M.KUMARASAMY
COLLEGE OF ENGINEERING
NAAC Accredited Autonomous Institution
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ISO 9001:2015 Certified Institution
Thalavapalayam, Karur – 639 113.

A Minor Project Report

on

AUTOMATIC HEADLIGHT DIMMER CONTROL SYSTEM FOR VEHICLES

Submitted by

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

M.KUMARASAMY COLLEGE OF ENGINEERING

(An Autonomous Institution Affiliated to Anna University, Chennai)

THALAVAPALAYAM, KARUR-639113.

MAY 2024

M.KUMARASAMY COLLEGE OF ENGINEERING

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BONAFIDE CERTIFICATE

Certified that this Report titled **"AUTOMATIC HEADLIGHT DIMMER CONTROL SYSTEM FOR VEHICLES"** is the Bonafide work of **DINESHKUMAR.J (927622BEE027),FAHMITHA.H(927622BEE031),KASIVISVANATHAN.K (927622BEE054),KARTHICK.R (927622BEE305)** who carried out the work during the academic year (2023-2024) under my supervision. Certified further that to the best of my knowledge the work reported herein does not form part of any other project report.

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Submitted for Minor Project II (18EEP202L) viva-voce Examination held at M.Kumarasamy College of Engineering,Karur-639113 on ……..

DECLARATION

We affirm that the Minor Project report II titled"**AUTOMATIC HEADLIGHT DIMMER CONTROL SYSTEM FOR VEHICLES"** being submitted in partial fulfillment for the award of **Bachelor of Engineering in Electrical and Electronics Engineering** is the original work carried out by us.

REG.NO	STUDENT NAME	SIGNATURE
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VISION AND MISSION OF THE INSTITUTION

VISION

- ✓ To emerge as a leader among the top institutions in the field of technical education

MISSION

- ✓ Produce smart technocrats with empirical knowledge who can surmount the global Challenges.
- ✓ Create a diverse, fully-engaged, learner - centric campus environment to provide Quality education to the students.
- ✓ Maintain mutually beneficial partnerships with our alumni, industry, and Professional associations.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

VISION

To produce smart and dynamic professionals with profound theoretical and practical knowledge comparable with the best in the field.

MISSION

- ✓ Produce hi-tech professionals in the field of Electrical and Electronics Engineering by inculcating core knowledge.
- ✓ Produce highly competent professionals with thrust on research.
- ✓ Provide personalized training to the students for enriching their skills.

PROGRAMME EDUCATIONAL OBJECTIVES(PEOs)

- ✓ **PEO1:** Graduates will have flourishing career in the core areas of Electrical Engineering and also allied disciplines.
- ✓ **PEO2:** Graduates will pursue higher studies and succeed in academic/research careers
- ✓ **PEO3:** Graduates will be a successful entrepreneur in creating jobs related to Electrical and Electronics Engineering /allied disciplines.
- ✓ **PEO4:** Graduates will practice ethics and have habit of continuous learning for their success in the chosen career.

PROGRAMME OUTCOMES(POs)

After the successful completion of the B.E. Electrical and Electronics Engineering degree program, the students will be able to:

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/Development of solutions:

Design solutions for Complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety,and the cultural, societal and environmental considerations.

PO4: Conduct Investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The Engineer and Society: Apply reasoning in formed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and Team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES(PSOs)

The following are the Program Specific Outcomes of Engineering Students:

- **PSO1:** Apply the basic concepts of mathematics and science to analyse and design circuits, controls, Electrical machines and drives to solve complex problems.
- **PSO2:** Apply relevant models, resources and emerging tools and techniques to provide solutions to power and energy related issues & challenges.
- **PSO3:** Design, Develop and implement methods and concepts to facilitate solutions for electrical and electronics engineering related real-world problems.

