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Wireless Auto Dimming for Sustainable Driving

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ABSTRACT: During night or in low light condition the headlight of the opposite vehicle distracts the eyes of the driver. This paper discusses about the automatically dimming the headlight of the vehicle switches from high intensity to low intensity. The auto dimming system will dim to low intensity to reduce glare and avoid hindering the other vehicles.

KEYWORDS: Headlight dimmer, Light Dependent Resistor [LDR], Bluetooth communication, Relay module, Microcontroller.

I. INTRODUCTION

The project idea is to implement the auto dim light using Bluetooth communication, by looking at the problems caused by the high intensity lights at the vehicle especially while travelling on highways at night. The requirement of headlight during night travel, are very prevalent. When driving at night, a sudden high intensity light reflection can often take a driver by compromising their focus and attention on the road. With the wireless auto dimming feature, their visibility will remain intact, ensuring safe driving.

In the existing method, controlling the switch is done manual. As it is very difficult to do in all situations this auto dimming system ensure to reduce the man power during driving.

II. BLOCK DIAGRAM

Block diagram of the project as shown in Fig1. and Fig2.

It includes two parts.

1. Transmitter
2. Receiver

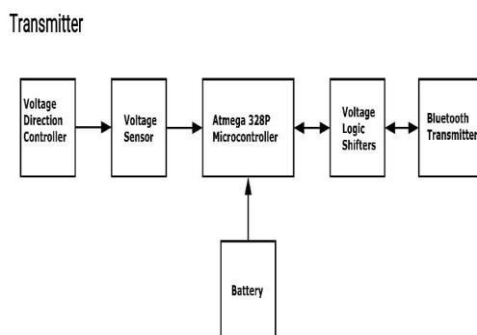


Fig1. Transmitter part

- ❖ Transmitter circuit include atmega 328p microcontroller based on AVR enhanced RISC architecture.
- ❖ The communication is done wirelessly using Bluetooth communication
- ❖ The transmitter receives the power from the vehicle battery
- ❖ Signal is transmitted to receiver via wirelessly to auto dim the headlight

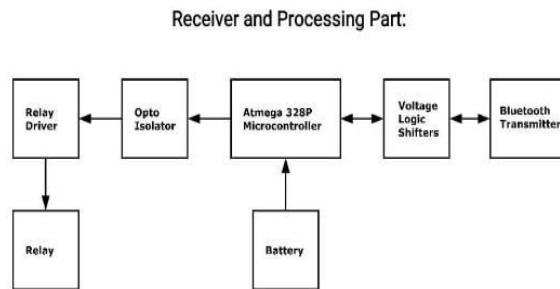


Fig2.Receiver part

- ❖ The Receiver receives the signal from transmitter and transmit to cabin of the vehicle and controls the headlamp.

III. WORKING METHODOLOGY

Based on the output of an LDR, the microcontroller senses the voltage output. As the microcontroller's capabilities are limited to handling voltages within certain parameters, a voltage divider comprising high-power resistors is employed to regulate the current and voltage.

This voltage divider reduces the voltage to one-tenth of its original value, acting as the voltage sensor component. To safeguard the system against short circuits caused by reverse polarity, two high-power diodes are integrated into the voltage sensor. These diodes facilitate voltage flow in the respective terminals while preventing it in the event of polarity mismatch.

Utilizing the ATmega328P microcontroller, the analog voltage from the voltage divider circuit converts the data into digital format through the built-in analog-to-digital converter.

The Bluetooth module initiates a search for receivers, verifying their credentials upon discovery. A logic voltage shifter is indispensable between the Bluetooth module and the microcontroller's UART communication. Upon receiving data wirelessly from the transmitter, the Bluetooth module on the receiver end initiates compatibility checks based on credentials. Upon verification, data exchange ensues between the transmitter and receiver. Confirmation of successful data exchange is indicated by the LED blinking, signalling receipt of acknowledgment from the transmitter.

IV. COMPONENTS REQUIRED

4.1 HARDWARE REQUIREMENTS

4.1.1 ARDUINO NANO

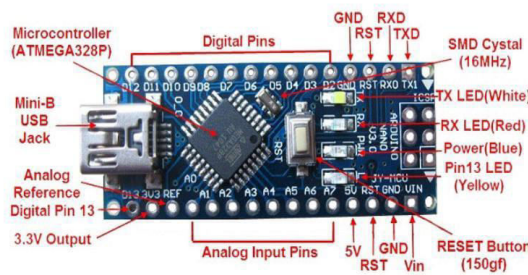


Fig3. Arduino nano

The Arduino Nano as shown in Fig3.is a small, compact board based based on the ATmega328 microcontroller.. It lacks only a DC power jack, andIt works receiving instructions from a computer or another device via USB, interpreting those instructions, executing them using its microcontroller. It works with a Mini-B USB cable instead of a standard one. The Arduino Nano uses on Mini-B USB port connection, unregulated power supply of 6-20V to Vin pin of the Arduino Nano (pin 30), and Connect the positive terminal of 5V external power supply (pin 27) to the 5V pin on Arduino Nano, and the negative terminal to the GND pin. This bypasses the onboard voltage regulator since the input voltage is already at the required 5V.

