

The Touch Less Door Bell

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ABSTARCT

Proposed paper explain the implementation of “**Touch less doorbell**”based on object detection using an IR sensor.An IR sensor consists of an IR LED and photodiode.Together they are called as photo-coupler or opto-coupler.Touchless doorconsists of IR LED,, photodiode,resistors, potentiometer,general led Photodiode is a semiconductor diode which generates a potential difference or changes in its electrical resistance when it is exposed to light.Whenever any object comes close to IR sensor, the buzzer starts beeping and the LED glows .This system is suitable for securing doors, alarm in industrial plants and specially in safeguarding from COVID-19 virus

KEYWORDS: *electrical resistance, IR sensor, object detecting, photo–coupler, semiconductor*

I. INTRODUCTION

The first COVID-19 case was first reported in January and after months it is in lakhs all over the country.According to the “WORLD HEALTH ORGANIZATION” social distancing and keeping yourself hygiene are the only ways to prevent contaminationBut in this extreme situation, we can't avoid visiting anyone's place.In this scenario,we will use the doorbell but in this case there is high risk of contaminating the virus.This problem can be solved by making a touch-less doorbell where you can put your hand in front of the sensor and buzzer sound will be generated from inside. [1].

Also our corona warriors that is doctors, government officials have to go door to door for testing the local communities touching surfaces is one we should avoid. As per the science , corona viruses stay on the surfaces for nearly 24-48 hours.This is one of the very interesting and much useful circuit in our real life.The circuit will automatically sense the presence of the person and doorbell rings. To avoid infection from Covid-19 virus in these difficult times, which is spreading exponentially this product will be very handy.Using the bell one can avoid touching surfaces. This circuit operates using a pair of transmitter and receiver modules which are used to detect the person and if the person is detected, the doorbell is automatically turned on when the person is in-front of door.Infrared technology addresses a wide variety of wireless application. Near to the infrared region that is from 700nm to 1400 nm and the mid infrared region is from 300nm to 1mm.

An infrared sensor emits infrared radiation to sense the surrounding. The main objective is that it would help the person in the door to notify if someone is standing outside the door . The alarm will start ringing when a man comes nearer to door to knock it .without using the normal door bell button. The IR sensor automatically detects the person, it's helpful as it is an automatic system.The working of any infrared sensor is governed by laws :

Planck's law states that every object emits radiation at a temperature not equal to 00k. Stephen Boltzmann law states that “at all wave lengths the total energy emitted by a black body is proportional to the fourth power of absolute temperature”.

II.PRINCIPLE OF WORKING:

The functional block diagram of the system is given below:

