

Electronic Head Lamp Glare Management System for Automobile Applications

*Sushil Kumar Choudhary¹, Rajiv Suman², Sonali³, Honey Banga⁴

¹ *Department of Industrial & Production Engineering,*

^{2,3,4} *Department of Mechanical Engineering*

College of Technology,

G.B.Pant University of Agriculture & Technology Pantnagar-263145, INDIA

* *E-mail of the corresponding author: (Sushil_think@rediffmail.com)*

Abstract- Headlamp glare is an issue that has grown in terms of public awareness over the past decade. High beam of headlight of an on-coming car has blinding effect and decreases visibility during night driving dangerously. The drivers of most vehicles use high, bright beam while driving at night. This causes a discomfort to the person traveling from the opposite direction. He experiences a sudden glare for a short period of time. This is caused due to the high intense headlight beam from the other vehicle coming towards him from the opposite direction. We are expected to dim the headlight to avoid this glare. This glare causes a temporary blindness to a person resulting in road accidents during the night. This model concept eliminates the requirement of manual switch by the driver which is not done at all time. This concept very useful in the automobile field applications, which provides safety of driver during night driving. The construction, working, advantages & future scope of the system is discussed detail in this paper.

Keywords: Headlight, automatic, dimmer, control, high beam, low beam, Kelvin (K).

1. INTRODUCTION

1.1 System Introduction

Driving an automobile is primarily a visual task. By one estimate, as much as 90% of the information that drivers gather is received visually (Alexander, G. and Lunenfeld, H. 1990), and whatever the actual percentage may be, the importance of the visual system to driving can not be doubted (Sivak, 1996). However, in order for the visual system to detect, attend to, and recognize information, there must be adequate lighting. Drivers require enough lighting at night to see a variety of objects on the highway, including traffic control devices, lane lines, vehicles, pedestrians, animals, and other potentially hazardous objects. However, too much light or improper lighting can result in glare, which can be a major problem both in terms of the ability to see and visual comfort.

The requirement of headlight is very common during night travel. The same headlight which assists the driver for better vision during night travel is also responsible for many accidents that are being caused. The driver has the control of the headlight which can be switched from high beam (bright) to low beam (dim). The headlight has to be adjusted according to the light requirement by the

driver. During pitch black conditions where there are no other sources of light, high beam is used to. On all other cases, low beam is preferred. But in a two-way traffic, there are vehicles plying on both sides of the road. So when the bright light from the headlight of a vehicle coming from the opposite direction falls on a person, it glares him for a certain amount of time. This causes disorientation to that driver. This discomfort will result in involuntary closing of the driver's eyes momentarily. This fraction of distraction is the prime cause of many road accidents. The prototype that is has been designed, reduces this problem by actually dimming down the bright headlight of our vehicle to low beam automatically when it senses a vehicle at close proximity approaching from the other direction. The entire working of the dimmer is a simple electronic circuitry arrangement which senses and switches the headlight according to the conditions required. Headlamp glare is an issue that has grown in terms of public awareness over the past decade. Developments in light source technologies and optical design have resulted in headlamp systems with higher efficiency (and thus the ability to produce higher luminance). High beam of headlight of an on-coming car has blinding effect and decreases visibility dangerously. Glare occurs when visual field brightness is greater than

the luminance to which the eyes are adapted. It can be caused by direct and indirect light sources. Discomfort glare causes discomfort, annoyance, fatigue, and pain. Disability glare produces a reduction in the visibility distance of low contrast objects. The elderly, people with light-colored eyes, and those suffering from cataracts are especially sensitive to disability glare. Glare at night can be mitigated by design changes in roadways, automobiles, and vehicle lighting systems. Countermeasures work in four ways, by:

- 1) Reducing the intensity of the glare source;
- 2) Reducing the illumination reaching the driver's eyes;
- 3) Increasing the glare angle; and
- 4) Indirectly minimizing the effects of glare.

1.1.1 Headlight

Headlights should project sufficient light far in advance of the vehicle so that steering and braking can be taken in time, while not causing excessive glare to oncoming drivers. While driving, it is necessary to illuminate the road ahead of the automobile so as to reveal objects ahead from a safe distance but improper lighting arrangements of the vehicles on road cause difficulty in driving at night. Bad driving habits and infrequent use of beam shifting/signals further enhances this problem and often remains the main reason for road accidents at night. With the auto boom, which had brought a large number of vehicles on to Indian roads? The accident rate has also risen alarmingly. "In about three lakh road accidents that occur every year, more than 70,000 persons are killed and 2.5 lakh injured. It is therefore, of paramount importance to drivers and other road users of fine-tune their road sense" Driving an automobile is primarily a visual task. By one estimate, as much as 90% of the information that drivers gather is received visually (Alexander, G. and Lunenfeld, H. 1990), and whatever the actual percentage may be, the importance of the visual system to driving can not be doubted (Sivak,1996). However, in order for the visual system to detect, attend to, and recognize information, there must be adequate lighting. Drivers require enough lighting at night to see a variety of objects on the highway, including traffic control devices.

1.1.2 Methods of lighting

There are only two practical methods of lighting the highway system at night: fixed overhead lighting and vehicle head lighting. While

the fraction of roads with fixed overhead lighting increases significantly each year, this form of lighting is expensive and can not be relied upon as the only means of providing for night visibility. Head lighting, from its inception, has involved a compromise between providing sufficient lighting for drivers to see (with adequate preview time), and avoiding excessive light that might produce glare. These two goals have been translated into standards in the form of minimum requirements to provide visibility and maximum limitations to control glare. Progressive improvements in head lighting and new technologies have increased night visibility and reduced the impact of glare, but any changes should be carefully considered before implementation. Changes in headlamp designs that affect light intensity, beam pattern and aiming have significantly improved night vision on the highway. Along with improvements in headlight systems, glare resistant interior surfaces, glare reducing mirrors, and changes to the highway environment have either directly reduced glare or indirectly reduced the effect of glare on drivers.

