PROJECT

"Reverse Car Parking Sensor

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ABSTRACT

Reverse car parking sensor it adopts infra-red light sensors which measure the distance accurately when reversing a car. This circuit was designed as an aid in parking the car near the garage well when backing up. In this manner we are alerted when approaching too close to the wall. The first LED illuminates when bumper-wall distance is about 65cm, 1 more LED illuminates at about 50cm, and in all 3LEDs at about 45cm. In this way it is provided with the visual feedback.

This reverse car parking sensor circuit solve all these problems. You can easily install at the back side of your car. You can also use them as shadow alarm at doors to protect your car. When shadow of an intruder fall on it will also give you alarm. This alarm will provide you the musical sound that's why it will not tease your ears.

Reverse car parking sensor circuit solves this problem by inducting the distance with the help of three LED's. We can easily arrange this system at the back side of the car. This system operates with 9v rechargeable battery.

This Reverse car parking sensor circuit is quite easy and use few commonly available components which are resistors, LED's, battery, IC LM358, buzzer, etc.

CHAPTER 1

INTRODUCTION

We are often afraid that our brand new Hummer is going to get scratched while parking it in the tight space. Or we have trouble backing our large Mercedes S- class into our small garage. There is no need to fear anymore! This car parking sensor circuit can sense how far we are away from the wall or a hidden object behind your car and warn us visually using LEDs. It is to note that we have kept our project scope only till the visual feedback using infra- red technology.

A significant portion of the people around the world owns cars or are daily drivers. Among these drivers, it's not entirely untrue to assume that parallel parking or rearward parking is one of the most cumbersome parts of their driving experience. It takes years of driving experience and rigorous practices to avoid an ugly scratch across the bumper. Some old school auto –enthusiasts may like to do everything manually, but most of us like to take advantage of the advanced car electronics and technologies to make our life a little bit easier and also to avoid common accidents during parking. Hence, we decided to design and build an infra-red parking assistant system that will help the driver get a sense of how far the car is away from a wall or an object behind the car.

CHAPTER 2

LITERATURE SURVEY

Intelligent Transportation system area unit outlined as those systems utilising synergistic technologies and systems engineering ideas to develop and improve transportation system of every kind. The scope of this knowledge base activity embrace the promotion, consolidation and coordination of ITS technical activities among IEEE entities and providing attention for cooperative activities each internally and outwardly.

In urban areas, engorged traffics leads to an oversized range of accidents at low speeds. This paper describes associate degree correct and quick driver help system (DAS) that detects obstacles and warns the motive force earlier of attainable collisions is such a engorged traffic surroundings. A laboratory model of the system is made and tested by simulating completely different atmospheric condition within the laboratory. The projected DAS is additionally appropriate as parking.

IR sensors are used for a lot of applicable for target which may measure the gap of the article which can not be simply detected by supersonic sensors.

A review of automobile –guidance analysis comes distributed in European universities and advanced safety vehicle development by Japanese automobile makers is followed by an outline of driver help systems in current use. a brand new analysis initiative for autonomous unidentified craft is then mentioned. totally autonomous model vehicle have incontestible spectacular feats on public roads, however automobile makers area unit presently concentrating on driver help systems. analysis is afoot to increase the employment of unidentified craft into the civil field, and to permit them to share airspace with piloted planes. gift current policies in automotive and part development, and describes the vary of detector technologies applied to collision rejection.

