BICYCLE AUTOMATIC HEADLIGHT INTENSITY CONTROLLER

Abstract–

Developing a technology that can be utilized to enhance nighttime driving by minimizing the usage of high beams is the main objective of this project. Using the Inputs Processes Output paradigm, a system that complied with the necessary requirements was constructed. When it comes to comfort driving—a common problem for drivers behind you who get a sudden glare in their eyes—the technology is quite helpful. We came up with the concept to build an automated headlamp intensity controller. An automatic headlight intensity high beam light controller that is affordable and easy to install. All of the necessary hardware and components for the suggested design were used. Experiments indicate that when facing other drivers, the controller automatically switches on and off the high and low beam lights to provide the driver the proper command. Upon testing, the system's ability to detect light from the opposite direction—which was quantified in terms of both intensity and distance—was found. As a consequence, the user tried and assessed the system, and the system and the automated headlight functioned as intended. The user gave the system a Strongly Agree rating.

Keywords--Automatic, Buck Converter, Controller, Relay Module

I. INTRODUCTION

Every car's headlights are made to shine brightly and safely as you drive. Two reflectors on them are intended to provide high and low beams. Depending on the road conditions, the driver manually switches between the two types of lighting. Sadly, the other driver may have a blind area as a result of the excessive headlight beams. Drivers should switch to low beams instead than high beams to avoid this effect. Road visibility is decreased by these lights, which emit a softer light.

The car lighting system is built using new technologies, which is one benefit of this technology. Changing from high beam to low beam requires little physical effort. LDR automatically switches the spotlight to low beam when it detects the light from the other car. The researcher used a buck converter to filter the input voltage and generate a modulated output pulse in order to supply the relay module with enough voltage and balance the power supply to the bulb and LDR. Researchers that study the advantages of this technology keep an eye on how long batteries last and how comfortable it is to drive at night. An automatic headlight dimmer prototype built on an Arduino UNO is the related system. An autonomous head lighting system with graphene-coated LEDs and an Arduino microcontroller is suggested. In this paper, the author presented an LED-based heat sink. A Microcontroller Arduino UNO was utilized by them.

The current headlight dimmer prototype, which is based on an Arduino UNO. An autonomous head lighting system with graphene-coated LEDs and an Arduino microcontroller is suggested. In this paper, the author presented an LED-based heat sink. A Microcontroller Arduino UNO was utilized by them.

2. The way an automated headlight dimmer reacts to oncoming cars is discussed. To distinguish between a low-beam and high-beam light, the author uses LDR.

In order to save time and avoid traffic during the day, people drive at night. When driving at night, approaching cars turn on their high beams, which gives the driver of the car a quick flash of light and increases the risk of an accident. He is legally supposed to lower his beam as a car approaches from the opposite direction, but no one follows the rules.

This level of distraction is a contributing factor in many traffic accidents. The automated headlight intensity that has been built lessens the issue by instantly switching from high to low beam when our car senses an approaching vehicle from the opposite direction. The dimmer's complete mechanism is a straightforward electronic circuitry configuration that sensors and turns the headlight based on the necessary circumstance. Thus, the researcher experimented with our own automatic headlight intensity controller for motorcyclists utilizing an LDR, a buck converter, and a relay module. The gadget is affordable, lightweight, and readily available on the market. It also has less parts than other similar devices. This will make the device commercially viable.

In order to regulate the headlight's intensity, we also need to make sure that:

1. The gadget is correctly set up.
2. To put it to the test and assess it on a real motorcycle.

People might feel more comfortable driving after this, especially at night. The automatic headlamp intensity management will make things much easier for the motorist rather than requiring them to manually switch from high to low beam.

Review Related Literature

R claims that driving exposes a driver's eyes to intense light all the time, which can result in glare. This phenomenon may result in mishaps. This also has an effect on the Troxler effect.

