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Smart Vehicle Head Light Auto Switching And Intensity Control

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ABSTRACT

This abstract highlights about Vehicle headlights have long been a critical safety component, but their technology has remained relatively stagnant despite advancements in smart cars. The issue of blindingly bright headlights causing accidents persists. The intense glare from high beams poses risks, leading to temporary blindness and potentially fatal collisions. To address this, we propose an innovative automatic headlight intensity control system. Our prototype employs Light Dependent Resistors (LDR) to detect oncoming vehicles and adjust headlight intensity accordingly, dimming them to reduce glare and enhance safety. This system eliminates the need for manual adjustments by drivers, significantly reducing the risk of accidents caused by dazzling headlights. According to the regulations of the Indian Roads and Transport Council, vehicles should primarily use low-intensity lights. However, drivers often misuse high beams due to poor visibility with low beams. Our automatic dipper system intelligently manages headlight intensity, optimizing visibility while ensuring compliance with regulations.

INTRODUCTION

While this project proposes a smart headlight system to address headlight misuse and glare, further exploration can strengthen your research paper. Consider including statistics on headlight-related accidents to solidify the problem's severity. delve into the limitations of current headlight technology and how yours offers improvement. Expand on the system's details with a schematic or explore different light sensor types for better performance. Imagine functionalities for the Bluetooth app beyond on/off control. What about diagnostics or customization features? Explore existing smart headlight systems or automatic dimming mechanisms to position your project within the technological landscape. Look towards the future - how might this system integrate with self-driving cars or project information onto the road? Finally, remember to cite all sources to add credibility to your research. By addressing these points, you can craft a comprehensive and impactful research paper.

Nowadays, the number of vehicles and road transportation system are increasing rapidly. Due to this, the number of road accidents also gradually raises which has been the motivation behind this project. The "ministry of road transport and highways transport research wing" reported a project called "road accidents in India (2018)" which says road accidents in India kills 1.5 lakh people annually, in which 52.02% of accidents are related to the collisions by vehicle to vehicle and more than 30% of accidents occur due to the

headlight glare at night. A survey tells that 26.5% of people use dipper properly, 25.53% use it for sometime then avoid using and the remaining 48.3% drivers use high beam continuously.

OBJECTIVES

- Sometimes users forget to switch on the lights before starting the car at night, which can lead to accidents
- At times users forget to turn off headlights during day time consuming unnecessary battery
- Also users sometime forget to turn off headlight before leaving car which drains the entire car battery
- Vehicle headlights usually glow at full intensity then turned on consuming max power
- This project bridges Android mobile technology with embedded systems, leveraging Bluetooth for seamless wireless control.

LITERATURE SURVEY

Research on smart headlights is flourishing, focusing on improving safety, saving energy, and making driving better. Studies explore various sensors (light detectors, cameras) to gauge light levels and oncoming traffic. Researchers develop algorithms to adjust headlights automatically based on surroundings and even driver behavior using machine learning. Smart headlights could talk to each other (V2V communication) to optimize light settings for all vehicles. They can also be energy efficient by adjusting brightness without sacrificing visibility. User acceptance and design are considered to ensure these headlights are user-friendly and meet driver expectations. Overall, this research is paving the way for safer, more enjoyable driving experiences.