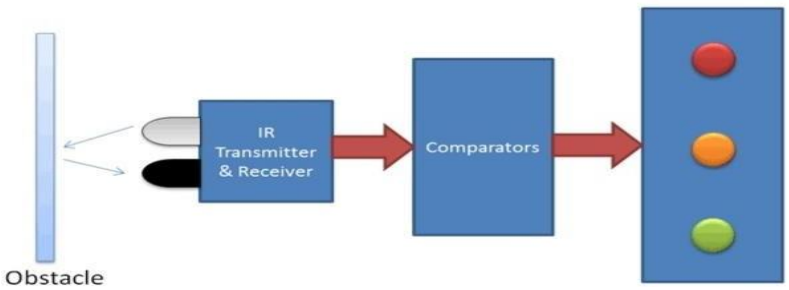
Chapter: 3

Principle and Working

Principle

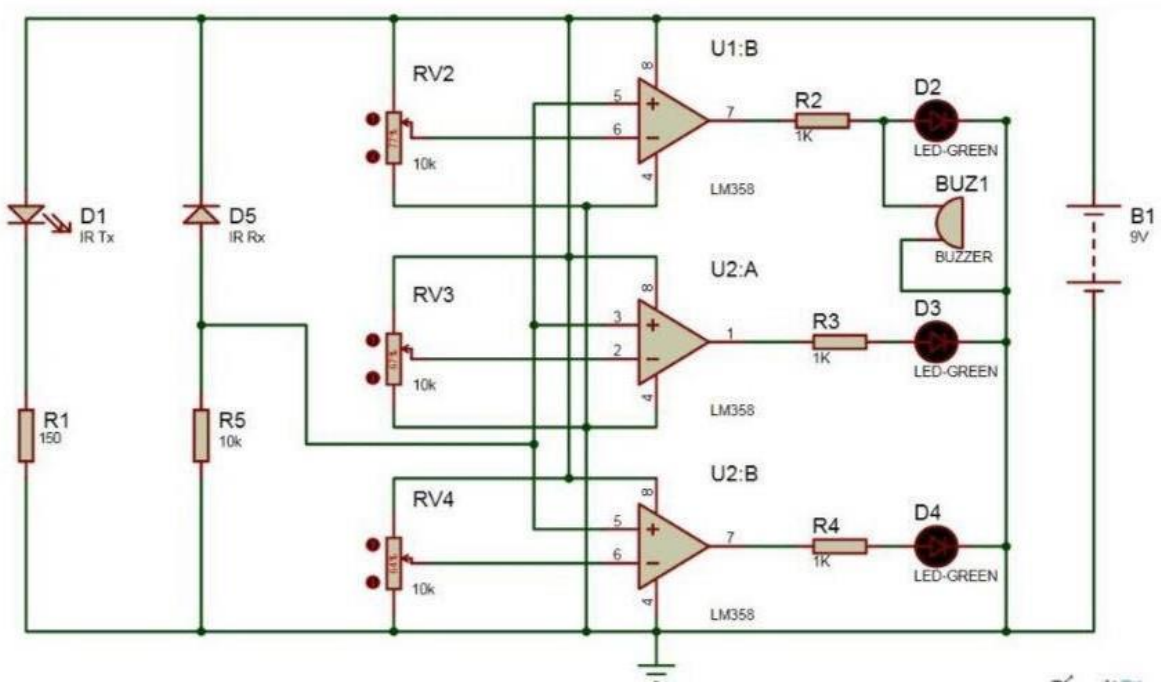
Reverse car parking sensor is a project that operates on IR power supply. The reverse car parking sensor is a circuit that works on the concept of 2 main components that is ICLM358, IR transmitter receiver.

To design this car parking system circuit, we placed an IR transmitter receiver pair at the rear side of the car. IR transmitter transmits infrared signal or rays into the environment continuously. When these transmitted IR rays reflect back to IR receiver after striking on an obstacle, some voltage difference generates across this IR receiver LED. This generated voltage difference depending upon the power of IR rays that are reflected back to the receiver. More powered signal leads to more voltage difference. This voltage difference is used in our project to measure the distance. Here more voltage difference indicates the lesser distance from the object. Here we have shown distance from the obstacle by using three LED's. meaning of these LEDD'S are explained in working of this project.



Circuit Diagram and Explanation

In this car parking circuit we have used an IR pair for detecting obstacle and two LM358 dual comparator ICs for comparing voltages. Comparator configured in non- inverting mode and 10K potentiometer is connected at its inverting terminal for adjusting reference voltage and IR receiver's output is directly connected at non-inverting pins of all comparators. One red LED is connected at output of U1: B IC (LM358), a yellow LED is connected at output pi of U2:A IC(LM358) And an Green LED is connected at output pin of U2:B IC(LM358) a 1K resistor. A buzzer is also added at Red LED.



Working

We have shown the reference voltage and relative parameters in the below table. But one can set distance by changing the value of potentiometers.

Obstacle v/s Vehicle	LED status	Reference Voltage	Distance
not close	All OFF		Greater than 15 cm
Close	Green ON	2.0 Volt	About 15 cm
More Close	Yellow ON	4.0 Volt	About 10 cm
More Close	Red ON	6.0 Volt	About 5 cm
Touch	Car Damaged		About 0 cm

This system is placed at the rear of the car and sensor's front side toward the obstacle (wall). Now suppose car is moving back toward the wall or obstacle in the parking slot. If distance between car

and obstacle is more than 15 cm then no LED will glow. Now if car moves toward the obstacles and suppose green light turned on, it means car is about 15 cm away from the obstacle. Now car is moving more close toward the obstacle and yellow light appears or turned on it means car is about 10 cm away from the obstacle. Now car is moving closer toward the obstacle and red light appears it means car is about 5 cm away from the obstacle and same time buzzer start beeping. Buzzer and red light indicates that the car need to stop now otherwise car may be damaged.

CHAPTER-4

PROJECT DESCRIPTION

1. IC LM358:

LM358 is a great,lowpower and easy use with dual channel op-amp. It consists of two internally frequency compensated, high gain, independent op-amps. This are specially designed to operate a single power supply through a wide range of voltages.