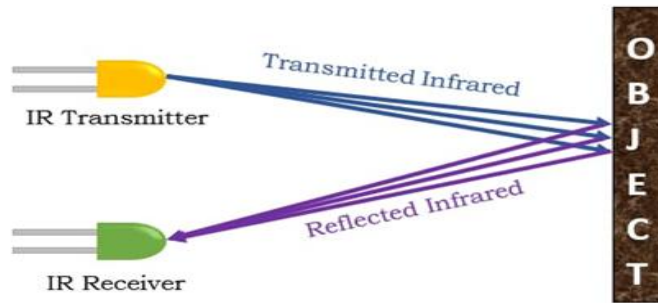


Figure 1:IR Sensor

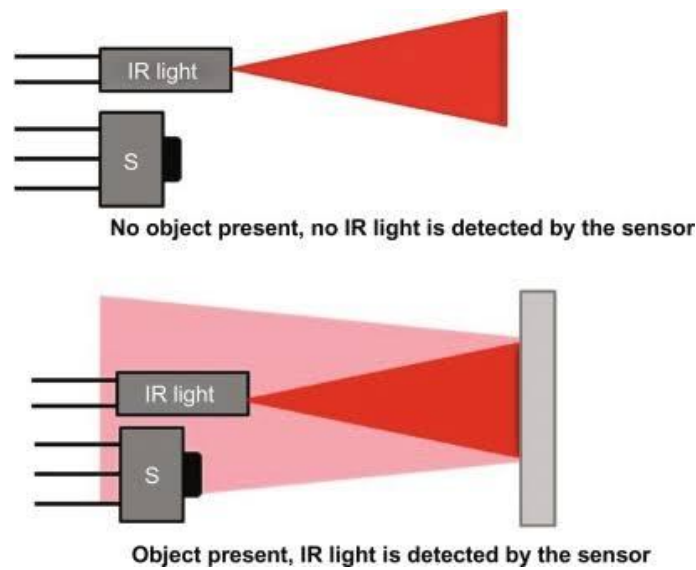


Figure 2:Working principle.

IR transmitter emits the radiation , it falls theobject and some of the radiation which falls on object reflects back to the IRreceiver. Based on the intensity of the reception by the IR receiver, the output of the sensor is defined. Although infrared detectors can be designed to perform different functions, all infrared detectors are made of pyro electric materials, whether natural or artificial, the pyro electric material produces an electrical voltage whenever it is heated or cooled. As the infrared wavesreach the sensor from different areas, they cause the sensor trigger an alarm or activate some other type of system.[2]

IR pair is an electronic device which consists of two parts

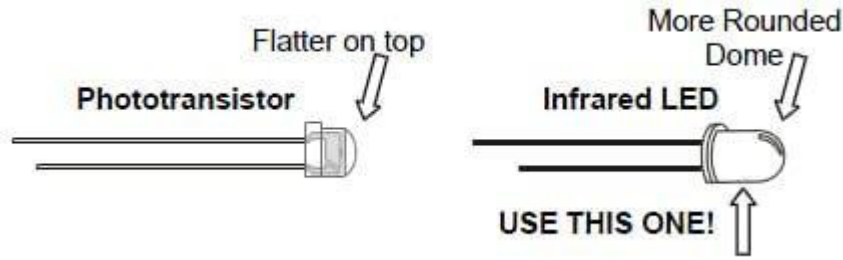


Figure 3: External Structure

Transmitter is used to transmit or emit the infrared rays and the receiver is used to receive these radiations. IR transmitter and receiver are commonly used to control electronic devices wirelessly, when they sense modulated IR pulses and convert them into electrical signal.

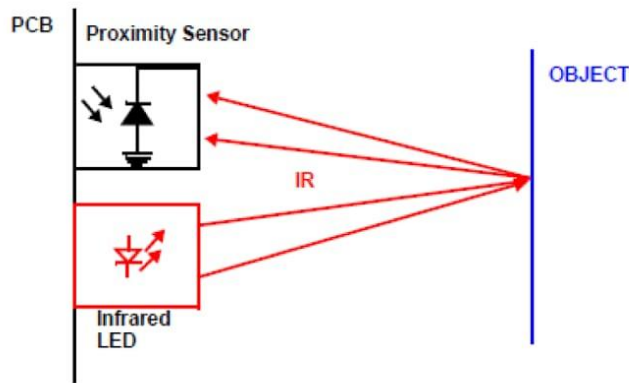


Figure 4: Internal Diagram

IR light-emitting diode is used it is also called as solid-state light-emitting device that produces light in the infrared band. An infrared sensor is a radiation-sensitive optoelectronic component with spectral sensitivity in the infrared wavelength range is 780nm. IR sensors use infrared light to determine whether an object is present or not. [2]