Abstract (Key Words)	Mapping of POs and PSOs
• Arduino • Power supply • Sensor • Dim bright light • Relay unit • Connecting wire	PO1,PO2,PO3,PO4,PO5,PO6,PO7,PO8,PO9,PO10,PO11,PO12,PSO1,PSO2,PSO3.

ACKNOWLEDGEMENT

Our sincere thanks to **Thiru.M.Kumarasamy, Founder and Dr.K.Ramakrishnan B.E,Chairman** of **M.Kumarasamy College of Engineering** for providing extra ordinary infrastructure, which helped us to complete the Minor project in time.

It is a great privilege for us to express our gratitude to our esteemed **Principal Dr.B.S.Murugan M.Tech., Ph.D.,** for providing us right ambiance for carrying out the project work.

We would like to thank our **Head of the Department Dr.J.Uma M.E., Ph.D., Department of Electrical and Electronics Engineering,** for her unwavering moral support throughout the evolution of the project.

We would like to express my deep gratitude to our Minor Project Guide **Mr.G.Subramaniam M.E., Assistant Professor, Department of Electrical and Electronics Engineering,** for his constant encouragement, kind co-operation, valuable suggestions and support rendered in making our project a success.

We offer our wholehearted thanks to our Minor project coordinator **Mr.P.Maniraj M.E., Assistant Professor, Department of Electrical and Electronics Engineering,** for his constant encouragement, kind co-operation and valuable suggestions for making our project a success.

We are glad to thank all the **Faculty Members** of **Department of Electrical and Electronics Engineering** for extending a warm helping hand and valuable suggestions throughout the project.

Words are boundless to thank **Our Parents and Friends** for their constant encouragement to complete this Minor project successfully.

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ABSTRACT

The Automatic Headlight Dimmer Control System for Vehicles is an innovative solution designed to enhance road safety and driver comfort. This system employs advanced sensors and algorithms to detect ambient light conditions and oncoming traffic, automatically adjusting the vehicle's headlights to optimize visibility without causing glare to other drivers. By seamlessly managing headlight intensity, this technology contributes to safer night time driving experiences and reduces the risk of accidents associated with inadequate or excessive lighting. The abstract encapsulates the system's focus on adaptive illumination, aiming to create a more efficient and secure driving environment. By seamlessly optimizing illumination levels, the system aims to minimize glare for other road users while ensuring optimal visibility for the driver. The Automatic Headlight Dimmer Control System for Vehicles is a sophisticated automotive innovation designed to enhance road safety and driver comfort. This system employs advanced sensors and image processing techniques to dynamically adjust the vehicle's headlight intensity based on environmental conditions, oncoming traffic, and ambient lighting. By seamlessly adapting to the surrounding circumstances, the system ensures optimal visibility for the driver while minimizing glare for other road users. This abstract encapsulates the innovative features and benefits of a cutting-edge solution that contributes to a safer and more efficient driving experience. The Automatic Headlight Dimmer Control System for Vehicles is a cutting-edge automotive technology designed to enhance road safety and driver comfort. This system utilizes advanced sensors and algorithms to dynamically adjust headlight intensity based on environmental factors such as oncoming traffic, ambient light conditions, and vehicle speed. By intelligently dimming headlights when appropriate, the system minimizes glare for oncoming drivers, reduces energy consumption, and optimizes visibility for the driver.

CHAPTER 1
SURVEY FORM ANALYSIS

1.1 NAME AND ADDRESS OF THE COMMUNITY:

Name: Mr. Mohan,

Address: Thalavapalayam, Karur.

Name: Mr. Muthu,

Address: Thalavapalayam, Karur.

1.2 PROBLEM IDENTIFICATION:

The problem identified for an Automatic Headlight Dimmer Control System for vehicles is the inherent limitation of conventional headlights, which often fail to adapt to changing lighting conditions. This leads to suboptimal visibility and poses safety risks, especially in situations with oncoming traffic. The need to address these limitations and enhance road safety by developing an automated system capable of adjusting headlight intensity based on ambient light and traffic conditions is the core problem.