1.2. Basic terms

The remainder of the introduction provides definitions of some basic terms used in the study of lighting and vision. The key terms to be defined are:

- Brightness
- Point light source
- Luminous intensity
- Luminance
- Illuminance
- Reflectance
- Glare

1.2.1 Brightness

Brightness is the attribute of visual sensation according to which an area appears to emit more or less light. Brightness is a relative term which describes the appearance of to an observer. An object of any brightness will appear brighter if the ambient light levels are lower. Brightness can range from very bright (brilliant) to very dim (dark). In popular usage, the term "brightness" implies higher light intensities, whereas "dimness" implies lower intensities

1.2.2 Point light source

Point light source is a light source that subtends an extremely small angle at the observer's eye so that its attributes are not affected by its size, only by its luminous intensity. An example of a point light source is a star.

1.2.3 Luminous intensity

Luminous intensity is the light-producing power of a source, measured as the luminous flux per unit solid angle in a given direction. It is simply a measure of the strength of the visible light given off by a point source of light in a specific direction, and usually expressed in terms of candelas (cd), where one cd equals one lumen/steradian.

1.2.4 Luminance

Luminance is the amount of luminous flux reflected or transmitted by a surface into a solid angle per unit of area perpendicular to given direction. More simply, it is a physical measure of the amount of light reflected or emitted from a surface and roughly corresponds to the subjective impression of "brightness". Luminance does not vary with distance. It may be computed by dividing the luminous intensity by the source area, or by multiplying illuminance and reflectance. The most common units of measurement for luminance are candelas per square meter (cd/m²), foot-lamberts (fL), and mill lamberts (mL).

1.2.5 Illuminance

The illuminance or light level is the amount of light energy reaching a given point on a defined surface area, namely the luminous flux (i.e. lumens) per square meter. Illuminance is invisible! It is light passing through space and not seen unless you look at the source (e.g. a light bulb) or a surface it reflects off. In other words we can only see "luminance".

1.2.6 Reflectance

Reflectance is a measure of the reflected incident light (illuminance) that is actually reflected away from a surface. For many surfaces reflectance will depend on the angle of viewing and the angle from which it is illuminated, as well as the properties of the surface (including diffuseness or retro reflectivity of the surface).

1.2.7 Glare

Glare can be defined generally as a bright, steady, dazzling light or brilliant reflection that occurs when the luminous intensity or luminance within the visual field is greater than that to which the eyes are accustomed; glare can cause discomfort, annoyance, or loss in visual performance and visibility. Direct glare is caused by light sources in the field of view whereas reflected glare is caused by bright reflections from polished or glossy surfaces that are reflected toward an individual (for example, a chrome nameplate on a leading vehicle). The entire visual field contributes to the glare level, and even a completely uniform field, such as that in a photometric sphere, will produce some glare.

1.3. Concept of headlamp dipping

To see far enough ahead, the beam pattern of the headlight must have a high intensity directed just below the horizontal. To prevent glare to oncoming drivers. There needs to be a very low intensity in the direction just above the horizontal. "Headlight serves not only to light the road ahead but also to illuminate pedestrians, cyclists and road signs mounted on the side of the road as well as overhead signs, indicating a need for a wide beam spread". All these requirements for safe and comfortable driving make the design of an optimum beam pattern a compromise, which should well balance. Optimum design has been based on two types of beam pattern:

- Low Beam (Meeting beam)
- High beam (driving beam)

The low beam is used where there is road lighting and on unlit roads when there are oncoming drivers. A high beam is much more intense and is projected further down the road and can be used only on rural roads and highways when there is no oncoming traffic. Double filament bulb or bifocal bulbs are most extensively used and universally accepted to meet above requirement of driving and meeting beams. These bulbs have two filaments in which one filament is positioned in relation to the reflector to give the main forward beam, while the other filament gives the dipped beam the driver controls this system; either by a foot operated switch or by a switch mounted on the steering column. The present practice is to operate the dipswitch manually. The auto Dipping Device senses the opposite vehicles bright headlights and automatically makes our vehicles bright lights dip, but for a few seconds only; afterwards the device will make our lights to start flickering. This

function will be repeated to all the vehicles coming in the opposite direction



Fig.1a. Glare due to HID Head Lamp



Fig.1b. Glare due to HID Head Lamp

1.4. Problems associated with manual dipping

There are many reasons due to which manual dipping is not being done satisfactorily. One of the major reasons includes sheer physical strain involved in operation of the dipper switch hundreds of times every night. "The total for a single night will be 1000 if we consider 8 hours of traveling and one encounter every one-minute and could exceed this number if one travels on roads with dense traffic." The other reason includes a general tendency of paying more attention to steering control at the cost of dipping during a critical vehicle meeting situation especially in the case of heavy loaded vehicles.

Physiological and psychological state of a driver also affects the dipping practices. Working

hours, economic issues and social factors influences the mindset of the driver. "Another major cause in 'ego problem', which makes each one wait till the other person initiates dipping, which may not happen".

