MODELING OF STIMULUS HEADLIGHTS USING ADVANCED ELECTRONIC DEVICES

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Abstract: Many people find it more difficult to drive at night than during the day. Driving in the dark is quite different from driving in daylight since the human eye field is reduced without the aid of light. The light from a front-light system, such as the vehicle's headlights, aids the driver's overall vision and allows them to drive safely. This pushes the automobile industry to investigate various intelligent headlamp control systems, with the goal of automatically and optimally controlling an automobile's headlights during a nighttime drive is quickly becoming a key component of modern driver assistance systems. Drivers no longer need to manually and continuously switch between high and low beams, allowing them to focus more on driving.

***Index Terms* –** Head light, Vision.

I. INTRODUCTION:

Headlights are one of the most crucial characteristics in a car. Headlights are commonly regarded as the car's eyes, displaying its influence. This causes an increased emphasis on the design rather than the form of the headlight. However, as innovation has evolved, structures have become more complex, and the way your vehicle illuminates the roadway has become increasingly exciting. The following technologies have evolved over time. A large, strong light in the front of a vehicle, typically one of two: I saw a car's headlights approaching me. Headlights are on. It was misty, and every car had its headlights turned on. The major function of headlights on automobiles is to illuminate the road and promote fatigue-free and safe operation. Headlights and their light sources are thus car components that are important for safety. Proper communication, whether driving or riding a bike, can help keep you and other road users safe. In addition to turn and hand signals, lights and other useful gestures help you communicate your intentions, avert accidents, and keep traffic moving. Adaptive headlights can change their direction and intensity depending on a variety of circumstances. They can pivot or swivel in the direction of the vehicle's movement to better illuminate the road ahead, increasing safety and visibility. Clear and properly operating headlights provide optimum visibility, allowing you to spot roadside obstructions and hazards quickly. Furthermore, well-maintained headlights decrease the chance of accidents and contribute to overall road safety for all motorists.

TYRES OF HEADLIGHTS:

Electric Headlights: Modern headlamps are powered by electricity and are arranged in pairs, one or two on each side of a vehicle's front. A headlight system is required to create a low and a high beam, which can be produced by several pairs of single-beam lamps, a pair of dual-beam lamps, or a combination of single-beam and dual-beam lamps.

Fig 1: Electric Headlights

Sealed beam headlamp: A sealed beam lamp is a headlamp that is housed in a sealed unit that includes the lens, reflector, and element. Prior to the invention of the sealed beam, headlights were made up of distinct components. This resulted in out-of-aim headlights that burnt out quickly owing to moisture entering the light assembly.

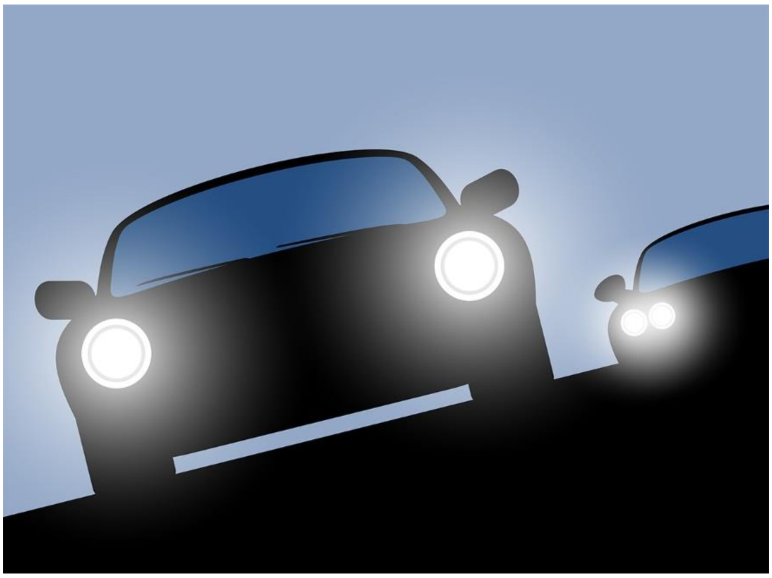

Fig 2: Sealed beam headlamp

Light Emitting Diodes: A light-emitting diode (LED) is a semiconductor device that produces light when electricity is sent through it. Electrons in the semiconductor recombine with electron holes, releasing energy as photons.