The component is utilized in an automated headlight dimmer and is referred to as a light-dependent resistor. the headlights of oncoming vehicles with the use of a sensor that determines the brightness of the incoming vehicle. This eliminates drivers must manually switch the headlights on and off. The car then switches between its low and high lights to lessen glare and make it harder for onlookers to see the approaching car. This method was proposed by Tejas Vijay Narkar [3]. There is light everywhere at night when driving in cities, which may interfere with the device's functionality. After that, the model can be set to manual mode to stop the headlights from flickering. The "Automatic Dipper," when installed in both cars, effectively dipped the headlights of the other car. This paper by Khavare Vinayak Vithal and Vithalkar Akshay Ganesh [4] describes an automatic headlight control system that consists of two phototransistors that can show two different fields of view: one for auto-switching and one that is different from the road surface. Beam modulation is another usage for this technique.

Williams, S.K. Kumassah,[5] and E.A. F. assert that car headlights pose a serious risk when driving at night. Most of the time, when driving, drivers utilize high-intensity beams, which can briefly glare at the car in the other direction. The reason for this is because the headlights of the other car are aimed at the same spot.

An automatic headlight dimmer has been created that automatically dims the high-intensity beams while preserving the low-intensity beams in order to reduce the influence of human eyes on the headlights of the other vehicle. By using this approach, glare may be reduced and manual switching can be done away with.

Hardware and software were combined to construct the project. An LDR sensor, which could identify a car traveling in the other direction, was used in the system's construction. In order to lessen the light's spread angle, it then shifts the headlights to a low beam.

The intensity of light from other sources would be greatly reduced when it struck the sensor. The photodetector's sensitivity was then used to determine the device's output signal. The information regarding the light's output can be stored in this system.

Conceptual Framework

The researcher employs an IPO (Input–Process–Output) model to categorize the process steps and explain the system life cycle provided by this framework. IPO offers a methodical approach to defining a system's goals and objectives as outputs and how to evaluate process method choices by analyzing those outcomes. Additionally, gap analysis—which determines which inputs are required to achieve which outputs—is made considerably easier by the IPO's structured approach.

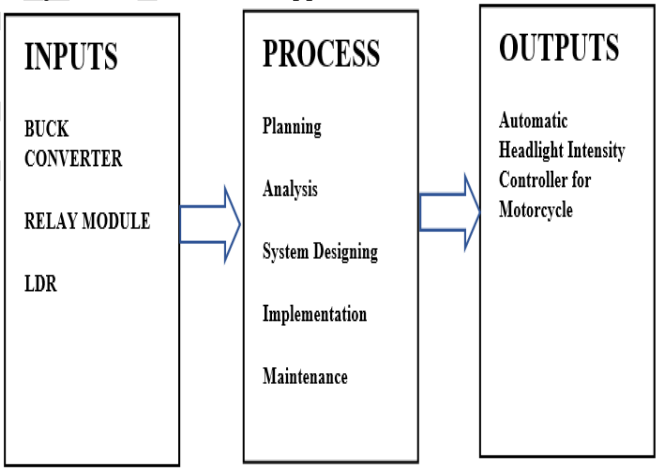

Figure 1.*Input-Process-Output Diagram of the Project*

The block diagram displays the overall definition of the system. The framework describes how the system flows. The input block is the supplies required to construct a power supply project, an automatic headlamp for testing, and the controller provides the driver with the required automated command by turning on and off the high and low beam lights while facing other drivers.

To reduce visual impairments caused by approaching cars, an automatic headlight dimmer that employs a Light Dependent Resistor (LDR) sensor to dim headlights has been developed. By detecting the light intensity of approaching cars, the high beam would automatically switch to the low beam, decreasing glare and the need for the driver to manually adjust, which was not always done. A load that has a lower output voltage (Vo) than the input voltage (Vin) can be powered using a buck converter. The output voltage may be controlled and regulated by the duty cycle of the converter, D=Ton/TsD=Ton/Ts, where Ton is the length of the charging period and Ts is the total switching cycle time; the inverse is the switching frequency, fs=1/Tsfs=1/Ts. There is an increase in battery life.