Pin configuration is given as:

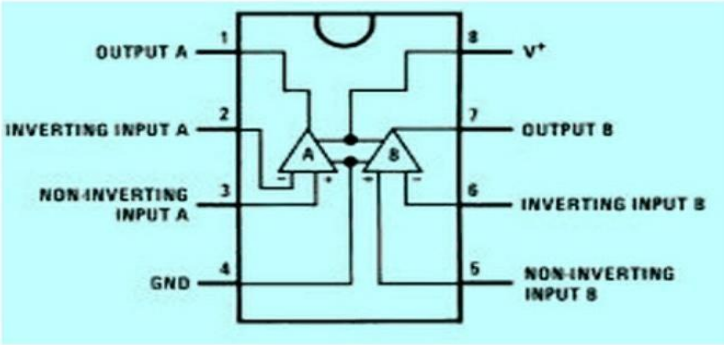


Fig 1.a:pin configuration of LM358

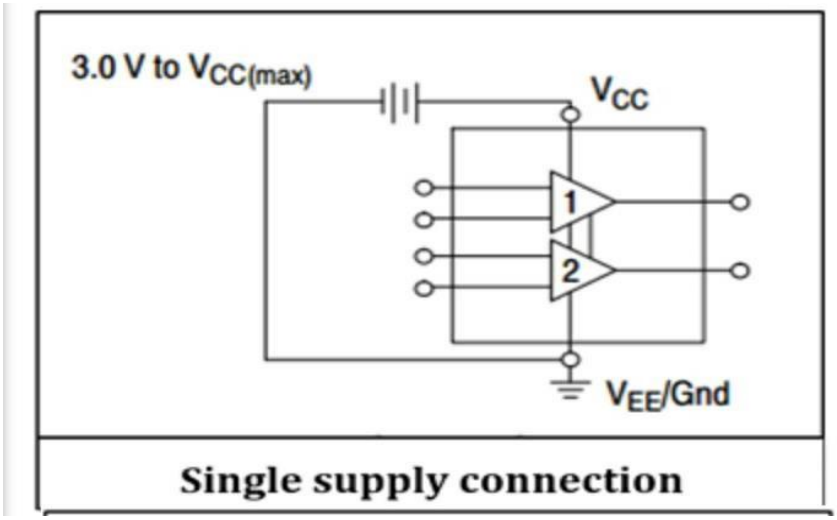


Fig 1.b:Single supply connection

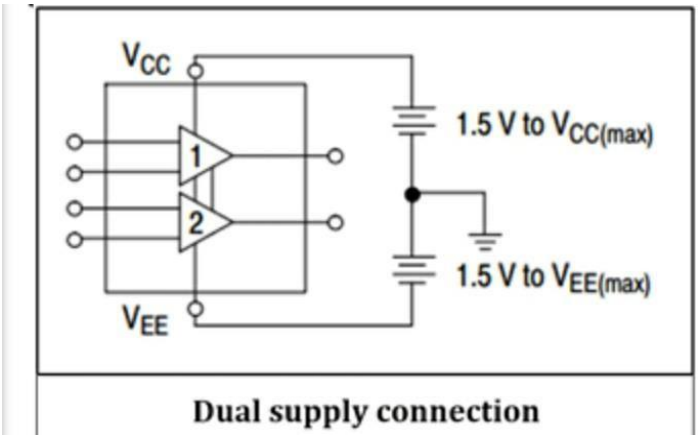


fig 1.c: Dual supply connections

If the inverting pin is HIGH, the output is NEGATIVE
If the inverting pin is LOW, the output is POSITIVE
If the non-inverting pin is HIGH, the output is POSITIVE
If the non-inverting pin is LOW, the output is NEGATIVE

Features of LM358:

1. It consists of two op-amps internally and frequency compensated for unity gain.
2. Max voltage gain of 100dB
3. Max wide of bandwidth is 1MHz
4. It includes both single and dual power supplies
5. Single power supply ranges from 3V to 32V
6. Dual power supply ranges from -1.5V to -16V
7. Drain current is very low i.e, is 500uA
8. Low input offset voltage of 2mV
9. Common mode input voltage comprises to ground
10. Output swing is large

Applications:

1. Transducer amplifiers
2. Conventional op-amp circuits
3. Integrator, differentiator, summer, adder, voltage follower
4. Dc gain blocks, digital multi-meters, oscilloscopes
5. Comparators

2. Resistor

A resistor is passive two-terminal electrical part that implements electric resistance as a circuit component. In electronic circuits, resistors area unit wont to cut back current flow, modify signal levels, to divide voltage, bias active parts, and terminate transmission lines, among alternative uses. high-energy resistors which will dissipate several watts of electric power as heat, could also be used as a part of motor controls,

in power distribution systems, or as take a look at hundreds for generators. mounted resistors have resistances that solely modification slightly with temperature, time or operative voltage. Variable resistors is wont to modify circuit parts (such as a volume management or a lamp dimmer), or as sensing devices for warmth, light, humidity, forces, or chemical activity.

Fig2.1

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. The electrical function of a resistor is specified by its resistance: common commercial resistors are manufactured over a range of more than nine orders of magnitude. The nominal value of the resistance falls within the manufacturing tolerance, indicated on the component.