III. IMPLEMENTATION

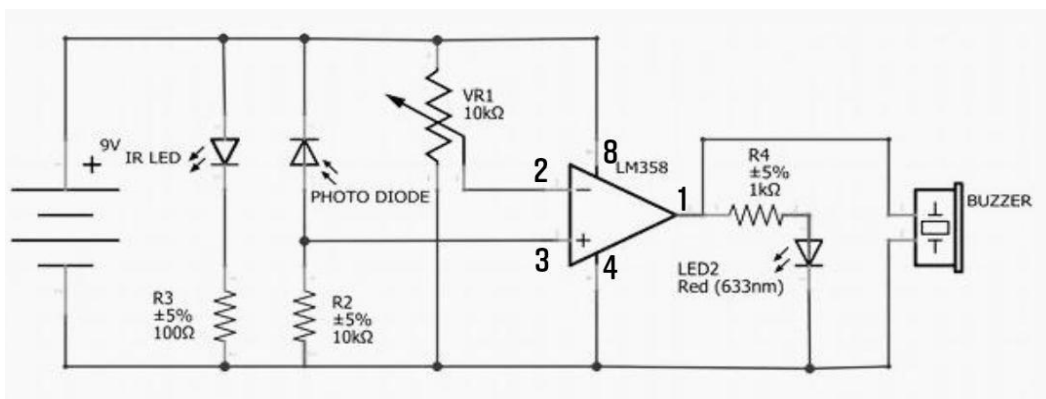


Figure 5: circuit diagram

Components:

RESISTOR:

A resistor is a passive two terminal electrical component that implements electrical resistance in a circuit . The current through a resistor is in direct proportion to the voltage across the resistor's terminals. .

IR LED(TRANSMITTER):

An IR LED also known as IR transmitter, infrared rays in the range of 100 nm wavelength . They alongwith sensors is a special purpose LED that transmits . Such LEDs are usually made of gallium with IR receivers are commonly used as sensors.

PHOTO-DIODE:

A photo-diode is a p-n junction in which reverse current increases when the junction is exposed to light. This means that greater the intensity of light falling on the p-n-junction of photo-diode, the greater will be the reverse current

BUZZER:

A buzzer or beeper is an audio signaling device, which may be mechanical. Buzzer consists of an outer case with two attached pins .

PRESET OR VARIABLE RESISTOR:

A preset is a three legged electronic component which can offer varying resistance in a circuit ,these resistors can also be known as digital potentiometer. By using the variable resistor you will have more control over the voltage . you can adjust the amount of current flowing through the circuit .

BATTERY/ SUPPLY(DC) :

The 9-volt battery, is a common size of battery . it is a power source consisting of one or more electrochemical cell. Battery are once used and then it is discarded .Battery comes in different shape and different sizes.

LIGHT EMITTING DIODE(LED):

Light-emitting diodes are not made from silicon or germanium but are made by using elements like gallium, phosphorus and arsenic. Light emitting diode produces light up to 90% more efficiently . They are used as electronic device , interacting with processes involving no human vision.

LM358 IC:

The LM358 IC is a great, low power and easy to use dual channel op-amp . . This IC is designed for specially to operate from a single power supply over a wide range of voltages. The LM358 IC is available in a chip sized package and applications of this op amp include conventional op-amp circuits, DC gain blocks and transducer amplifiers. LM358 IC is a good standard operational amplifier and it is suitable for our needs. it can handle 3-32V DC supply & source

Features of LM358 IC:

The features of the LM358 IC are: . The large voltage gain is 100 dB and the Wide bandwidth is 1MHz Range of wide power supplies includes single and dual power supplies . Range of Single power supply is from 3V to 32V o Range of dual power supplies is from + or -1.5V to + or -16V .[4]

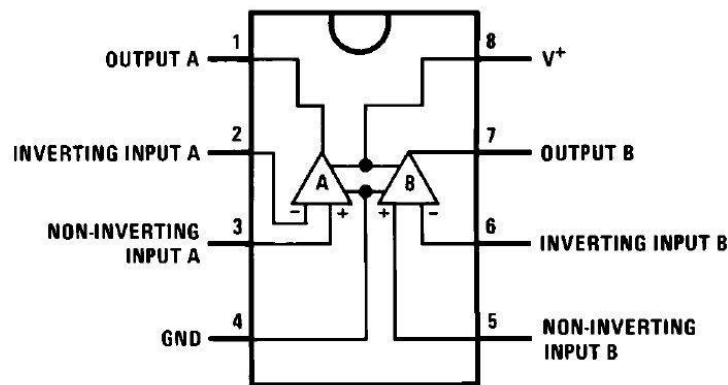


Figure 5: Internal structure of IC LM358

IV. WORKINGPRINCIPLE

The circuit consists of a photo-diode, Resistor, operational IC LM358, potentiometer, IR led, battery , and a beeper . When the IR led emits infrared light, the photodiode detects the infrared light. Photodiode is a passive component the basic principle of photodiode is it converts light into current.