1.5. Dipping practices in India

There has been a study carried out by "Road Research institute, New Delhi", which reveals the poor state of dipping affairs on the Indian roads. The observations and recommendations of the study group on road safety are as follows:

1.5.1 Night driving

“A frequent cause of accidents at night is the glare caused by oncoming vehicles which momentarily blinds the driver’s vision. It takes three to eight seconds for a person with good eyesight to recover from the glare and during this time the vehicle will have covered a long distance in utter darkness and it will be sheer luck if it escapes an accident. A glare recovery test should be carried out to gauge the applicant’s ability in this direction, followed by tests pertaining the color and night blindness”.

1.5.2 Driving at night with main beam of headlight on

“This is one of the common failings of our drivers in night driving, specially on dark or badly lit roads in our cities and towns. Driving courtesy imposes a special responsibility on the driver, that the oncoming driver is not handicapped by the dazzle of headlights.



Fig.2 Headlamp at high beam intensity

To avoid this, it is imperative that as the vehicles approach from opposite direction, the main beams should be switched OFF and the dipped beams used instead, so that the two vehicles can pass each other safely. Contrary to the above requirement, many of our heavy vehicle drivers are given to the practice of blinding oncoming vehicles drivers by using both the main and dipped beams of their headlights simultaneously, to gain on advantage over the oncoming driver”.

1.6 Optometry

Optometry Is Most Necessary Parameter Which must be studied before developing headlight system optometry is the science which evaluates the sensitivity of eyes towards any light pattern and the problems associated with it. It also facilitates the design parameters through its empirical and theoretical results. A study conducted by a university in Germany presented the following document whose abstract is: “To see far enough ahead, the beam pattern of the headlight must have

a high intensity directed just below the horizontal. To prevent glare to on-coming drivers, there needs to be a very low intensity in the direction just above the horizontal and to the right. The small difference in angular direction between the high intensity of the low-beam pattern down the road and the low intensity in the glare direction works only for well-aimed headlights on straight, flat roads. All these requirements for safe and comfortable driving make the design of an optimum beam pattern a finely-balanced compromise, which has not yet been achieved with any great success.”

1.7 New light sources for automobiles

New lamp technologies have significantly improved visibility on the road at night. The new lamp technology includes xenon lamps, optic fiber Technology and LEDs. The new mechatronics will allow the headlight beam pattern to change to suit the road environment. Increasingly, xenon high intensity discharge (HID) lamps are being used in

cars for headlights and for distributed lighting systems. They have many advantages: they have two to three times the light flux for half the electrical energy of ordinary lamps, five times longer lifetime, and low heat emission allowing for more compact headlight design." Distributed light systems (DLS) are fibreoptic systems with a light source of high luminous efficiency (usually a xenon high intensity discharge source) and a high efficiency coupling optical system so that a high proportion of the light (for example, 57%) is transferred into the opticfibre system this gives a fibre optic headlight providing 1000 lm from a 60 W xenon HID lamp."

1.8 Glare

"Glare is the uncomfortable brightness of a light shining into eyes, leaving a person unable to see much of anything else (extreme examples are the setting sun and oncoming auto headlights)".

"Glare is the contrast lowering effect of stray light in a visual scene. Glare forms a veil of luminance, which reduces the contrast and thus the visibility of a target is decreased. We cannot see intensity differences efficiently in the presence of a high background of light intensity".

Glare can be divided into two types:

1. Discomfort glare
2. Disability glare

"Discomfort Glare refers to the sensation one experience when the overall illumination is too bright e.g. on a snowfield under bright sun".

Disability Glare refers to reduced visibility of a target due to the presence of a light source elsewhere in the field. It occurs when light from glare source is scattered by the ocular media. This scattered light forms a veil of luminance, which reduces the ocular media. This scattered light forms a veil of luminance, which reduces the contrast, and thus visibility of the target" All the above indicate the importance of dipping of headlights in a country like India, so as to avoid the problem of glare which impairs the visibility which is vital for safe driving in a meeting situation during the night. This leads to the conclusion that an auto Dipping Device can go a long way towards safety enhancement. Reading or identification of detail, only photonics sensitivity applies because there are no rods in the central parts of the retina"

1.8.1 Discomfort glare

Spectrum does play an important role in the perceptions of visual discomfort that are experience

when presented with a glare source during nighttime driving conditions. This is a phenomenon that has been appreciated since at least the 1930s, when it was reported that "discomfort glare was caused more by "blue than by "yellow" light". "The effect of spectrum on discomfort glare for nearly monochromatic, highly saturated colors has shown that yellow sources are perceived as less glaring (from a visual comfort perspective than green or blue sources)". For nominally white light sources, such as halogen and HID headlamps, a series of studies conducted in laboratory and simulated field settings has confirmed that typical HID headlamps, viewed in an oncoming situation, result in greater discomfort than typical halogen headlamps. However, the differences in discomfort glare between HID and halogen headlamps are much greater that would be explained by the differences in their scotopic light output. "Halogen headlamps need to provide an illuminance at the eye that is 25%-50% higher than that from typical HID headlamps in order to be rated equally glaring, but as mentioned above they differ only by 5%-10% in terms of scotopic output".

1.8.2 Disability glare

Disability glare is created by a light so bright that its intensity results in a measurable reduction in a driver's ability to perform visual tasks. The reduction in visual performance is a direct result of the effects of stray light within the eye, which in turn are dependent on the age of the driver. Transient adaptation refers to a temporary reduction in basic visual functions, such as contrast sensitivity and form perception, which occurs when the luminances from objects in the visual field change rapidly (Adrian 1991 a). The degree of reduction in function is dependent on the change in luminance to which the eye must adapt.