3. Potentiometer (pot):

A potentiometer is a three-terminal resistor with a sliding or rotating contact that forms an adjustable voltage driver. If only two terminals are used , one end and the wiper, it acts as a variable resistor or rheostat.

Fig:3.1

The measuring instrument called a potentiometer is essentially a voltage divider used for measuring electric potential the component is an implementation of the same principle, hence its name.

Potentiometers are commonly used to control electrical devices such as volume controls on audio equipments. Potentiometers are operated by a mechanism can be used as position transducers, for example, in a joystick. Potentiometers are rarely used to directly control significant power since the power dissipated in the potentiometer would be comparable to the power in the controlled load.

There are a number of terms in the electronics industry used to describe certain types of potentiometers:

- **Slide pot or slider pot:** A potentiometer that is adjusted by sliding the wiper left or right, usually with a finger or a thumb.
- **Thumb pot or thumbwheel pot:** A small rotating potentiometer meant to be adjusted infrequently by means of a small thumbwheel.
- **Trim pot or trimmer pot:** A trimmer potentiometer typically meant to be adjusted once or infrequently for “fine-tuning” an electrical signal.

4. Power Supply:

A Power supply is a device that supplies electric power to electric load. The term is the most commonly referred electric power that converts one form of electrical energy to other, through it may also refer to that convert another form of mechanical, chemical or solar energy to electrical energy. The regulated power supply is that controls the output voltage or current to a specific value.

5.LED Working

These LED consists of 2 lead semiconductor light. In 1962, Nick Holonyk came up with an idea of light emitting diode, and he was working for the general electric company. The LED is a special type of diode and they have similar electric characteristics of a PN junction diode. Hence the led allows the flow of current in the forward direction and blocks the current in the reverse direction. The led occupies the small area which is less than the 1mm2.

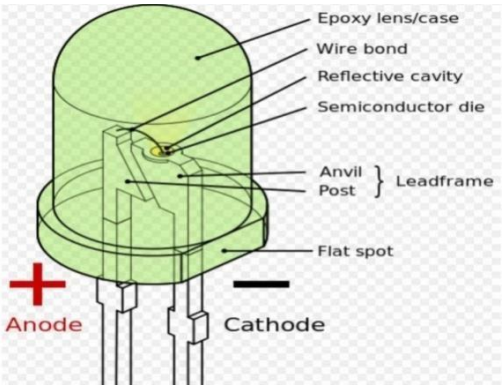


Fig 5.1

Light Emitting Diode

The light emitting diode simply, we know as a diode. When the diode is forward biased, then the electrons and holes are movingfast across the junction and they are combining constantly, removing one another out. Soon after the electrons are moving from the n-type to the p-type

silicon, it combines with the holes, and then it disappears. Hence it makes the complete atom and more stable and it gives the little burst of energy in the form of a tiny packet or photon of light.

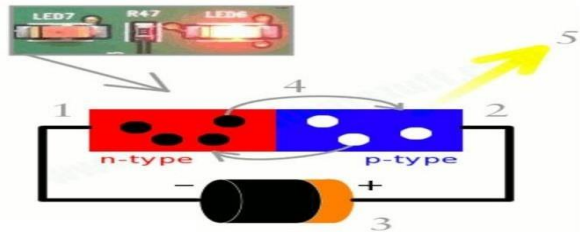


Fig5.2

Working of Light Emitting Diode

The above diagram shows how the light emitting diode works and the step by step process of the diagram.

From the diagram, we can observe that the N-type silicon is in red color and it contains the electrons, they are indicated by the black circles.

The P-type silicon is in the blue color and it contains holes, they are indicated by the white circles.

The power supply across the p-n junction makes the diode forward biased and pushing the electrons from n-type to p-type pushing the holes in the opposite direction.

The electron and holes at the junction are combined.

The photons are given off as the electrons and holes are recombined.

Fabrication of LED:

GaN and nitrides of groups are the major role in higher-efficiency for LED's. Most of them are mostly accessible as GaN LED's. It is fabricated by the MOCVD on a crystalline sapphire wafers, due to this high thermal and it's chemical stability. The application are often restricted. The identification problems are expensive in cost, having a small area.

Sapphire in GaN it suffer a wide mismatch in the lattice constant (16%), (34%) of thermal expansion co-efficient.

Metal is emerge to a promising substrate to this purpose.Hence the metal foils possess the electrical conductivity, thermal flexibility wide area metal foil will be get ready by a rolling process in a sensible price. Among different metals to grow GaN the (Hf) is the ideal substrate, because it split various similarities with the structural properties of GaN

Among these all advantages, Hf foil is the reason for the growth of GaN but it has not been that much of practical due to 2 major problems:

1. Adventitiously positioned grains are generally available in Hf foils which leads to low crystalline quality for the laminated GaN film.