1.3 PROPOSED SOLUTION

- One effective solution for an automatic headlight dimmer control system in vehicles involves integrating ambient light sensors with a microcontroller.
- The sensors detect surrounding light levels, and the microcontroller adjusts the headlight intensity accordingly.
- This ensures optimal visibility without causing glare for other drivers.
- Additionally, incorporating machine learning algorithms can enhance the system's adaptability to various driving conditions.
- One solution for an automatic headlight dimmer control system in vehicles could involve integrating sensors like cameras or ambient light sensors to detect surrounding conditions.
- The system would then adjust the headlight brightness accordingly, ensuring optimal visibility without causing discomfort to other drivers.
- Additionally, incorporating machine learning algorithms could enhance the system's ability to adapt to various driving scenarios and environmental factors.

CHAPTER 2

LITERATURE REVIEW

Paper 1: Design and Implementation of Automatic Headlight Dimmer for Vehicles using LDR Sensor

Inference:

As the brightness increases, the strain to focus on an object increases. This will increase the response time of that person. 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. In 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.

Paper 2: IOT Based Realtime Automatic Headlight Dimmer System

Inference:

The number of traffic accidents that take place daily have risen annually. Per the records of past years, vehicular accidents are mostly based on the use of wrong beam in different climatic conditions. The use of high beam during

situations like fog or rain have caused the most number of accidents in the recent years and have become a rising concern. This paper proposes a prototype of an automatic headlight dimming system, constituting of three major sensors-LDR, rain and fog sensors which provide inputs to Arduino Uno which acts as a microcontroller to provide a control mechanism, that has been developed to toggle the beam from low to high or vice versa for driving scenarios when there is sudden change in climatic conditions or in the visibility(light) in the air. The project can be used in the field of automotive performance improvement or with the help of better experience that maintains the safety of driver as well as the passengers. The project is based upon aims to try to eliminate the human error of beam switching in wrong surroundings hence posing as a major security threat to the driver or the surrounding cars.

Paper 3: Automatic Vehicle Headlight Management System to Prevent Accidents Due to Headlight Glare

Inference:

The headlight during the night travel plays a major role. While driving there may be an irritating situation due to the headlight lamp focus from the opposite vehicle. It may cause temporary blindness that leads to collision or sometimes it may lead to accidents. There is a manual way to adjust the headlight focus but it is difficult to adjust manually. This paper provides an automated headlight management system. Here, the headlight beam is reduced in the vehicle according to the intensity of light from the opposite vehicle. LDR is used to detect the high beam from the opposite vehicle . Microcontroller compares the intensity of incoming light with the desired intensity value. When the intensity value is increased beyond the desired intensity value, it reduces the intensity of light and provides a great relief for the driver from the irritating situation that occurs during the night driving. More than 30% percent of accidents during night time happen due to headlight glare. The visibility during night time also

reduced due to fog. The correct use of dipper (low beam) during night is essential for the drivers in the presence of street light. The unwanted use of high beam may let to unnecessary crashes.

Paper 4: Automated Headlight Intensity Control and Obstacle Alerting System

Inference:

Headlight intensity of vehicles poses a great danger during night travel. The drivers of most vehicles use high bright beam while driving at night. This causes inconvenience for the person travelling from the opposite direction. To avoid such incidents. The proposed system can be demonstrated with the help of two vehicles where the high beam of vehicle can be controlled with help of other car coming in opposite direction and vice versa using LDR sensor and zig bee communication which avoid the accidents to greater extent. . We are designing a prototype of automatic headlight intensity control system and expected to dim the headlight to avoid this glare. This beam causes a temporary blindness to a person resulting in road accidents during the night. This automatically switches the high beam into low beam thus reducing the glare effect by sensing the approaching vehicle. This model concept eliminates the requirement of manual switch by the driver which is not done at all time.