The phases of planning, review, system design, implementation, and maintenance are contained in the process block, which comes after the input block. To ensure project performance, all project procedures and activities need to be scheduled, and a comprehensive set of plans needs to be created. Several collected and processed things are compared, evaluated, and given the appropriate background in order to make them relevant during an examination. Getting a decent performance out of your project is the aim of system design. Achieving the project's goals and starting the project are both parts of its implementation. Here, the project's advocates work on the deliverables. The last step is repair, which entails making modifications to the hardware, software, and documentation of the system to ensure its continuing operational effectiveness. It includes enhancing security, fixing bugs, optimizing system efficiency, and satisfying user needs.

The project's output, an automatic motorcycle headlight intensity controller, is the result of the input and procedure.

Objectives

The general objective is to build and implement an Automatic Headlight Intensity Controller for Motorcycles that will make night driving safer while also minimizing accidents caused by headlight glare, as well as to create a gadget that is comfortable to use while driving.

The study specifically aimed to:

1. To design and build an automatic Headlight Intensity controller for a motorcycle.
2. To test and evaluate the project.

II METHODS

Research Design

The researchers employed a descriptive study methodology and survey method to collect customer input on the Automatic Headlight Intensity Controller for Motorcycle project and estimate the level of awareness about its efficiency. This is a study in which data is gathered without causing environmental disruption. It displays the relationship between the variables.

A descriptive research approach is a good way to learn more about a topic and prepare for a more quantitative and qualitative study. While statistical validity is a major concern, this type of study is a useful scientific tool as long as the researcher is aware of the limits.

This research employed a qualitative and quantitative approach. A qualitative approach was used to examine the respondents' profiles. Furthermore, the information was gathered from the study's participants.

Project Design

Its goal is to create one or more designs that will help the project meet its objectives. The project's block diagram can be seen in the image below.

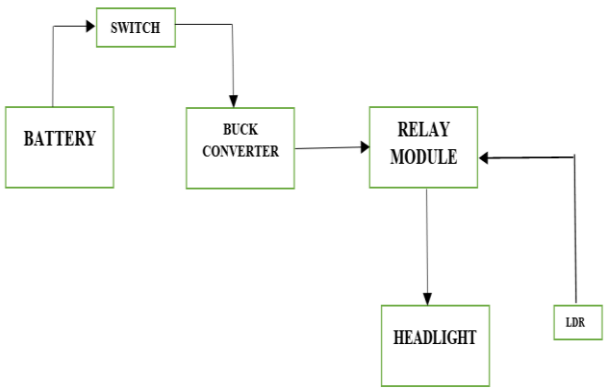

Figure 2. ***Block diagram of the Project***

The block diagram for the project is shown in the diagram above. The researchers built a device using these hardware components.

Researchers also utilized the Buck Converter to monitor the battery life offered on the mini digital panel of the Buck Converter when they were going somewhere.

LDR is used by the Relay Module to analyze the command. The LDR can only give the command based on the given criteria.

Project Development

The development of this project is divided into many sections. The researcher's primary responsibility is illustrated in the diagram above. From the stage of analysis to the level of assessment, each block evolves.

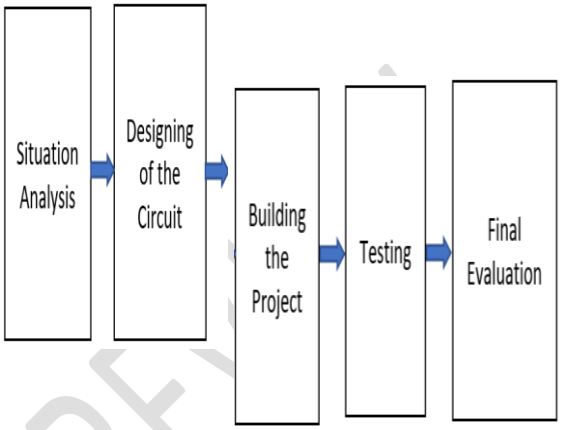

Figure 3. ***Development***

Figure 3.To do a Situation Analysis, the researchers must be familiar with any type of vehicle that is often utilized daily, particularly at night.