To overcome these problems a high c - axis positioned Hf foils with a wide grains size would be prepared before growth of GaN.

2. The next problem is having a highly interfacial reactions among the both GaN and Hf, while having a wide range of temperature growth in a standard techniques like as MoCVD. Hence, LT growth is to suppress the interfacial reactions between the GaN and chemically endangered substrate like as metals. It should also note that PD's it is a study, we noted that growth of GaN by PD's and it is explorer the workable of GaN depend on full colour LED's on Hf.

SEM means Scanning electro microscope, it is an image of received 50m thick Hf it shows the foil surface to a rough(fig 5a) Expect from the rolling process for production of the foils. The RHEED pattern is inserted. It indicates the surface by making crystal oriented map received by electrons. EBSD in the normal direction on a surface.

From the fig 1.c the heating and cooling surface smoothness is gradually improves , as we seen in SEM image. The RHEED pattern is a streaky diffraction which indicates the avoid of amorphous oxide layer which it appears the crystalline Hf which is having the smooth surface.

We can see in fig 1d , EBSD crystal positioned map with the surface in a general direction. We clearly see the amealed Hf foils it has widely c - axis positioned structure in the entire area.

In this rolling process revealed the grain size of the annealed c - axis which orients the Hf foils, as wide as 500m , as we see in fig 1e.

The received Hf foils it shows various peaks which indicates random oriented crystalline structure. Only {00001} associated diffracted peaks are observed by the annealed Hf foils.

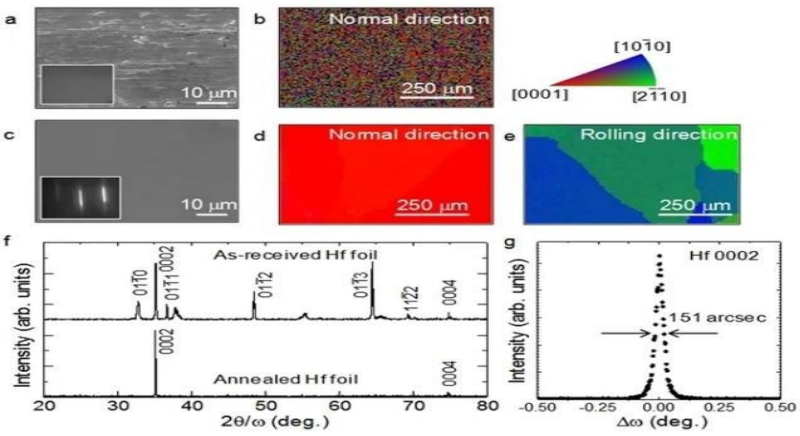


Fig 5.3

Exterior structure and crystal familiarisation of Hf foils:

Here we can observe the 6 various surfaces

a) SEM image

b) EBSD crystal oriented map with normal directional surface

c) SEM image of annealed Hf

d) Have EBDs crystal oriented map of general surface and rolling directions.

e) The xRD curves are received and annealed the Hf foils.

f) XRC of Hf is 0002 diffraction of Hf foils.

When the Hf foils are annealed then a 1m thick GaN film is produced by the PDs along with LT - growth reaction having barrier layer.

From the fig the EBSD poles figure the 20*20m^2 area of reaction takes place of GaN growth on Hf. Here, the {0001} is the certain spot to the GaN, which is sharp and {1124} pole fig shows the clear six fold rotational symmetry. The results significant the GaN have only one domain structure and at least the EBSD scanned area (20*20m^2), because of restraint from the Hf.

By this result we can conclude the use of LT - growth by PDs which enable the production of GaN on Hf without any interfacial reaction.will be potentially used for electronic device fabrication.

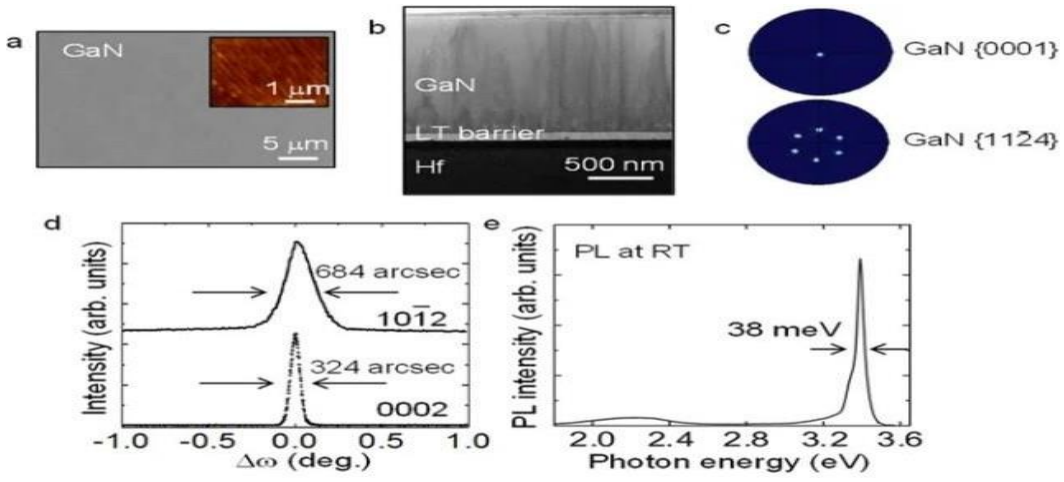


Fig 5.4

GaN film on Hf with LT - growth reactions barrier layer are having structural and optical properties.