2. EXPERIMENTAL SETUP

The Device

The headlamp glare management device is a safety accessory, which automatically shifts the headlights position according to the existing lighted atmosphere. The essential objective of the device is to promote nighttime road safety by minimizing glare. The device is intelligent enough to understand lit and dark roads and operates the headlamps accordingly. Headlamp glare management system can be fitted in any type of vehicle. This device has been successfully tested on

actual road conditions. The system automatically avoids glaring form the opposite vehicles thus provides clearer and safer drive at night.

Salient features of the Device

Salient features of the device are given below:



Fig.3 Experimental setup for electronic headlamp glare management device.

Double mode on/off function

First mode-allows the driver to operate dim/dip action mechanically and manually as usual. Second mode-enable the system to operate fully automatic and hence the driver can almost forget about the dim/dip action thus ensuring safe and pleasant travel. Auto Dipper keeps the head light in “High” beam if there is no vehicle from opposite direction. While crossing, first momentary dip is given by the vehicle fitted with the auto dipper automatically to “Low” beam and continues in the “Low” beam till the two vehicles cross each other.

Range tuner

The driver can select the tuner according to his convenience to activate the dim/dip action in terms of distance between the approaching vehicles. Presently the range of the device is 5 m to 50 m. however depending upon the conditions the range can be further increased upto about 500 m and can also be made variable.

Description of the device

The size of the device is about 1 inch cube and can be fitted in any type of vehicle within half an hour only. Device can be installed any where near steering as per convenience so that “ON-OFF” switch on auto dipper box can be used easily. Sensor Eye is mounted near wiser position near the top edge of windscreen (inside the car) such that it receives the light of the approaching vehicle in proper position. Sensor eye can also the fitted in headlamps itself. Sensor position can be adjusted slightly by bending the sensor support. The device gets activated only when headlights are in “on” position. The performance of the device is directly proportional to the intensity of light which falls on the sensor. If intensity that falls is high the response will be fast. For truck & buses, sensor eye can be placed on lower side of wind shield inside close to the right hand of driver and for car and jeep etc. the device can be operated with the exiting 12 volts battery of the vehicle.

Main component of device

Following are the main component of device:

1. Headlamps
2. Sensor (ORP 12)
3. Switch
4. Battery (12V)
5. Relay
6. rectifier circuit
7. I.C. (integrated circuit)
8. Capacitors & resistor
9. Diodes
10. Wires & clips

Two circuits are use to proper working of the device that is:

2.4.1 Headlamps

A headlamp is a lamp attached to the front of a vehicle to light the road ahead. Headlight is a synonym for headlamp. Headlamp performance has steadily improved throughout the automobile age,

2.4.2.1 Working of LDR sensor

An LDR is a component that has a resistance that changes with the light intensity that falls upon it. They have a resistance that falls with an increase in the light intensity falling upon the device.

Applications of LDR Sensor: There are many applications for Light Dependent Resistors. These include.

- Lighting switch: The most obvious application for an LDR is to automatically

spurred by the great disparity between daytime and nighttime traffic fatalities: the US National Highway Traffic Safety Administration states that nearly half of all traffic-related fatalities occur in the dark, despite only 25% of traffic traveling during darkness.

2.4.2 Sensor

Sensor is a device which is us to sense the different type of action like light, temperature, air, motion etc. the sensor sense the condition by own natural property like voltage resistance etc. for example is we have to sense light then we use a resistance. After sensing it sends the information or signal in the form of voltage or temperature. In this experiential device we used LDR (light dependent resistor) sensor description of this sensor given below:

turn on a light at certain light level. An example of this could be a street light.

- Camera shutter control: LDRs can be used to control the shutter speed on a camera. The LDR would be used the measure the light intensity and the set the camera shutter speed to the appropriate level. The resistance of an LDR may typically have the following resistances. Daylight = 5000 ohms, Dark = 2000000 Ohms

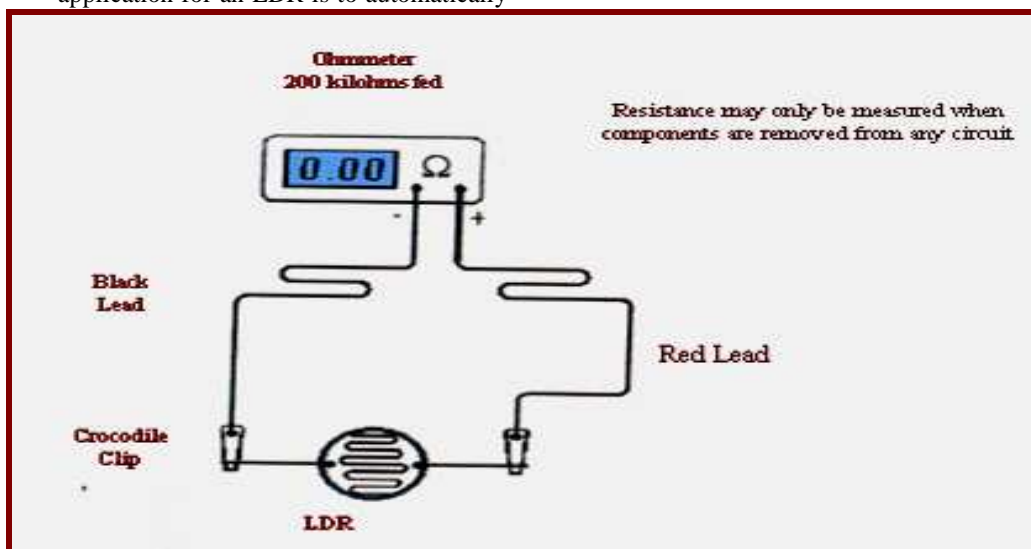


Fig.4 LDR Sensor

2.4.3 Battery

A supply of 12 volts is required for the circuit. It is taken from the vehicle's battery box. This is preferred for two reasons. First, it is a constant DC supply and second, there is no need for introducing a separate electrical supply source.