Paper 5: A Multi Featured Automatic Head Light Systems Prototype for Automotive Safety

Inference:

This paper presents the research work done in the field of automotive safety. As head light are the major important in night drives but up and highs of light as per requirement, intensity of head light as per sun light has to be taken car which is not available in automotive In this work prototype of headlight system is made by using Arduino, sensors, LEDs and other accessories. A prototype of multi featured headlight system consist turning headlight on, off and provides facility of automatic switching of headlight from low beam to high intensity beam in poor weather conditions. Also

this model eliminates the requirement of manual switch by the driver as switching takes place automatically. This model brought three different features of headlight system together. These features are automatic starting of headlight in night conditions, automatic light intensity adjustment with respect to opposite light beam and automatic switch ON during the moist weather conditions. This concept is very useful in the automobile field applications, which provides safety of driver during driving. When driving vehicle, headlights are required to be turned on before sunset and turn off after sunrise, according to light intensity and any other time of poor light conditions, such as fog, snow or rain, which keeps driver from clearly seeing people or vehicles less than 150 meters away. At night even with less traffic on the road, more than half of accidents occur, because headlight glare is a major issue that has grown in terms of public awareness over the past decade.

CHAPTER 3

PROPOSED METHODOLOGY

3.1 BLOCK DIAGRAM

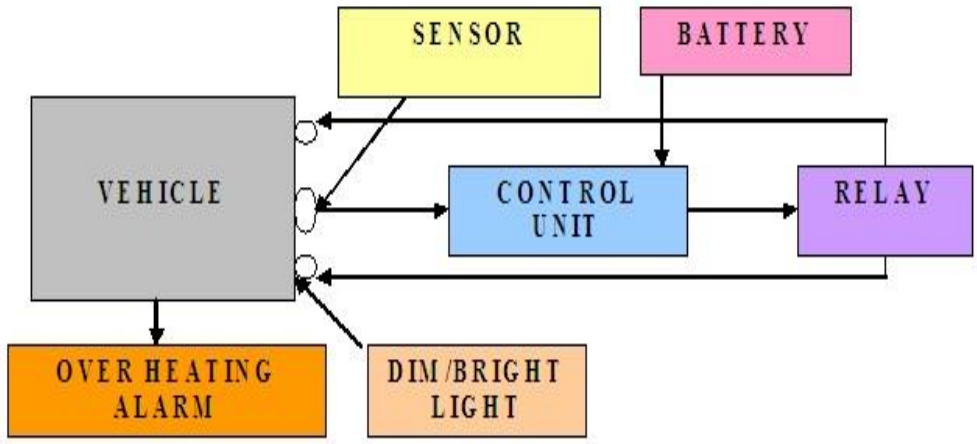

Fig 3.1: BLOCK DIAGRAM OF THE PROJECT

3.2 DESCRIPTION

The Automatic Headlight Dimer Control System for vehicles is an innovative technology designed to enhance driving safety and comfort. This system utilizes sensors to detect ambient light conditions and the presence of oncoming or preceding vehicles. Based on this data, it automatically adjusts the brightness of the vehicle's headlights, ensuring optimal illumination without causing glare to other drivers. By seamlessly adapting to changing environmental factors, this system contributes to improved visibility on the road, reducing the risk of accidents and providing a more pleasant driving experience, especially during nighttime or adverse weather conditions. When driving in varying lighting conditions, the system constantly monitors the surroundings. The Automatic Headlight Dimmer Control System for Vehicles is a sophisticated automotive feature designed to enhance driving safety and convenience.

3.3 COST OF THE PROJECT

S.NO	COMPONENT DESCRIPTION	QUANTITY	COST
1.	Power supply	1	1250
2.	Sensor	1	350
3.	Dim / bright light	1	650
4.	Relay unit	1	450
5.	Arduino , connecting wires	1	1100
		Total	3800

Table 3.3 Project- Total cost

CHAPTER 4

RESULT AND DISCUSSION

4.1 HARDWARE COMPONENTS DESCRIPTION:

ARDUINO

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to battery to get started. The Uno differs from all preceding boards in that it does not use the FTDIUSB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter.