4.1.2 BLUETOOTH MODULE(HC-05)

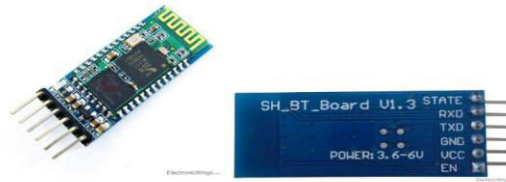


Fig4. Bluetooth Module(Hc-05)

- ❖ Bluetooth is used for exchanging data over short distance device through wirelessly.
- ❖ It is used for many applications like wireless headset, game controllers, wireless mouse, wireless keyboard and many more consumer applications.
- ❖ It has range up to <100m which depends upon transmitter and receiver, atmosphere, geographic & urban conditions.
- ❖ Bluetooth is the IEEE 802.15.1 standardized protocol and uses frequency-hopping spread spectrum (FHSS) as the modulation technique, which involves hopping between different frequencies within the 2.4GHz band to reduce interference and enhance security.

4.1.3 BC557 PNP TRANSISTOR

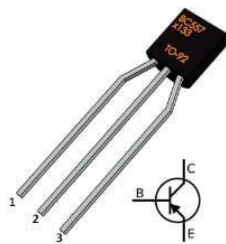


Fig5. BC557 Transistor as switch

When a transistor acts as a switch as shown in Fig5. it operates in Saturation and Cut-Off Region as explained above. As discussed a transistor will act as an Open switch during Forward Bias and as a Closed switch during Reverse Bias, this biasing can be achieved by supplying the required amount of current. As mentioned the biasing current should maximum of 5mA. Anything more than 5mA will kill the Transistor. Hence a resistor is always added in series with base pin.

4.1.4 RELAY



Fig6. Relay

A relay in Fig6 is an electromechanical switch that uses an electromagnet to mechanically operate a switch mechanism. Relays are commonly used in circuits to control high-voltage or high-current devices with low-voltage signals. They can be used for various purposes, such as switching lights, motors, solenoids, or other electronic devices. Relays come in different types, including electromechanical relays (EMR) and solid-state relays (SSR).

4.2 SOFTWARE REQUIREMENTS

4.2.1 ARDUINO IDE

The Arduino IDE provides a user-friendly interface for writing, compiling, and uploading code to Arduino boards. It supports a variety of programming languages, including C and C++, and comes with a range of built-in libraries for different functionalities. The IDE also includes features like syntax highlighting, automatic code indentation, and serial monitoring for debugging. Additionally, it offers extensive documentation and a large community of users who share projects, tutorials, and troubleshooting tips

V. CIRCUIT DIAGRAM

The circuit diagram of transmitter and receiver is shown in Fig7. and Fig8.

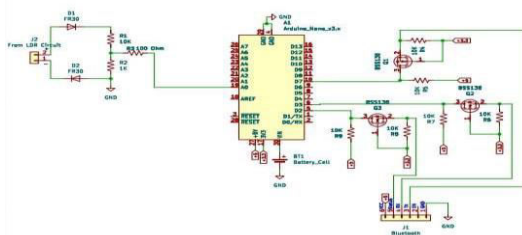


Fig7. Transmitter circuit

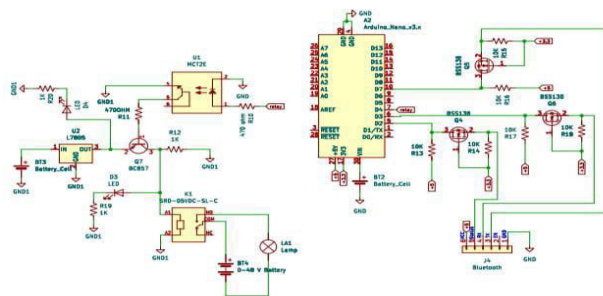


Fig8. Receiver circuit.

VI. RESULT AND CONCLUSION

An automatic headlamp dimmer is designed using wirelessly. Glare during driving is a major problem as it causes a bright exposure to our eyes. This causes Troxler effect eventually which may result in temporary blindness and this is the reason for increasing accidents. In manual mode the drivers must turn down the high beam light to avoid glaring. Hence this project aims in developing a prototype circuit known as “wireless auto dimming in sustainable driving” which automatically switches the headlight of the lamp.

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