done with no dry contacts and no bubbles at connection points. The jumpers should be on top side with wire length optimised based on the distance of the pads
4. Board bring up: Step by step with proper measurements of voltages at IC socket needs to be done.

Check points for the project include:

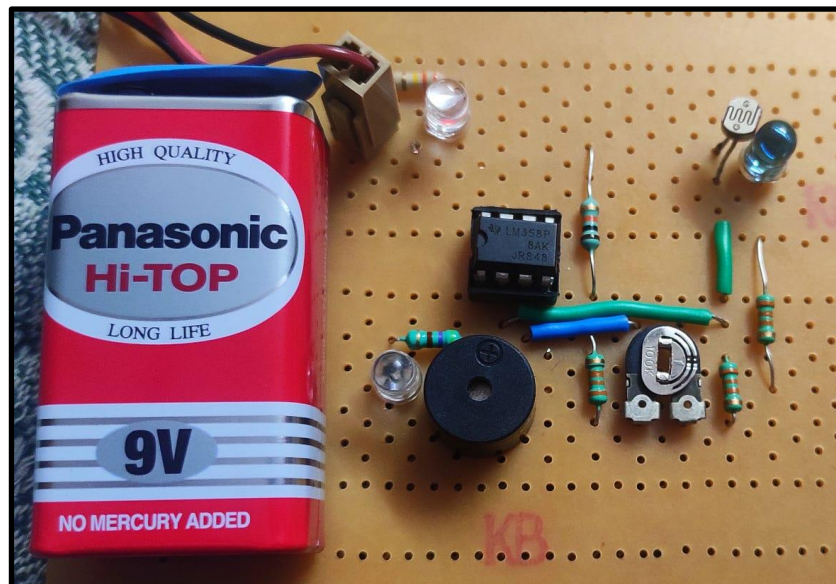
- a. Supply Pin 8 +9V with respect to Pin 4 Ground
- b. Pin 2 inverting input - should vary from 7V with no obstacle to approximately 3V with obstacle
- c. Pin 3 Non-Inverting input: Should be adjustable with preset from 7V to 0V

With above checks done the IC LM 358 can be inserted

5. Operation Verification: Verify the circuit operation by placing hand in from to transmitter receiver pair. The buzzer should sound at a distance of about 2-3 inches from the transmitter. The output LED should glow to indicate that the output is activated

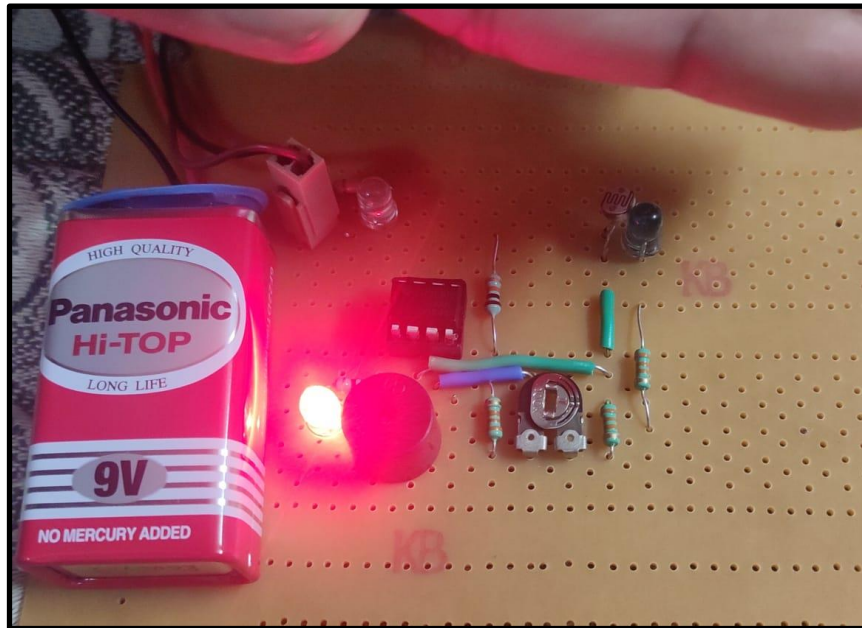
## 6.2 GPP soldering

- Fig 6.2.1 Shows Top View of Touchless Doorbell Circuit:



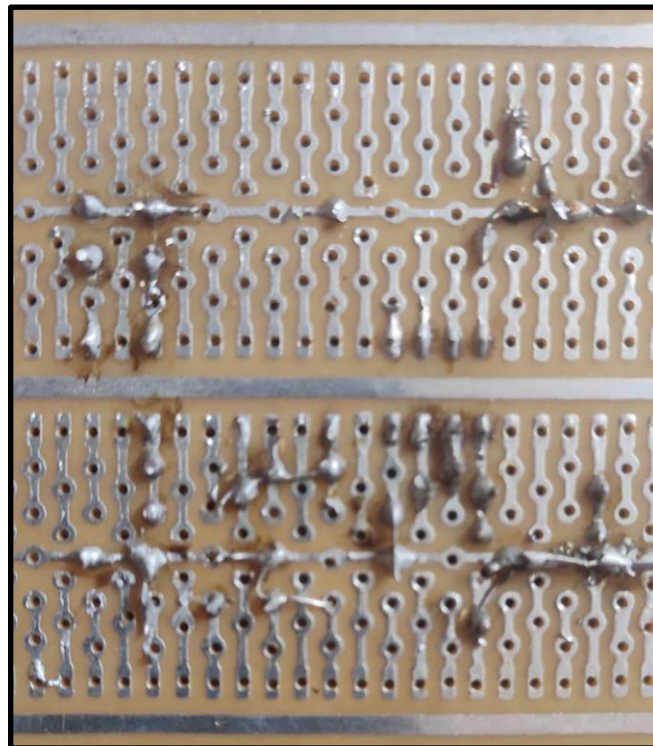
**Fig 6.2.1**

- Fig 6.2.2 Shows LED lighting up after an obstacle is detected by Photoresistor:



**Fig 6.2.2**

- Fig 6.2.3 Shows Soldered Components on the Back of PCB:



**Fig 6.2.3**

## **7. TROUBLESHOOTING**

### **7.1 Problems/ Faults in project**

- No output when hand is brought in proximity to circuit
- Buzzer has weak sound
- Buzzer is on but no LED indication

### **7.2 Steps to Solve Problems/faults in project**

#### **7.2.1 No output when hand is brought in proximity to circuit**

Check:

1. Supply Pin 8 +9V with respect to Pin 4 Ground
2. Pin 2 inverting input - should vary from 7V with no obstacle to approximately 3V with obstacle
3. Pin 3 Non-Inverting input: Should be adjustable with preset from 7V to 0V

Issue:

- Dry solder at connection to pin 2

Resolution:

- Resoldering of pin 2

#### **7.2.2 Buzzer has weak sound**

Check :

1. Battery voltage

Issue:

- Battery Voltage is 6-7 Volts gets loaded when buzzer is ON

Resolution:

- Changed to a new battery

#### **7.2.3 Buzzer is ON but no LED indication**

Check :

1. Voltage change at resistor connected to LED when buzzer sounds  
connection of Pin1, resistor, LED and ground

Issue:

- Ground connection missing to the LED circuit

Resolution:

- Soldering of ground connection to the LED circuit

## **REFERENCES: -**

- 1.) <https://technicalraju123.blogspot.com/2018/07/touch-less-door-bell.html> (06/09/2020)
- 2.) [https://www.academia.edu/36284921/MINI\\_PROJECT\\_TITLE\\_TOUCH\\_LESS\\_DOOR\\_BELL](https://www.academia.edu/36284921/MINI_PROJECT_TITLE_TOUCH_LESS_DOOR_BELL) (06/09/2020)
- 3.) <https://www.youtube.com/watch?v=A-WQ8ikMZUQ> (Touchless Doorbell Demo) (22/09/2020)
- 4.) Op-Amps and Linear Integrated Circuits 4th Edition by Ramakant A Gaikwad
- 5.) <https://www.electronicshub.org/>(13/12/2020)

## **APPENDIX**

## **DATASHEET**

<https://www.ti.com/lit/ds/symlink/lm158-n.pdf>