2.4.4 Relay circuit

Relay circuit is main part of the model which is use to automatic change from high beam to low beam of head lamp. This circuit is governed by an IC (555 timer) and relay.

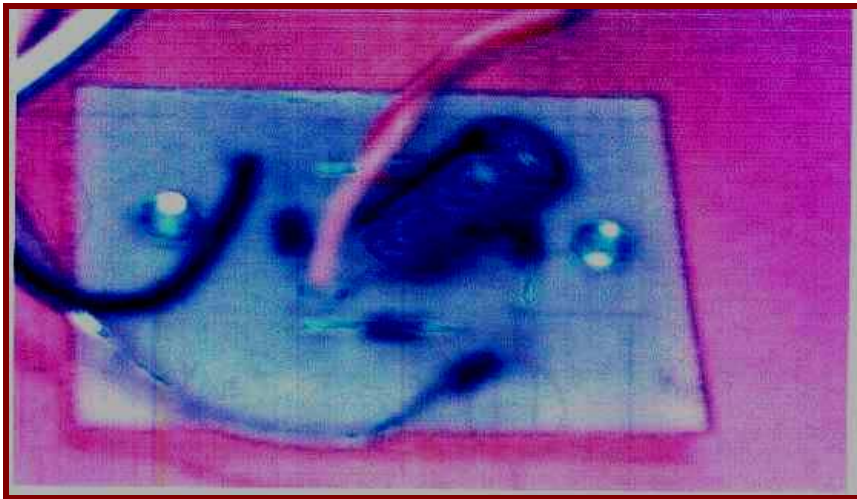


Fig. 5 Relay circuit

2.4.5 Rectifier circuit

Rectifier circuit is use to safety purpose of the device mainly IC of the relay circuit it avid the

reverse connection of the in put. In this project we use "full wave bridge rectifier". In which 5 diode and one capacitor are used,



Fig.6.Rectifier circuit

2.4.6 Working with IC 555

The 555 integrated circuit (IC) is an easy to use timer that has many applications in Meccano modeling. It is widely used in electronic circuits

and this popularity means it is also very cheap to purchase, typically costing around 30 p. version of the 555 are available for low current applications or use in extreme temperatures. A 'dual' version

called the 556 is also available which includes two independent 555 IC in one package.

Output States: The 555 relies on both analogue and digital electronic techniques to perform its functions, but if we consider its output only, it can be thought of as a digital device. The output of the 555 can be in one two states at any time, which means it is a digital output. The first state is the 'low' state, which is the voltage 0V at the '-' (black) connection of your power supply, the second state is the 'high' state, which is the voltage V_s at the '+' (red) connection of your power supply. V_s is sometimes referred to by other names, and you will see that I frequently use the following names for them in my articles:

Low: is also known as 'space', or 'logic 0'. If a digital device is said to be 'on', its output is normally V_s .

555 CIRCUITS

In electronics in Mecca no, three of the most common 555 circuits will be introduced. Their names give you a clue as to their functions:

The astable circuit produces a continuous train of pulses at any frequency you require. The name

"astable" means "never stable"- the output of the circuit never stays stable in any of the two states.

The Monostable Circuit: produces one pulse of a set length in response to a trigger input such as a push button. The output of the circuit stays in the low state until there is a trigger input, hence the name "monostable" meaning "one stable".

The bistable Circuit toggles between the states. Triggering one input sets the output to the low state, while triggering another input sets the output to the high state. The name "bistable" means "two stable states".

There are many ways to construct astable, Monostable, and bistable circuits, but using a 555 IC is one of the easiest.

The pins of the 555: First, we need to know what that 555 looks like. It has eight connections (called pins) to its plastic case, arranged as four on one side and four on the other, as shown in the pin-out diagram of figure 1. From this diagram, you can see that pin 1 is the pin on the bottom left when the IC is held horizontal with the writing the correct way up. The little notch in one side also helps to identify pin 1, as does the small white dot next to this pin.

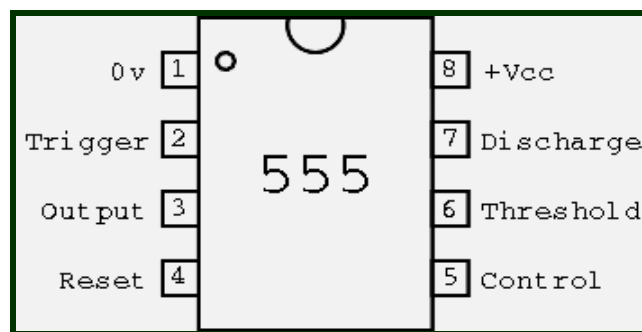


Fig.7 Pin out diagram IC 555

The eight pins carry out the following functions:

1. Ground, which acts as a safety measure as with electrical plugs
2. Trigger, which passes on voltage to start the timing operations, Pin 2 is called the Trigger input as it is this input that sets the output to the high state.
3. Output, which carries voltage to the device using the timer, Pin 3 is the digital output of the 555. it can be connected directly to the inputs of other digital ICs, or it can control other devices with the help of a few extra components.
4. Reset, which is used to end the timing operation
5. Control voltage, an optional pin used for controlling the timer from outside the main circuit set-up
6. Threshold, which determines how long the timer should output voltage in each on/off cycle – in other words, how long the timing interval should be
7. Discharge, connected to a capacitor which also influences the timing interval
8. V_+ , which is the voltage input, Pin 8 is where you connect the positive power supply (V_s) to the 555. This can be any voltage between 3V and 15V DC, but is

commonly 5V DC when working with digital ICs. Pin 1 is the 0V connection to the power supply.