The design of the circuit diagram is used to map the circuit and its functionalities regardless of the size, shape, or location of the component devices or components. The design process includes circuit layoutsand device definition.

Building the project is not easy as you often encounter many errors. Building the project is creating instructions that tell a logical guide on how to perform a task and how the project works.

The device must be tested to assess its consistency and functionality

In the final evaluation, the researcher decided where they would build their system, and the motorcycle was chosen.

Project Evaluations

It aims to identify the project's relevance and level of success, as well as the development's efficacy, efficiency, impact, and long-term viability. The project evaluation of the research is depicted in the block diagram below.

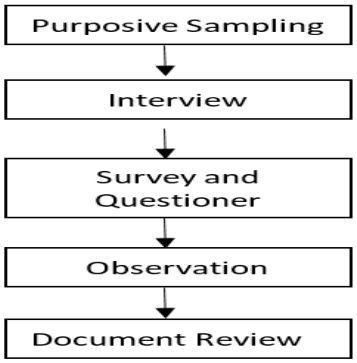

Figure 4. ***Qualitative Data Collection Process of the Block diagram***

Purposive Sampling was observed and used by the researcher.To collect the proponent's data the researcher was interviewedabout how the headlight improved, and how this project is going to be implemented

by using Qualitative analysis. Surveys and questions about how researchers collect data might assist project supporters to learn more about their project.The proponents Observe the components that are appropriate for the design.The data results of the proponents will be documented and reviewed.

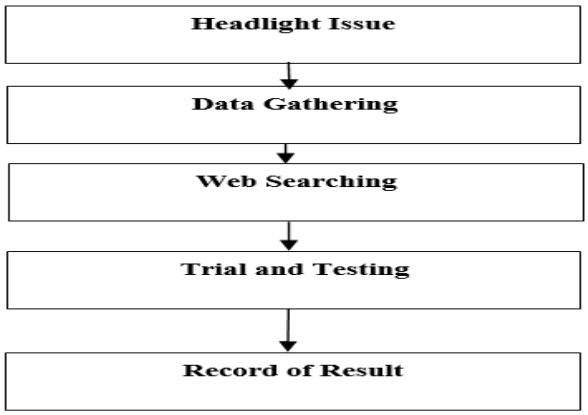

Figure 5. ***Quantitative Data Collection Process of the Block diagram***

The researcher observed and applied to the headlight issue. To acquire statistics and information from the proponent on how the system works formotorcycles, and how this project is going to be implemented by using Quantitative analysis. Web searching how researchers can collect data via the Internet helps the proponents to enhance their knowledge about their project. Series of trials and testing done by the proponents to their components suited to the design. The proponents record the results of the data gathered through surveys and interviews.

Table 1. ***List of Participants***

Participants	f (n=20)	% 0f involvement
Tricycle driver	5	45.00
Motorcycle driver	10	55.00

The researchers used a purposive sample and a selective strategy to find participants who could provide detailed information about the venture while also meeting the standard output requirements for the phenomenon under investigation. It represents the entire population within the scope of the study for the selected respondents.

The table above shows the number of participants and their involvement in the study. The survey had 15 participants, with a Tricycle driver having 5 participants and a 45 percent participation rate, and a Motorcycle driver having ten participants and a 55 percent participation rate.

Instruments

*A multimeter*is an electronic estimating device that combines multiple estimation functions into a single unit. Voltage, current, and resistance may all be tested with a standard multimeter.

*A Lux meter*is aLight captured using a photocell. The meter then converts this light to an electrical current, and measuring this current allows the device to calculate the lux value of the light captured.

*A voltmeter*is a gadget that calculates the distinction in electric potential between two focuses in an electric circuit. It is associated in an equal way. It normally has a high resistance, which means it only draws a small amount of current from the path.

*Qualitative survey questions*are characterized as objective questions designed to collect detailed information from respondents regarding a survey study topic. The answers to these quantitative survey questions are analyzed, and a research report based on the quantitative data is created.