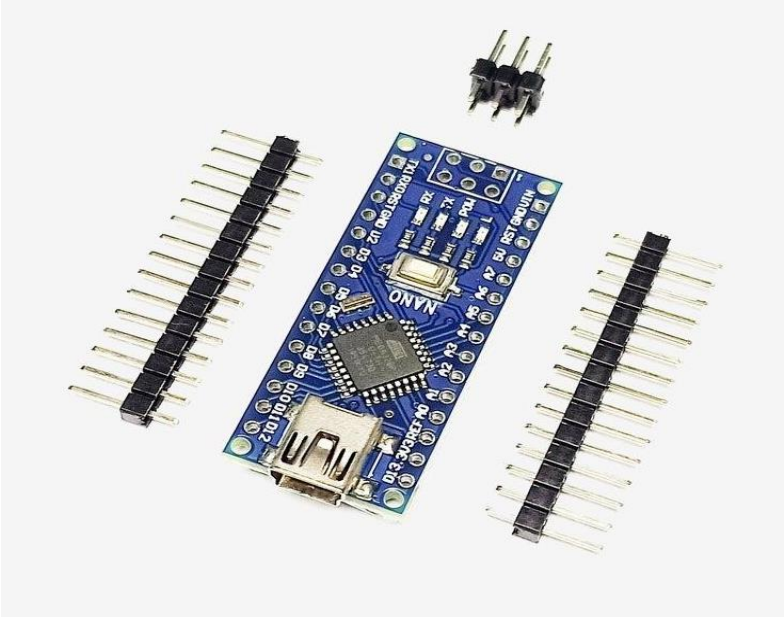

Fig 4.1 ARDUINO

BATTERY

According to ohm's law, current is a function of voltage and resistance. Hence current can be controlled by these two parameters. In a commercial vehicle power to headlights is taken from the alternator under normal driving conditions than from battery. The power supplied by the alternator varies under various driving conditions. Hence battery acts a reservoir of power which supplies current whenever necessary. We may also encounter intermittent dimming of headlights during long travels for one or two seconds which may be a result of faulty alternator. This indicates alternator supplies current to the headlights with battery as a back.

Fig 4.2 BATTERY

RELAY

A relay is basically an electromagnetic switch that uses low current to control a higher current circuit. Most automotive relays are normally open, meaning current does not flow between the contacts until the relay is activated.

Fig 4.3 RELAY

ULTRASONIC SENSOR

The ultrasonic sensor is a non-contact type of sensor used to measure an object's distance and velocity. This sensor operates on sound wave property to measure the velocity and distance of the object.