2.4.7 Capacitors

Capacitors Store electrical energy by separating positive and negative charges. They store electrons by attracting them to a positive voltage. When the voltage is reduced or removed the electrons move off as well. When the capacitor removes or adds electrons to the circuit it can work to smooth out voltage fluctuations. The capacitor acts as a delay and can be combined with resistors. If you increase the resistance it increases the delay in time. A resistor and capacitor connected together can often be referred to as an RC circuit. Any circuit I view that has a potential divider and features a capacitor will have something to do with time. Power supply that convert AC current to DC current often use capacitors to keep the voltage at a certain level. When a capacitor is connected in series with a signal source, such as a microphone, it can block the DC current but pass the AC current. Most kind of amplifiers would use this function. Capacitors can be used to make filters that reject AC signals above and below a desired frequency, by adjusting the value of the capacitor it can be possible to change the cut-off frequencies of the filter. The capacitor itself is actually quite a simple device.

2.4.8 Diodes

Diodes are two terminal devices that exhibit low resistance to current flow in one direction and high resistance to current flow in the other. The direction in which the current flow is often referred to as the forward direction whilst in the negligible current flows is known as the reverse direction. When the diode is conducting a small voltage is dropped across it and this is known as the forward voltage drop. The diode is one of the simplest forms of semiconductor and it is used to control the flow of electrons. A variety of applications use diodes and they are classed in different subtypes.

- Zener diodes: Zener diodes limit voltage to a pre-determined amount. A zener diode can be used to build a voltage regulator into a circuit
- Light emitting diodes, LED's: All semiconductors emit infrared light when they conduct current. LEDs make this light visible.

- Silicon-controlled rectifier (SCR): The SCR is types of switch used to control AC or DC currents and are commonly used in light dimmers.
- Rectifier: This basic diode transforms AC current to provide DC current only. The DC current does not alternate and is only positive or negative. Diodes can be referred to as rectifiers because they perform this rectifying function, a thyristor is a type of rectifier
- Bridge rectifier: This component is made up of four diodes and rectifies AC to DC with great efficiency.

All diodes will have a positive (anode) and a negative terminal (cathode) and the cathode can commonly be identified by a red or black stripe near one of the leads. The stripe will correspond with the line in the schematic symbol for the diode. When following a schematic diagram to build a circuit the diode must be orientated to the line facing the specified way. If a diode is placed in the circuit in the wrong direction it will not work and it can damage components.

2.4.9 Resistors

Resistors limit the amount of current that reaches a component such as an LED. In some circuits different voltages need to be supplied to different parts of a circuit which can be done with resistors. If two resistors are joined it forms a voltage divider, if the two resistors are of equal value the voltage in between the two resistors is half that of the rest of the circuit. A resistor can control the voltage/current going into a component, so for instance placing a resistor at the input of a transistor controls how much the transistor amplifies a signal. A resistor can protect the input of sensitive components. If a resistor is placed at the input of a sensitive component the resistor limits the amount of current traveling to it protecting it from damage. A 470 resistor is usually a sufficient one to protect LED's. A fixed resistor supplies a specific resistance depending on its value. This is determined by a colour coding system that starts at the edge of the resistor and is combined of 4, 5, or sometimes 6 bands of different colours to give the resistor its value.

2.5 Working Of The Device

Sensing the opposite vehicles bright head lights automatically makes our vehicles bright lights DIP –but for few seconds only. Immediately after the crossing of the opposite vehicles the light will come to bright position automatically. This function will be repeated to all the vehicles coming in the opposite direction. Dipping will result in smooth and happy driving pleasure for drivers and negligible risk of accidents.

Those vehicles fitted with device are almost out of the risk of accidents, because by giving signal our vehicle area and road gap will be cleared to the opposite vehicles fitted with device are almost out of the risk of accidents, the opposite vehicles for clear road negotiations.

In the present system the driver required to control the steering with his one hand and the other hand is required to operate the DIM/DIPPER switch to make the head to totally eliminated by providing the vehicle with our device which will give the driver a very happy and pleasant experience of driving and total safety to the vehicles and to the traveling passengers.

2.6 Circuit Description

The entire circuit of automatic dipper consist LDR followed by timer IC NE555 (IC₁) and few other components, where LDR is used as sensor. LDR sense the light and change its internal resistance according light fall on it, which is further mounted in PVC pipe of 4 cm length positioned on the grill of car or in front such that the light fall on the LDR only when vehicles is approaching and is distance of 3M to 9M. When light fall on it the resistance decrease and makes output of IC₁ low which energized the relay. The relay operates and voltage across the head lamps is reduced. When the distance between two approaching vehicles is more than 9 meter or less than 3 meter the circuit is not operated. The operating and non operating distance of the circuit can be varied by proper positioning of the PVC pipe and by adjusting the variable resistor VR₁.