III. RESULT AND DISCUSSION

This section discusses how the system works and how it operates. The following results and discussion of the design and development of the Automatic Headlight Intensity Controller for Motorcycle.

3.1 Design of the System

Figure 6. ***Buck Converter***

A buck converter reduces the input voltage to produce a lower output voltage. From a 5 V USB supply, a buck converter might be used to charge a lithium-ion battery to 4.2 V. A boost converter raises the voltage to a level higher than the input voltage.

Figure 7. ***2way Switch***

A two-way light switch may be used in conjunction with another two-way light switch to turn on and off a light (or lights) from multiple locations.

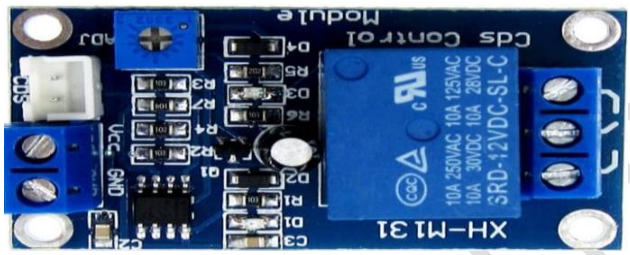

Figure 8. ***Relay Module***

A power relay module is an electromagnet-controlled electrical switch. A separate low-power signal from a microcontroller activates the electromagnet. The electromagnet pulls to open or close an electrical circuit when energized.

Figure 9. ***LDR***

The principle of operation of an LDR is photoconductivity, which is an optical phenomenon. When light is absorbed by the substance, the material's conductivity improves. When light shines on the LDR, the electrons in the material's valence band rush to the conduction band.

Figure 10. ***Headlight***

A headlight is a light that is mounted on the front of a vehicle and illuminates the road ahead. Headlamps are sometimes referred to as headlights, however,is the most accurate sense, a headlamp refers to the device itself, while a headlight refers to the light beam produced and distributed by the device.

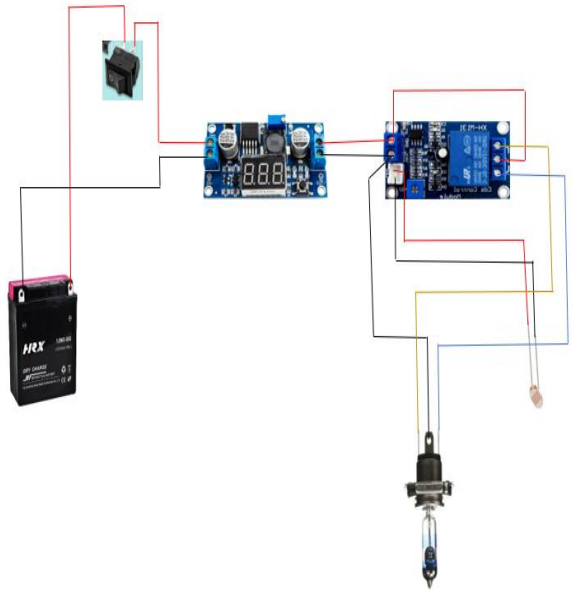

Figure 11. Schematic Diagram

Connect the battery supply to the 2way switch, then connect the input of the buck converter. The battery voltmeter will display on the buck converter's mini digital panel, and the buck converter's output will be connected to the input relay module. Thepositive and negative are present in the input relay module, while the common, normally open, and normally close are present in theoutput of the relay module. The positive input of the relay module will be tapped to the common and the negative input of the relay module will be tapped to the ground of the headlight, then the normal close of the relay module will be tapped to the High Beam of the headlight, then the normalopen of the Relay Module will be tapped to the Low Beam of the Headlight, and so on. LDR will be tapped to Relay Module.