Receiver comes in in the form of photodiode. IR photodiode can detect only infrared radiation. IR sensors can detect motion. Basically, resistors are used in series with photodiode to obtain high voltage range which will be useful for feeding it to a comparator. A comparator is a device that compares two voltages and output voltage at the positive side voltage and at negative side. It is used to check whether an input has reached the predetermined value, the potentiometer is used to calibrate the output of sensor according to the requirement. A potentiometer is a simple device used to measure the electrical potentials according to the requirement.

When the light emitted by the IR led is incident on the photo-diode after hitting an object the resistance of the photo-diode decreases. First input of the op-amp is at threshold value set by the potentiometer. The other input of the op-amp is from the photo-diode's series resistor. When the incident radiation is more on the photodiode the voltage drop across the receiver resistor will be high. In the IC, both the threshold voltage and the voltage across the series resistor are compared. IC LM358 is a dual op-amp IC integrated with two op-amp powered by common power supply. If the voltage drop across the series of resistor increases with intensity of light the current flow will increase with intensity of light. 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. In led minimum threshold must be present between anode and cathode for the flow of current.

The output is also connected to the buzzer which is an audio-signaling device which also consists of an output side-case with two attached pin so when the output is applied to the buzzer the buzzer starts ringing.

V. RESULT ANALYSIS:

The basic elements which are used in the circuit are an infrared source, transmission medium, optical components, infrared detectors or receivers and signal processing. Infrared LEDs can be used as infrared sources. The three main types of media used for infrared transmission are, atmosphere and optical. Optical components are used to limit the spectral response. Optical lenses made of Germanium and Silicon are focused on the infrared radiation. Infrared receivers can be photodiodes, phototransistors are sensitive to light.

VI. ADVANTAGES, DISADVANTAGES AND APPLICATIONS:

ADVANTAGES

- **No wiring required:** one of the biggest benefits of having a touchless doorbell installed at your premises is that you won't see wires all around your home surroundings. For those who do not like wires spoiling the beauty of your houses.
- **Portability:** a wired doorbell cannot be fitted anywhere you want in the house and will only be installed in a fixed place. This contingency can be removed by replacing it with touchless doorbell.
- **Innovation:** because they are portable in nature, and more and more people are attracted to using them hence more innovation.
- **Price:** wireless doorbell was relatively expensive till a few years back, but in today's times, the touchless doorbell are relatively cheaper. [5]

DISADVANTAGE

- The only disadvantage that a wireless doorbell poses has been that it most often works on batteries. Now you don't always check the battery charge of your doorbell every day. When the battery gets discharged. And if you are not conscious of this fact, this may be troublesome and embarrassing too.
- A visitor might press the bell button, but you still won't hear the sound, as the doorbell is dead. And this leads to visitors leaving your premise unattended. But this is a small disadvantage that can be ignored as the advantage of having a wireless doorbell are numerous. So this one problem cannot make the entire product obsolete.

Some general applications of touch less doorbell system are:

Fire engines,

Telephone,

Railroad crossing,

School bells,

Alarm in industrial plants etc.

VII. FUTURE WORK:

Ahead of covid-19 we were already expecting touchless experience to ripple through out every corner of the smart house. social distancing have proven effective in reducing this spread of germs. So the future scope this project

will be to extend the range using laser light instead IR LED, as lasers are more powerful and operate at faster speed than LED's and they can also transmit light further with fewer errors.

This feature in age of covid-19, but I'm wondering how it can be made as water-resistant touchless doorbell, to overcome the climatic humidity this can be implemented by using common compounds for water proofing electronic material such as an epoxy resin, coating on a component or the entire PCB is encased in the material, or we can also choose urethane if we need a water proofing material.

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