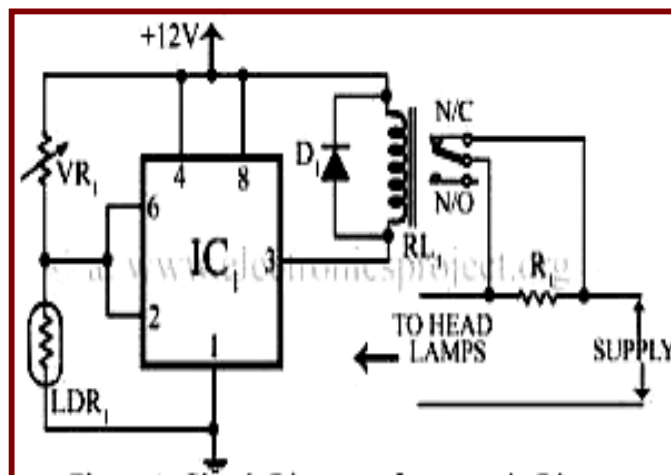


Fig.8 Circuit diagram

2.7 Block Diagram Of The Device

The block diagram of the headlamp glare management device is shown below. The device is

composed of a sensor, and electronic control unit, switch and a battery of 12V. The sensor of the device sensor the light of the oncoming vehicle and the electronic unit dips the headlamp of the device fitted vehicle.

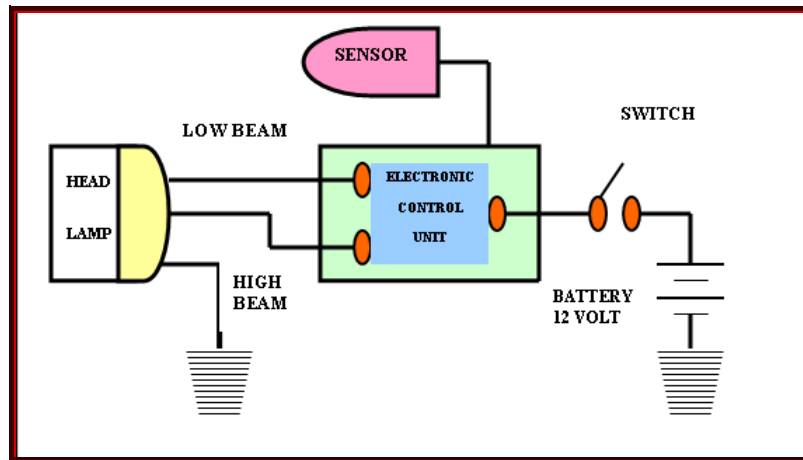


Fig. 9 Schematic Diagram of Electronic head lamp glare management System

Tests & Reliability: The device developed was fitted in a model and was tested for long distance travel at night. The device was found to work satisfactorily. Large number of the tests has been conducted on the device to study it's on –road behavior. Tests were carried out taking different speeds of vehicles as relative speeds between two vehicles are of prime importance.

The following table indicates the response of the device. The device was fitted with headlamp of Bajaj Chetak scooter and was tested against many vehicles on actual road conditions. Dipping distance (m) indicates the distance between the two vehicles when the headlamp beam dips. Sensitivity range of the vehicle can be modified as per the requirements.

2.8 Response of The Device

Table 1 Response of the device

Vehicle	Dipping distance (m)	Headlamp type
Chevrolet TAVERA	30.0	Xenon bulb, 12v, 100/90w
Toyota Qualis	30.0	Xenon bulb, 12v, 100/90w
Maruti Alto	20.0	Halogen bulb, 12v, 60/55w
Maruti 800	15.0	Halogen bulb, 12v, 50/45w
Hero Honda CBZ	12.0	Halogen bulb, 12v, 35/35w
Hero Honda splendor	9.0	Halogen bulb, 12v, 35/35w
Bajaj Chetak	7.0	Simple bulb, 12v, 35/35w

3. RESULTS

Sensing the opposite vehicles bright head lights automatically our vehicles bright lights DIP- but for few seconds only. Immediately after the crossing of the opposite vehicles the lights will come to bright position automatically, this function will be repeated to all the vehicles coming in the opposite direction. Dipping will result in smooth and happy driving pleasure for drivers and negligible risk of accidents.

Those vehicles fitted with device are almost out of the risk of accidents, because by giving signal our vehicles for clear road negations.

In the present system the driver required to control the steering with his one hand and the other hand is required to operate the DIM/DIPPER switch to make the head to totally eliminated by providing the vehicle with our device which will give the driver a very happy and pleasant experience of driving and total safety to the vehicles and to the traveling passengers.

4. DISCUSSIONS

The device developed was fitted in model and was tested for long distance travel at night. The device was found to work satisfactorily. Large number of the test has been conducted on the device to study its on-road behavior. Tests were carried out taking different speeds of vehicles as relative speeds between two vehicles are of prime importance.

This report will be of interest to headlamp designers, automobile manufactures and consumers, third-party headlamp manufactures, human factors Engineers, and people involved in headlamp and road way specifications. As mentioned in the methods, the aiming protocol used for this study resulted in a deviation in the maximum intensity location from where it typically is for same headlamp types.

The question of whether low-volume roads with low accident rates should be illuminated to minimize to effects of glare is not easily answered. Drivers certainly are more comfortable driving on illuminated roads, and this benefit alone might justify lighting more roads. However, this should be a local decision, made with an understanding of local resources and priorities. Therefore, it is unlikely that all roads with glare problems will ever be illuminated, and until this happens, another solution to the problems introduced by glare must be found properly aimed and cleaned, they should be able to deliver improved visibility without excessive glare on roads without curvature; however, if these lamps become dirty, are misaimed, or are encountered on vertical or horizontal curves, the amount of glare can exceed levels considered tolerable. The most significant disadvantage to lowering the photometric beam pattern or moving it more toward the right edge of the road is generally reduced sight distance and reduced visibility of left-mounted and overhead guide signs. Maintaining a minimum headlamp size would constrain the flexibility that designers would like to have to appeal to consumer test. Any physical restriction on the headlamp may restrict future capability to control the headlamp beam pattern. This restriction could be particularly important for adaptive headlight.