Figure 12. ***Pictorial Diagram***

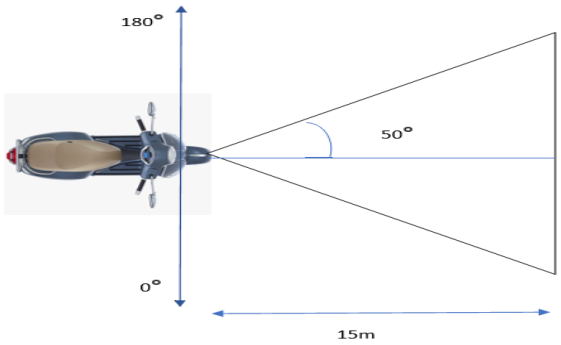

Figure13.*Range of the LDR andblind spot of the LDR sensor's detection*

The diagram above shows that when it encounters an opposing vehicle, each of the two vehicles detects the light of the opposing vehicle. As a result, if either of the vehicles is using a high beam, it will automatically switch to a low beam approximately 15 meters away. When the vehicles collide, the intensity of light falling on the sensor after 50 degrees from the center of the LDR switches back to the previous model.

3.2 Test and Evaluation of the System

Table 2. ***Detection and blind-spot angle analysis***

Angle (°)	LDR (Detect)	LDR (Blind Spot)
10	NO	YES
30	NO	YES
50	YES	NO
70	YES	NO
90	YES	NO
110	YES	NO
130	YES	NO
150	NO	YES
180	NO	YES

Table 2. shows the angle detection and blind spotwhen it encounters an opposite vehicle.

Table 3. ***LED light dimmer analysis***

Percent of Accelerator (%)	Voltmeter (V)	Luminance (Lux)
0	12.7	5791
25	13.15	5791
50	13.6	5791
75	14.05	5791
100	14.5	5791

As shown in the table3. above, as the accelerator and voltage increase, the output of the lumen remains constant due to the relay, which controls the voltage and provides a fixed output.

Table 4. ***Halogen light dimmer analysis***

Percent of Accelerator (%)	Voltmeter (V)	Luminance (Lux)
0	12.7	9222
25	13.15	9222
50	13.6	9222
75	14.05	9222
100	14.5	9222

Tables4. In terms of voltmeter and accelerator percentage, this table displays the same data as Table3, but the lumen output remains the same. LED lighting is less intense than halogen lighting.

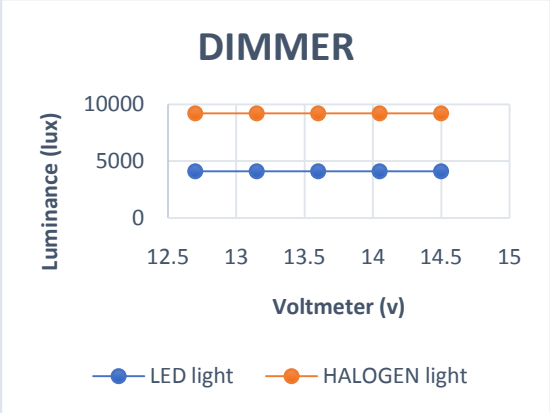

Figure 14.*Halogen and LED light dimmer analysis*

The graph depicts the difference in light intensity between LED and Halogen. The halogen bulb emits lighter than the LED bulb. Even at higher voltages, the Lumens remain constant.

Table 5. *LED light dipper analysis*

Percent of Accelerator (%)	Voltmeter (V)	Luminance (Lux)
0	12.7	4113
25	13.15	4113
50	13.6	4113
75	14.05	4113
100	14.5	4113

As shown in table5. above, as the accelerator and voltage increase, the output of the lumen remains constant due to the relay, which controls the voltage and provides a fixed output

Table 6. *Halogenlight dipper analysis*

Percent of Accelerator (%)	Voltmeter (V)	Luminance (Lux)
0	12.7	7148
25	13.15	7148
50	13.6	7148
75	14.05	7148
100	14.5	7148

Tables6. In terms of voltmeter and accelerator percentage, this table displays the same data as Tables 1 and 2, but the lumen output remains the same. LED lighting is less intense than halogen lighting.