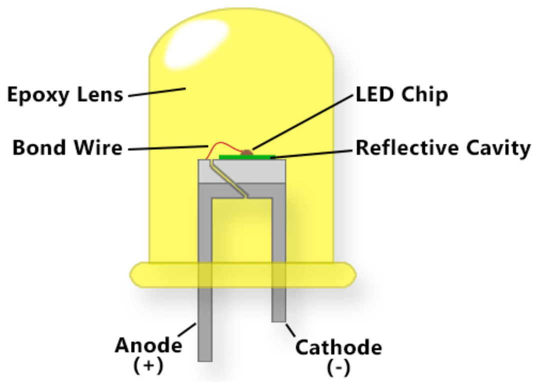

Fig 3: Light Emitting Diodes

Lasers : The most current improvement in front lamp technology uses laser beams. The BMW i8 was the first automobile to feature front-end laser beams. Three diodes blast blue laser bars into a crystal, focusing them into a single beam. The beam passes through a phosphorous focus point, which converts it from blue to white, before striking a reflector and directing it onto the road. The laser unit outperforms LEDs by 30% and can illuminate up to twice as far at 2000 meters.

II.LITERATURE REVIEW:

Ian J. Reagan recommend focusing on contemporary automotive lighting systems, including adaptive curve HID, fixed HID, and fixed halogen low beam headlights. The aforementioned lighting solutions were evaluated in low-beam conditions. An on-site experiment was done to assess the glaring effect of the headlights shown above. The user feedback was scored using the DeBoer visual discomfort scale. The Highway Loss Data Institute (HLDI) analyzed insurance claims from four automakers (Mazda, Acura, Volvo, and Mercedes-Benz) to determine the impact of adaptive headlamp systems.

Stephen J. Anderson handicap glare is a significant issue for senior drivers, particularly at night. An on-site experiment was undertaken to observe the visual damage occurring. The mean display luminance was set at 50 cd/sq. m and 0.5 cd/sq. m, and an exponential curve was used to analyze the results. Headlights in high beams can reduce maximum contrast sensitivity by an order of magnitude in individuals with mild lens opacity of 1.0 c/deg or less, based on the average illuminance of road lighting.

Shreyas S develop and implement a microcontroller-based Adaptive Headlight System (AHS) for autos. This article aims to provide a cost-effective method for illuminating blind spots while driving at night or in low visibility. The design use the Atmel AT89S52 to power the stepper motor connected to the headlight, resulting in effective blind spot illumination. The framework can also receive input from a pointer switch, which causes the front bulb to reflect a full turn when the marker is pressed.

P.F.Alcantarilla want to create an effective system for detecting cars in front of camera-assisted vehicles under nighttime driving situations. It helps drivers avoid glare by switching between low and high beams on their vehicle headlights. When no traffic is detected, the system defaults to a high beam output, but switches to a low beam when detected. This applies to both well-lit and urban areas. A black and white micro-camera was put in the wind shield of a C4-Picasso prototype car to implement this technology.

III PROBLEM DEFINITION:

Driving at night can be challenging due to impaired vision caused by lack of light compared to during the day. The light from a vehicle's front-light system, such as the headlights, improves driver visibility and safety. When approaching car headlights hit our eyesight, it can cause temporary blindness, known as Dazzling of Headlights. This can pose a major threat and lead to fatalities. To address this issue, governments have improved roadway infrastructure and implemented speed limits, among other measures. The National Highway Authority of India (NHAI) has sought a budget of 25000 crore Indian rupees to fulfill this goal. Automobile firms have included safety features, including crash test-based certificates. Nighttime headlight glare is a significant contributor to accidents in India, yet often overlooked. In India, drivers often overlook the need of controlling headlight intensity, such as switching from high to low beams. We should address the lack of strong restrictions on automotive design, particularly in India and the Sub-continental regions.

A stimulus is an environmental change that prompts an organism to respond. A response is an organism's reaction to a stimuli.