The reduction in glare from lowering headlight height or aiming higher-mounted headlamps downward must be considered in conjunction with the drop in visibility of distant objects will be reduced. Lower headlight positions are not a problem in passenger cars because in these

vehicles the driver's eye height is also low, close to the height of the headlights. For best visibility of retro reflective objects, headlights on heavy trucks need to be high – closer to the height of the driver's eyes-to maintain brightness equivalent to that obtained by cars. The magnitude of the loss in visibility from reduced headlamp height and the consequences for traffic safety have not been well researched. Lowering headlamp height to below 40 inches will reduce the glare experienced by the drivers of leading vehicles from their side and rear-view mirrors. The greatest reduction in glare will be achieved if headlamps are aimed properly and low-reflectance, preferably automatic, dimming mirrors are used inside and outside the leading vehicle. While it would be desirable to place a headlamp height restriction on all vehicles, the prevalence of SUVs and small trucks suggest that the greatest advantages would be achieved with this class of vehicles.

5. CONCLUSIONS

Headlamp glare is an issue that has grown in terms of public awareness over the past decade. High beam of headlight of an on-coming car has blinding effect and decreases visibility dangerously. With the auto boom, the ability to see and visual comfort lighting can result in glare, which can be a major problem both in terms in accident rate has also risen alarmingly. However too much light or improper lighting can result in glare, which can be a major problem both in terms of the ability to see and visual comfort.

Glare occurs when visual field brightness is greater than the luminance to which the eyes are adapted. Glare is caused by both direct and indirect light sources. Discomfort glare produces loss in visual discomfort, annoyance, and fatigue. Disability glare produces loss in visual performance which is generally defined as a reduction in the visibility distance of low contrast objects. The elderly, people with light-colored eyes and those suffering from cataracts are especially sensitive to disability glare. Glare at night can be mitigated by prudent design of the roadway, the automobile, and vehicle lighting systems.

The extent to which glare is a problem for night driving is not easily quantified. In the absence of official statistics or scientific data, evidence of a glare problem is based almost entirely upon subjective reports, most of which are anecdotal without data from well-designed experiments, we can only qualitatively assess the deleterious effects of glare, and the economic and safety consequences

are left unknown. While there is little doubt that the number of drivers complaining about glare is increasing, the age of the driving population is also increasing. Without good data there is no way of knowing whether the drivers having problems with glare are those with the most exposure to glare situations (such as high volume two-lane roads), or whether they are older drivers that have visual problems even in the absence of glare, if drivers have basic problems with night vision, solving their problems with glare may increase their risk by giving them a false sense of security and encouraging them to drive more at night.

In terms of glare, the discomfort glare, the SPD. Factors such as light source size, driver age, visual condition (within reasonable limits) and expectations seem to be much smaller effects, and more open to influence by other factors of the environment.

6. FUTURE SCOPE

There are only two practical methods for nighttime lighting: fixed overhead lighting and vehicle headlight, while the number of roads with fixed overhead lighting increases each year, this form of lighting is expensive and cannot be relied upon as the only means for providing night visibility. From its inception, the use to headlights on automobiles has involved a compromise between providing enough light for drivers to see the road ahead and avoiding the excessive light for drivers to see the road ahead and avoiding the excessive light that produces glare. Changes in headlamp designs that affect light intensity, beam pattern, and aiming have significantly improved night vision on the highway. Technology has brought changes to headlight, interior surfaces (including mirrors), and the highway environment that directly reduce glare or indirectly reduce the effect of glare on the driver. However, every change has involved a tradeoff with hidden costs. For example, lowering headlamps may reduce glare but can result in a loss of forward visibility.

In addition to the countermeasures discussed in this report, there are a vast number of patented products in various stages of development. Many are for products that offer enhancements to the countermeasures already discussed. Unfortunately, it is beyond the scope of this report to explore the potential of all of these concepts. Hopefully, those ideas that offer useful solutions to the glare problem will gradually find their way into commercial products.

Two of the potential countermeasures discussed in this report are being studied in large ongoing research programs adaptive headlamp technology is being developed and strategies for its implementation are being devised with the support of several European countries and manufacturing firms. Of UVA headlamps is underway. Both adaptive head lighting and UVA headlamps are more likely to benefit visibility than to offer any comprehensive solution to headlight glare. "In future the concept of this project will be used in auto vehicles and no doubt it will be of great use and universally adopted".

REFERENCES

1. Alexander, G. J.; Lunenfeld, H. (1990): A user's guide to positive guidance, third ed." Report No.FHWA-SA-90-017, U.S. Department of Transportation, Federal Highway Administration, Washington, DC, pp. 1-39.
2. Bulloth, J.D.; Fu Z, Van Derloske J. (2002): Discomfort and disability glare from halogen and HID Headlamps system, Society of Automotive Engineers world congress, Detroit, MI: society of automotive engineers.
3. Gupta, K.M. : Automobile Engineering (Umesh Publications)
4. Muralikrishnan, R. (2014): automatic headlight dimmer a prototype for vehicles", International Journal of Research in Engineering and Technology, 3, 02, pp.85-90.
5. Report "Glare from head lamps and other front mounted lamps department of transportation national highway traffic safety administration us"
6. Report "Light pollution information", astronomical society of greater Hartford.
7. Report "The concept of auto dipping". Kakatiya Electronic Private Limited, INDIA.
8. Report "The quest for travel". Delhi Traffic Police, INDIA.
9. RobertL Boylested & Loues Nashelsky :Electronic device & circuit system", by (prentice-Hll of India private Limited).
10. Sivak, M.; Simmons, C. J.; & Flannagan, M. (1990): Effect of headlamp area on discomfort glare, Lighting Research Technology, 22, pp.49-52.