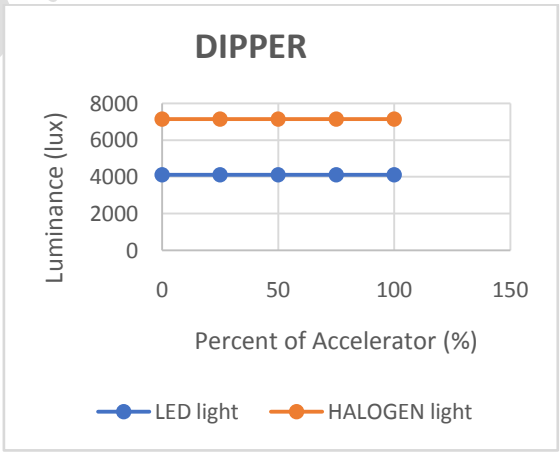

Figure 15.*Halogen and LED light dimmer analysis*

The graph depicts the difference in light intensity between LED and Halogen. The halogen bulb emits lighter than the LED bulb. Regardless of acceleration, the Lumens remain constant. This function is served by relay.

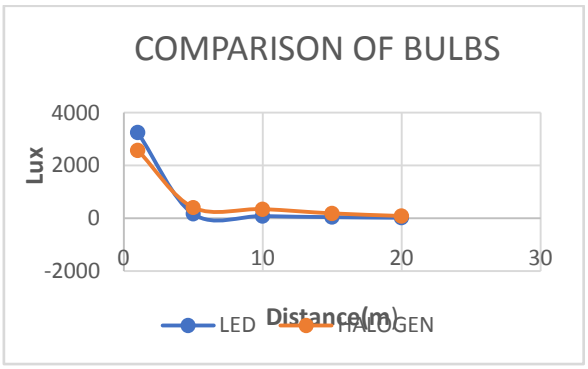

Figure 16.*Comparison of the dimmer's bulbs*

The graph shows the Lux difference in a single bulb. The lumens decrease asmove away from the light.

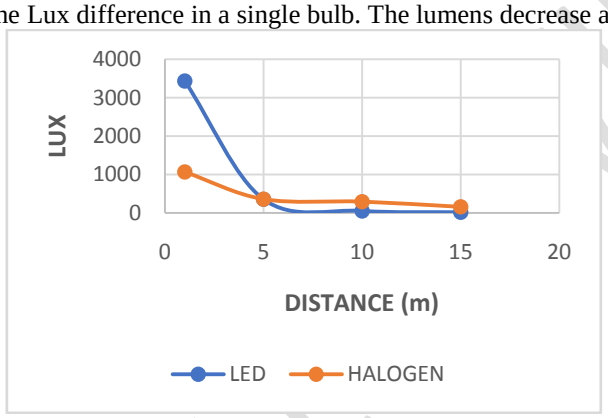

Figure 17.*Comparison of the dipper's bulbs*

The graph depicts the difference in Lux produced by a single light bulb. The luminescence of researchers decreases as they move away from the light. The LDR detects at a distance of about 15 meters.

IV. CONCLUSION AND RECOMMENDATIONS

Conclusion

The headlight on a motorcycle is controlled manually. Immediately dimming the bright lights will help the driver avoid gazing at the other person, which is not the intention. Thus, the notion to create and construct a motorcycle headlight intensity controller on autopilot was born. When necessary, the driver can utilize a high beam thanks to a mechanism known as automatic headlamp intensity. But when it detects an oncoming car from the other side, it instantly turns the lamp to a low beam. So, when this gadget is installed in every car going forward, driving will be safe and comfortable in addition to preventing accidents.

Because of this, the researchers examined and assessed the system's functionality, and the outcome was flawless, proving that both the system and the automatic headlight intensity function effectively.

Recommendation

Based on the study's findings and the conclusion obtained, the following recommendations are given:

1. It is recommended to use a 24VBuck Converter to regulate a higher current and utilize the low current.
2. It is recommended to use a 3way switch to control the headlight manually and automatically.
3. It is recommended to cover the LDR with a reflector light cover so that it can detect light easily.

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