- Surface of SEM
- Cross sectional TEM image of GaN
- EBSD pole fig of {0001} GaN , {1124} GaN.
- At xRCs 0002 and 1012
- GaN film has a spectrum of RT-PL

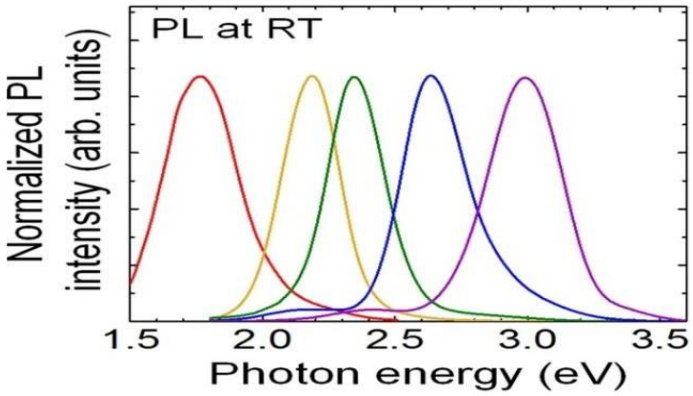


Fig 5.5

RT - PL spectrum of GaN film without difference in composition which consists of optical properties.

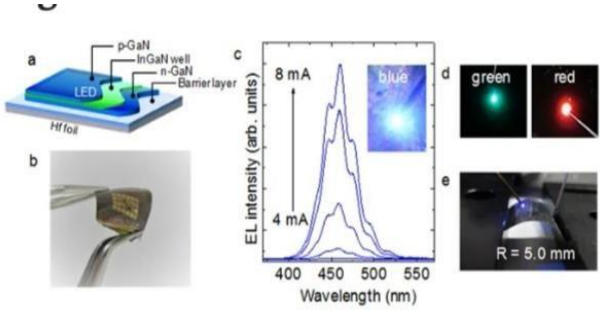


Fig 5.6

Hf foils of LEDs fibrication

a. Diagrammatic illustration of LED design

b. Visible image of a malleable Hf foils where GaN depends on LED

c. EL spectrum of LED design is forward current ranging from 4 to 8mA. The slide show the optical image of blue EL in the forward current at 8mA.

d. The green and red LED's takes place at photography.

e. Light discharge photography at the radius of 5.0mm.

6. Buzzer:

It is a audio signalling device they are like mechanical, electromechanical, piezoelectric. In alarm,timer these buzzers are mainly used.

Fig 6.1

Types of buzzers:

Electro-mechanical: Early devices were mostly based on electromechanical system which were electric bell without the metal gong. Similarly a relay would be connected to interrupt its own actuating current which is causing the contacts to buzz. The word

“buzzer” comes from the rasping noise that electromechanicalbuzzers made.

Fig 6.2

Mechanical: A joy buzzer is an example of a purely mechanical buzzer and they require drivers. Other examples of them are doorbells.

Fig 6.3

Piezoelectric: These elements are worked by the oscillating electronic circuits or other audio signal source. The button is pressed then it gives a sound or a beep sound as an indication.

Fig 6.4

A piezoelectric buzzer can be depended on acoustic cavity resonance or Helmholtz resonance which can produce an audible beep.

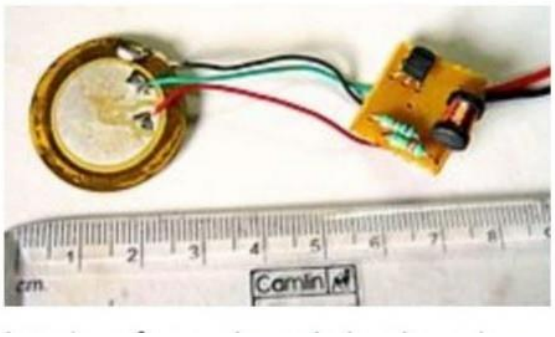


Fig 6.5

7. IR Pair:

These are electronic devices which helps to scene the changes in the surroundings.Changes are like temperature,colour, moisture, sound,etc..IR sensor consist the emitter and detector.