FUNCTIONAL DESCRIPTION

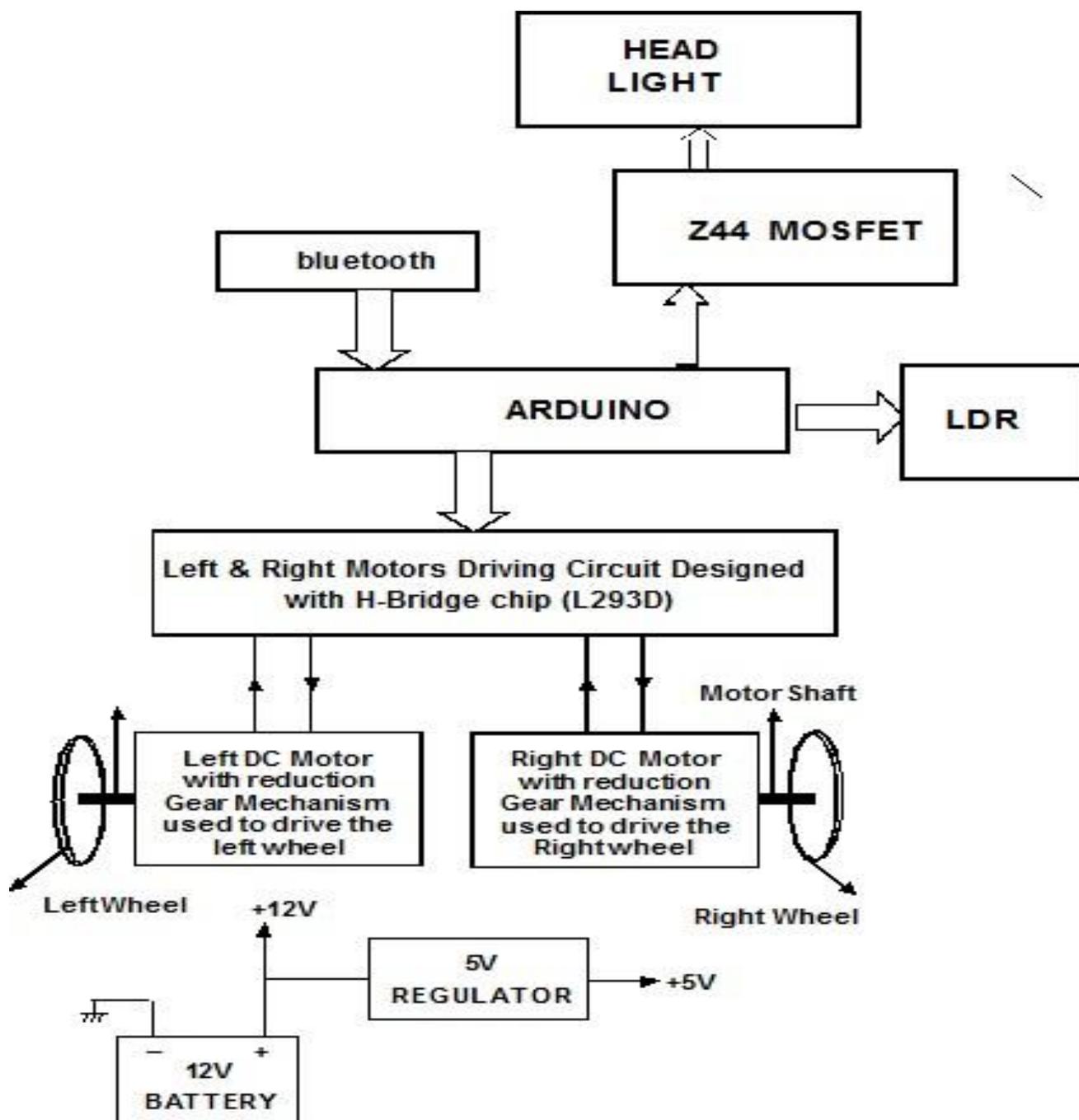
The functional description of the project work is explained in this chapter. For better understanding, the total module is divided into various blocks and each block explanation is provided here. The diagrams (block diagram and circuit diagram) of this project work are provided in the next chapter. The following is the description of the overall function or operation of the project work.

BLUETOOTH MODULE

The HC-05 is a Bluetooth module that allows wireless communication between devices like smartphones and microcontrollers. It uses Bluetooth technology which operates at 2.4 GHz and is designed for low power consumption. This module is easy to use and integrates well with various devices. The project described here utilizes an HC-05 module along with an Android phone to control various appliances.

ARDUINO NANO:

The Arduino Nano is an open source bread board friendly microcontroller board based on the Microchip ATMEGA 328P microcontroller (MCU) and developed by Arduino.cc and initially released in 2008. It offers the same connectivity and specs of the Arduino Uno board in a smaller form factor. The Arduino Nano is equipped with 30 male I/O headers, in a DIP-30-like configuration, which can be programmed using the Arduino Software integrated development environment (IDE), which is common to all Arduino boards and running both online and offline. The board can be powered through a type-B mini-USB cable or from a 9 V battery. In 2008, the Arduino Nano was released. In 2019, Arduino released the Arduino Nano Every, a pin-equivalent evolution of the Nano.



This smart headlight system automatically adjusts based on its surroundings to optimize visibility and avoid blinding oncoming traffic. Light sensors and detectors continuously monitor ambient light levels and approaching vehicles.

A microcontroller analyzes this data and determines when to switch between high and low beams or adjust the intensity of the headlights. This control system then communicates with the vehicle's electrical system to make the necessary adjustments. By automatically adapting to the environment, this system improves nighttime driving safety for both the driver and others on the road.