Emergence of temporary blindness: Driving at night requires optimal visual abilities owing to reduced illumination and increased glare from headlights. Headlight intensity correlates with glare, making using HID lights more challenging. Elderly individuals are at a higher risk of temporary blindness because to increased intraocular light dispersion, glare sensitivity, and photo stress recovery time. This can have serious consequences for driving skills.

Circuit Diagram and Components:

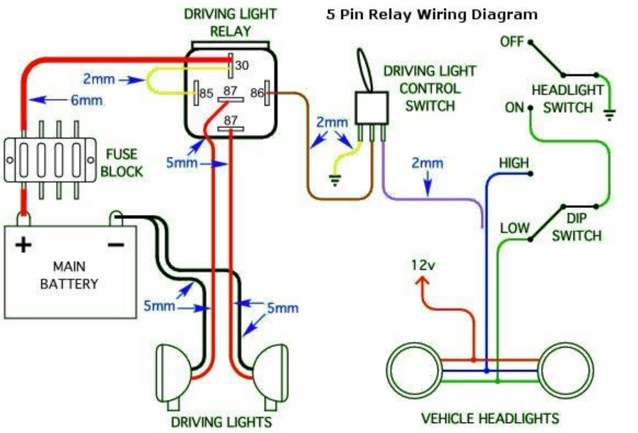

Fig:4 Detailed Circuit diagram

List of Components:

- Crystal oscillator
- Headlight
- Microcontroller- ATMega 328P
- Voltage Regulator
- Ambient Light Sensor

Crystal oscillator

An oscillator circuit provides a precise and consistent clock signal to the microcontroller. The microcontroller's instruction execution speed is determined by the frequency of its clock signal, which can range from a few kilohertz to tens of megahertz.

Microcontrollers typically feature a clock driver circuit that drives a quartz crystal into oscillation. The PIC micro family's clock driver circuitry supports four clocking options: a signal from another oscillator, an RC clock (based on a resistor-capacitor charging time constant), a ceramic resonator, and a crystal oscillator. An R-C clock circuit is the simplest.

Microcontroller ATMega 328P

Atmel developed the ATMega 328P microcontroller. This 8-bit microcontroller with RISC architecture is simple to program and operates at a voltage range of 3.3-5V. The most popular controller system is the Arduino Uno. The following figure describes its features.

Fig:5 ATmega 328P

Ambient Light Sensor:

The digital ambient light sensor detects light and changes resistance and output voltage in relation to the intensity of the incident light. The sensor is connected to the microcontroller using the I2C communication protocol. The microcontroller processes the sensor output. This sensor's output serves as one of the system's principal inputs.

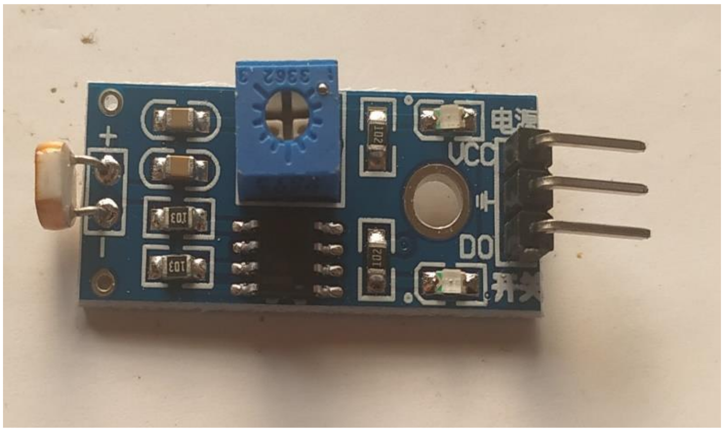

Fig:6 Light Sensor Module

Voltage Regulator:

The Voltage Regulator regulates the required DC voltage for a board or microcontroller. Microcontrollers require stable input voltage supply to function properly. Therefore, IC LM317 and IC LM7805T are utilized in parallel connection. The IC LM7805T can adjust the input DC voltage from 6-12V to 5V for the Microcontroller's working voltage. The capacitor on the IC's input and output terminals stabilizes the output voltage and ensures appropriate operation of the microcontroller.