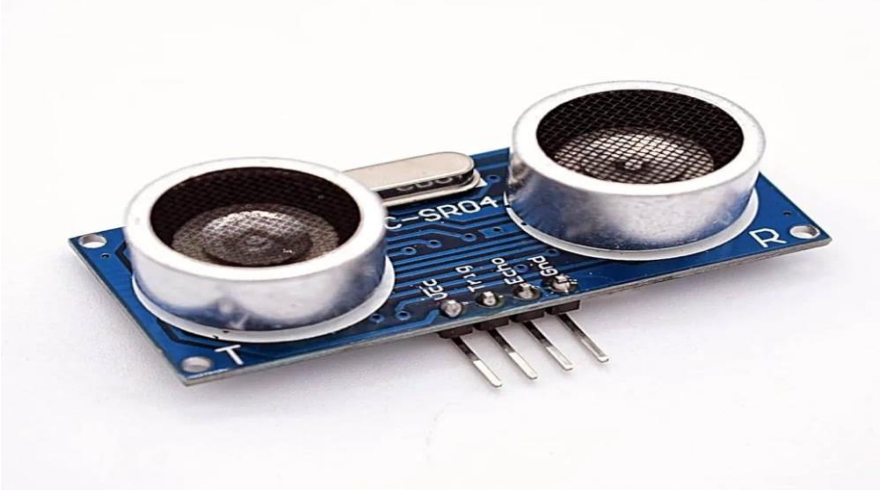

Fig 4.4 ULTRASONIC SENSOR

BULB

Arduino, the program is coded using embedded C to control the switching of the light. And the other two bulbs are connected to the other end of the relay circuit. Each bulbs represents the high and low beam which is used for indication purposes

Fig 4.5 BULB

4.2 HARDWARE KIT

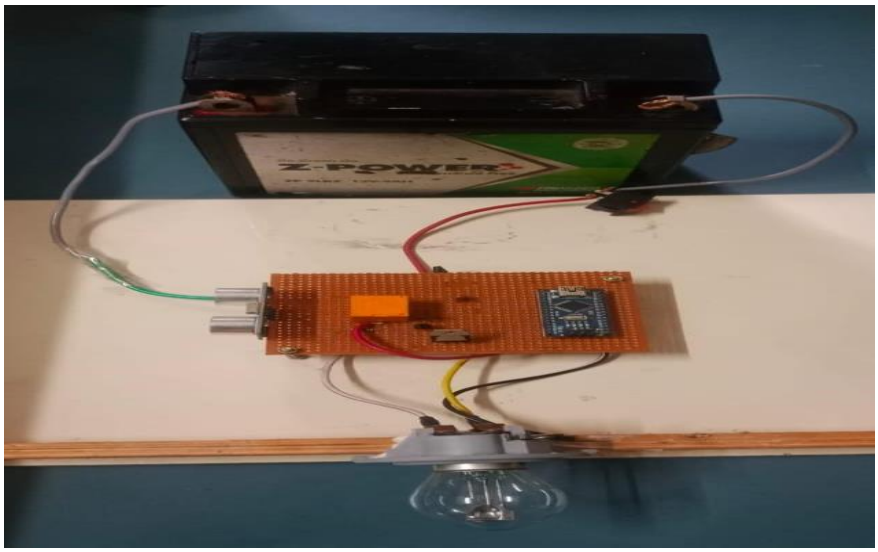

Fig 4.6 HARDWARE KIT

4.3 WORKING OF THE PROJECT

Automatic dimmers are used to switch the brightness from high beam to low beam. The theory behind the dimmers is that it either reduces supply voltage to the headlights or it varies the on time of wave cycle by phase control so that less power is consumed by headlights so there is less brightness . When you're on a very dark road with no traffic, the high beams come on. But when a vehicle with headlamps on is approaching up to 2,000 feet or traveling ahead of you with taillamps visible up to 500 feet, the system will dim to low beams to reduce glare and avoid hindering the other motorist.

CHAPTER 5

CONCLUSION

Glare during driving is a serious problem for drivers. This is caused due to the sudden exposure of our eyes to a very bright light; the bright headlights of vehicles in this case. This causes a temporary blindness called the Troxler effect. Eventually this becomes the major reason for night accidents. The driver should actually turn down the bright lights immediately to avoid glare to the other person which is not happening. Hence, is the idea for the design and development of a prototype circuit called the automatic headlight dimmer. It gives the driver to use high beam light when required. But it automatically switches the headlight to low beam when it senses a vehicle approaching from the opposite side. The circuit consists of simple and economical components which can be easily installed. The effects of bright light on the human eye are also studied. Thus the implementation of this device in every vehicle in future will not only avoid accidents but also provide a safe and a comfortable driving.

PROJECT IMPLEMENTATION-GEOTAG PHOTO

PROJECT DEMONSTRATION VIDEO LINK:

https://we.tl/t-73aSwwkebk

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