SOFTWARE DESCRIPTION

The software details for a smart vehicle headlight auto-switching and intensity control system involve programming the microcontroller to effectively manage the operation of the headlights based on sensor inputs and user preferences. Here's an overview of the software components and functionalities:

Microcontroller Programming:

The heart of the system is the microcontroller (e.g., Arduino, Raspberry Pi), which requires custom software programming to implement the desired functionalities.

Sensor Data Acquisition: Writing code to read analog sensor inputs (from LDRs or other light sensors) to determine the ambient light levels.

Decision Making Algorithms: Implementing algorithms to analyze the sensor data and determine when to switch between high and low beam modes based on predefined thresholds or conditions (e.g., detecting oncoming headlights).

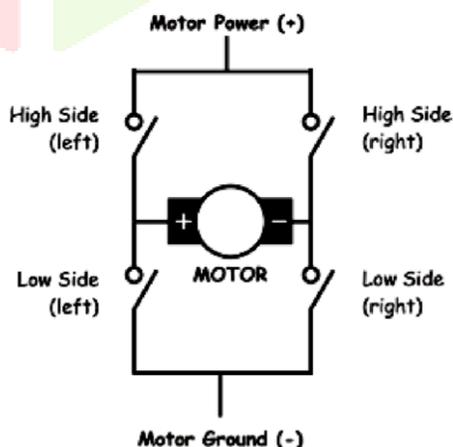
PWM Signal Generation: Writing code to generate Pulse Width Modulation (PWM) signals to control the intensity of the headlights. This involves adjusting the duty cycle of the PWM signal to vary the brightness of the headlights.

Control Logic: Developing logic to interface with external components like transistors or relay modules to physically switch the headlights between different modes based on the decision-making process.

DESCRIPTION OF “H” BRIDGE

This passage talks about how to control DC motors with a microcontroller. It discusses H-bridges, which are circuits that allow you to control the direction of a DC motor. There are three ways to build an H-bridge: with relays, transistors, or an L293D motor driver chip.

- Relays are the simplest way to build an H-bridge, but they are not very efficient and can break easily.
- Transistors are more efficient than relays, but they can get hot if they are controlling a large motor.
- L293D motor driver chips are the easiest and safest way to control DC motors. They can control two DC motors at the same time.



RESULT AND DISCUSSION

Automatic headlight systems improve road safety by automatically adjusting brightness and beam mode based on surroundings. These reduces glare for on coming drivers and improves visibility for the drivers, especially at night. It also frees the driver from manually adjusting headlights ,reducing the risk of errors and improving compliance with regulations .

However there are challenges, light sensors need to be accurate and reliable in detecting light level and on coming vehicles .The system's decision-making software needs to be well-tested to ensure it switches beams appropriately in different environments (city vs highway) .

Smart headlight systems automatically adjusts brightness and beam mode based on surroundings, significantly improving road safety. These reduces glare for on coming drivers and improves visibility for the divers, especially at night. While sensor accuracy, software testing ,and user acceptance require attention ,these systems for potential benefited in energy efficiency, reliability and durability. Despite challenges in cost ,component availability and system integration on going research on advanced sensors and communication technologies promises further advancements in automotive safety and technology.

CONCLUSION

The authors built a prototype automatic headlight dimmer system. This system automatically switches headlights to low beam when it detects an oncoming vehicle, reducing glare and improving safety. It is designed to be simple, compact, and easy to install in most cars.

The project was successful in demonstrating the concept. They built a basic prototype to show how it would work in a real car. They also considered future improvements like adding a camera for better control. However, there are some limitations to the current design, like the Bluetooth range being limited, especially in buildings.

FUTURE SCOPE

Automatic headlight systems are a significant improvement over manual controls. They eliminate human error and allow drivers to focus on the road. These systems have a bright future with potential for even greater safety benefits.

Future advancements include advanced sensors like cameras and radar that can provide a more detailed picture of the surroundings. This would allow the system to make even more precise adjustments based on complex driving scenarios. Additionally, car-to-car communication could enable headlights to talk to each other, preventing drivers from blinding one another. Artificial intelligence and machine learning could personalize headlight control based on individual driving styles and conditions. Smart headlights could also be integrated with self- driving cars and even smart city infrastructure to further enhance safety and efficiency on the roads.

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