The IR sensor basically consists of three components:
IR LED(emitter)
Photodiode(detector)
Op-Amp

IR LED:

Fig 7.1

IR LED is a light emitting diode which emits the IRradiations.The basic function of the emitter is to convert electricity into light.It works on the principle of combination of electron-holepair.As in the conduction band of a diode,electron sare the majority carrier and in the valence band, holes are majority carrier.So when an electron from a conduction bandre combines with a hole of valance band,some amount of energy is released and this energyisin the form of light.The amount of energy released is depends upon the for bidden energy gap.The IR Led has two legs,the leg which is longer is positive and other leg is negative.

Photo diode:

Fig 7.2

The photo diode is a p-n junction diode which is connected in reverse bias direction. The basic function of the detector is to convert light into electricity. As its name implies that it works effectively only when the certain number of photon or certain amount of light falls on it. When there is no fall of light on the photodiode it has an infinite resistance and act as an open switch but as the light starts falling on the photodiode, the resistance becomes low and when the full intensity of light fall on the photodiode then its resistance becomes zero and it starts act like a closed switch.

OP-AMP:

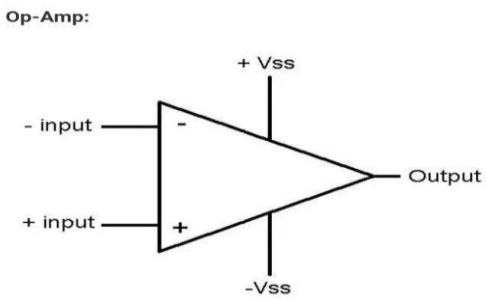


Fig 7.3

OP-AMP stands for operational amplifier. It is a DC-coupled high gain amplifier with differential inputs and single output. Typically the output of the op-amp is controlled by either negative or positive feedback. Due to the fact that it performs several operations like addition, subtraction, etc. It is named as operational amplifier. It has two inputs pins and one output pin.

8. IR Transmitter:

It is an LED that will emit IR radiation. They are also known as IR LED's. They look like normal LED the radiation which it emits that are even invisible to the human eye.

The picture of a typical infrared LED is shown below

Fig 8.1

These are various types of IR transmitter based on wavelength, output power and restore the time.

IR Transmitter are found in several applications.Few application need infrared heat and the good infrared source that is IR transmitter.

Solar cells are made up of the IR emitters using Quartz.

Distinguishing Between Black and White colours:

It is a universal that all the black colours absorb the entire radiation incident on it. Based on this principle, the second positioning of the sensor couple can be made. The IR LED and the photodiode are placed side by side. When the IR transmitter emits infrared radiation, since there is no direct line of contact between the transmitter and receiver, the emitted radiation must reflect back to the photodiode after hitting any object. The surface of the object can be divided into two types: reflective surface and non- reflective surface.

If the surface of the object is reflective in nature i.e. it is white or other light colour, most of the radiation incident on it will get reflected back and reaches the photodiode. Depending on the intensity of the radiation reflected back to the current flows in the photodiode.

If the surface of the object is non-reflective in nature i.e. it is black or other dark colour, it absorbs almost all the radiation incident on it. As there is no reflected radiation there will be no radiation incident on the photodiode and the resistance of the photodiode remains higher no current to flow. This is the main situation is similar to there being no object to all.

The pictorial representation of the above scenarios is shown below:

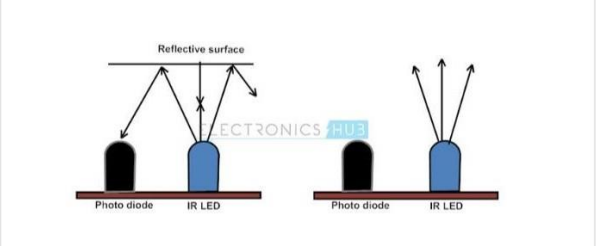


Fig 8.2

Transmitter and receiver should have the position and enclosing the necessary end those which are placed at certain angle then only it identify the obstacle property.Thr angle which is mainly dirrectivity of the sensor which is +/- 45 degrees.

The directivity is shown below:

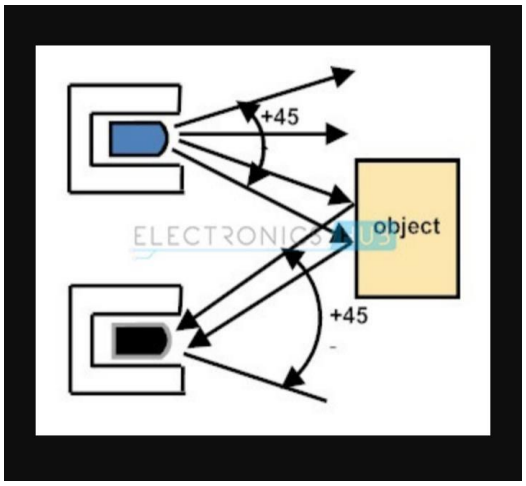
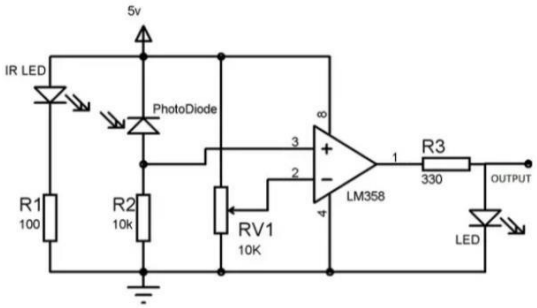


Fig 8.3

In order to avoid reflections from surrounding objects other than the object, both the IR transmitter and the IR receiver must be enclosed properly. Generally the enclosure is made of plastic and is painted with the black colour.