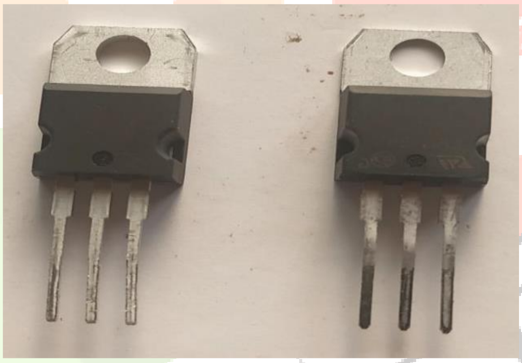

Fig:7 Voltage Regulators

METHODOLOGY OF FLOW DAIGRAM:

The 12V DC battery powers the LM7085T voltage regulator, which outputs a fixed 5V DC voltage to the AT Mega 328P microcontroller. The IC7805T receives input from the battery (positive terminal attached to pin 1) and outputs from pin 3. The microcontroller's output pin 3 is connected to pin 7, the IC LM317's input pin 3 serves as the power source, and pin 2 connects to the battery's negative terminal. The power supply is linked between pin 7 of the microcontroller and pin 3 of the FT232R. The microcontroller is powered and connected to a PC or laptop for program dump. The FT232R's Rxd and Txd pins link to the microcontroller's Txd and Rxd, respectively. The CTS (Clear To Send) and RTS (Request To Send) pins link to the RTS and CTS Microcontrollers, respectively, to manage data transport. The microcontroller's CTS pin is turned low for data transfer over USB. In response to the request, it will check the FT232R's CTS. If the voltage is low, the microcontroller receives incoming data via USB. The Digital Light Sensor Module measures the intensity of both the oncoming and preceding vehicles. The sensor can measure maximum LUX intensity by adjusting the potentiometer to the desired intensity. As light falls on the LDR,

As the light intensity increases, the resistance reduces, as does the voltage drop. Calculating the change in resistance of an LDR allows us to assess the intensity of light falling on it and detect impending glare from vehicles. The ATMEL developed the ATMega 328P microcontroller. The sophisticated RISC 8-bit AVR architecture ensures outstanding performance during operation. The device features 32KB of internal flash memory for program sketches and 2048 bytes of SRAM for program execution. The software is saved in a 1024-byte EEPROM, which is wiped upon reset of the microcontroller. It consists of 28 pins divided into various ports.

IV: Results and Discussion:

Working of Stimulus Headlight:

When driving at night, drivers often have their headlights set to high-beam when there is less traffic. However, even if there is more traffic, drivers may forget to switch to low-beam, causing glare on the oncoming driver's eyes. To prevent a potentially deadly situation, our solution can automatically switch the oncoming vehicle's headlights. The Light sensor (BH1750FVI) detects oncoming vehicle headlights and the LIDAR sensor (VL53L1XL) attached in parallel measures distance. the vehicle from which the glare originates. The stated range includes light intensities of 60,000cd at 200 meters and 40,000cd at 150 meters at 0 degrees. When the gadget detects light intensity from an unexpected source, it may immediately turn on and cause a problem for the motorist ahead. To eliminate this scenario, we measure the source's distance and compare it to the vehicle's headlight state before changing it. During the day, the device's headlight remains stable due to the constant ambient light in the environment. The driver can manually adjust the headlight state and turn it on/off as needed.

V CONCLUSION:

The normal car is approaching the stationary car that has the project implemented. When a car's high beam (small bulb) is within the LIDAR range (about 4 mtr) and the light emitted is within the range of the ambient light sensor, the car switches to low beam. After passing a car, there is a 5-10 second delay before the beam goes to high, indicating that no vehicle was detected.
The normal car is approaching the stationary car that has the project implemented. When an automobile with a low beam (tiny bulb) is within the LIDAR range (about 4 mtr) and the light emitted is within the range of the ambient light sensor, the car's high beam is switched to low beam.

The normal car is approaching the stationary car that has the project implemented. When a car's low beam (small bulb) is within the LIDAR range (about 4 mtr) and the light emitted is within the ambient light sensor's range, the intensity is not within the prescribed range, and the headlight remains in the same state.

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