Working:

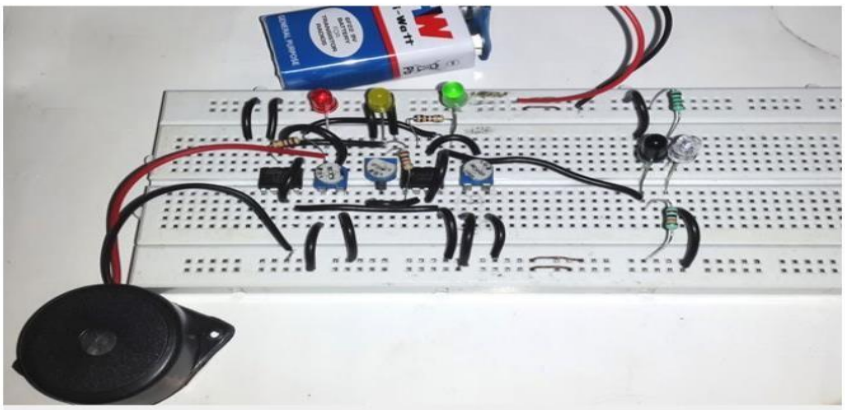


We know that the white surface reflects all the radiations falls on it whereas the black color absorbs them. When the supply is given to IR sensor, LED starts emitting light radiations. If the surface is of white color then it reflects all the radiations. As these radiations starts falling on the photodiode which is connected in reverse bias the resistance of the photodiode starts decreasing rapidly with the voltage drop across the diode. The voltage at pin 3 starts increases, as it reaches just beyond the voltage pin 2 the comparator gives high output. In case of the black surface, LED emits light but it is not reflected by the surface .Hence the comparator gives low output.

Chapter: 5

Results and Discussion

Results:



Reverse Car Parking Circuit using IC LM358

Discussion:

The effective range is proportional to the power of the transmitted pulses. As we have found out from our circuit, that as the distance of the car from the wall got less and less, the reflected IR needed less time and also it bought back a more intensified beam back reflected.

This system is placed at the rear of the car and sensors front side towards the obstacle. Now suppose car is moving back towards the wall or obstacle in the parking slot. If distance between car and obstacle is more than 15cm then no LED will glow. Now if car moves towards the obstacles and suppose green light turned on, it means car is about 15cm away from the obstacle. Now car is moving more close towards the obstacle and yellow light appears or turned on it means car is about 10cm away from the obstacle. Now car is moving closer towards the obstacle and red light appears it means car is about 5cm away from the obstacle and same time buzzer start beeping. Buzzer and red light indicates that the car need to stop now otherwise car may be damaged.

To test the accuracy of the device we measured the actual distance between the sensors and the object with ruler and compared that to the distance reading which we have expected from the calculations.

Obstacle v/s Vehicle	LED status	Reference Voltage	Distance
not close	All OFF		Greater than 15 cm
Close	Green ON	2.0 Volt	About 15 cm
More Close	Yellow ON	4.0 Volt	About 10 cm
More Close	Red ON	6.0 Volt	About 5 cm
Touch	Car Damaged		About 0 cm

Table 5.1 Distance intervals and corresponding lighted LEDs

Chapter: 6

Conclusion and Future Scope

Conclusion:

Using this circuit, the efficiency in alleviating the traffic problem that arises especially in the city and towns would get reduce. Where traffic congestion and the insufficient parking spaces are undeniable.

Future Scope:

New and better technology for the cars and other automobiles, with both visual as well as audible feedback**.**

This is a valuable car accessory technology because not only is it great addition to our high-tech car gadgets, it greatly lowers the risk of vehicle accidents.

Advantages:

1. By this parking area can be easily identified so the traffic is reduced and also carbon emission is also reduced.
2. Low cost
3. Low power consumption
4. More accurate and well suited for real time implementation
5. Helps the driver a better and convenient for parking.

Applications:

1.This circuit can be used in auto mobiles to park the vehicle safely.

2.We can use this circuit to measure the distance.

3.We can also use this circuit as IR Liquid Level Detector by making few modifications.

Limitations:

1.IR receiver may receive the normal light. As a result, parking sensor may not work properly.

2.We should arrange IR sensors accurately; otherwise they may not detect the obstacle.

Reference:

www.circuitdigest.com

www.electronichub.com