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# Automatic Head Light Intensity Control for Vehicles to Avoid Accidents

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**ABSTRACT:** This project involves using a Light Dependent Resistor (LDR) sensor and a relay to activate the headlights of a vehicle when light levels are low. The LDR sensor will be used to detect low light levels, and when the light level is low, the relay will be used to activate the headlights. To set up the project, the LDR sensor will be connected to a Controller IC like LM358. The LM358 will read the data of the LDR sensor or read the voltage from the LDR sensor. When the voltage from the LDR sensor is below a certain threshold, the IC LM358 will activate the relay. The relay will then turn up the headlights of the vehicle. In order to ensure that the headlights remain on, the IC LM358 will turn the relay off only when the voltage from the LDR sensor is above the threshold. This will allow the headlights to stay up until the light level increases enough to turn them down. The project can also be modified to include other components, such as a timer and/or a buzzer. The timer can be used to turn the headlights down after a certain amount of time, while the buzzer can be used to alert the driver when the headlights are up. Overall, this project is a simple and inexpensive way to automatically control the headlights of a vehicle, and it can be easily implemented with minimal components.

## I. INTRODUCTION

The project aims in designing an efficient automatic intensity control for head lights of the vehicles when they approach each other to avoid accidents using LDR. Automation has created a bigger hype in the electronics. The major reason for this hype is automation provides greater advantages like accuracy, energy conversation, reliability and more over the automated systems do not require any human attention. Any one of the requirements stated above demands for the design of an automated device. The energy conversation is very important in the current scenario and should be done to a maximum extent where ever it is possible.

Now a day's technology is running with time, it completely occupied the life style of human beings. It is being used everywhere in our daily life to fulfil our requirements. We can not only increase the speed of life but also increase security with good ideas by making use of advanced technology. In our project we use high power LED's as head light for the vehicle, LDR sensor for light intensity detection.

To detect the presence of another vehicle, and the intensity of the head light we have used LDR sensor, high power LED's as a source of head light. LDR is a special type of resistance whose value depends on the brightness of the light, which is falling on it. It has resistance of about 1 mega ohm when in total darkness, but a resistance of only about 5k ohms when brightness illuminated. It responds to a large part of light spectrum.

The controlling device of the whole system for the vehicle is a Microcontroller to which LDR sensor module, High power LED is interfaced to the microcontroller. When two vehicles oppose each other, the intensity of head lights falls on the LDR sensor and automatically the intensity will be reduced. This system avoids accidents due to high intensity head lights of the vehicles.

## II. MAIN FEATURES OF THE PROJECT

1. LDR sensor based head light intensity detection and control
2. Low power consumption.
3. Automatic intensity control using High efficiency high power LED's.
4. Long life.
5. Highly sensitive.

## III. PROJECT OVERVIEW

An embedded system is a combination of software and hardware to perform a dedicated task. Some of the main devices used in embedded products are Microprocessors and Microcontrollers.

Microprocessors are commonly referred to as general purpose processors as they simply accept the inputs, process it and give the output. In contrast, a microcontroller not only accepts the data as inputs but also manipulates it, interfaces the data with various devices, controls the data and thus finally gives the result.

The project “Automatic Head light Intensity control for vehicles to avoid accidents” using PIC16F72 microcontroller is an exclusive project which is used to automatic intensity control for head lights of the vehicles when they approach each other to avoid accidents using LDR sensor.

## IV. THESIS

The thesis explains the implementation of “Automatic Head light Intensity control for vehicles to avoid accidents” using PIC16F72 microcontroller. The organization of the thesis is explained here with: The project “Automatic Head light Intensity control for vehicles to avoid accidents” was designed Automatic Head light Intensity control system with the help of LDR. This system helps for vehicles to avoid accidents which explains the interfacing section of each component with micro controller.

## Automatic Head light Intensity control for vehicles to avoid accidents

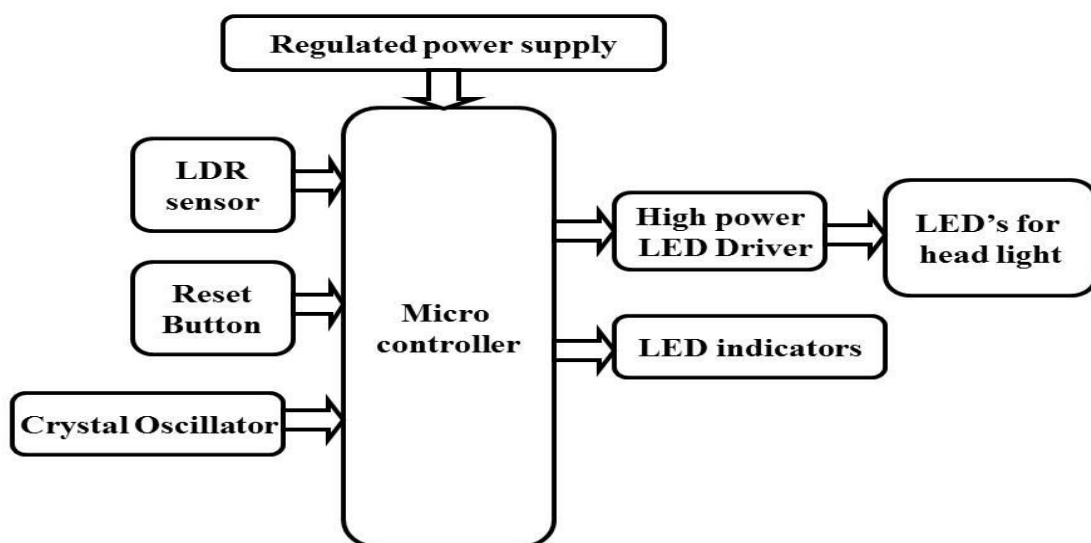


FIG 1: Block diagram of Automatic Head light Intensity control for vehicles to avoid accidents

**The main blocks of this project are:**

1. Regulated power supply with voltage regulator.
2. LDR sensor.
3. High power LED's with driver.
4. Microcontroller.
5. Reset button
6. Crystal Oscillator
7. LED indicators

**Micro controller:**



**Fig: 2 Microcontrollers**

## V. MICROCONTROLLER

A Microcontroller is a programmable digital processor with necessary peripherals. Both microcontrollers and microprocessors are complex sequential digital circuits meant to carry out job according to the program / instructions. Sometimes analog input/output interface makes a part of microcontroller circuit of mixed mode (both analog and digital nature).

1. A smaller computer
2. On-chip RAM, ROM, I/O ports...  
Example: Motorola's 6811, Intel's 8051, Zilog's Z8 and PIC 16X

### General-purpose microprocessor

1. CPU for Computers
2. No RAM, ROM, I/O on CPU chip itself
3. Example: Intel's x86, Motorola's 680x0

### Microprocessor vs. Microcontroller

#### Microprocessor

- CPU is stand-alone, RAM, ROM, I/O, timer are separate
- Designer can decide on the amount of ROM, RAM and I/O ports.
- expansive
- versatility
- general-purpose

#### Microcontroller

- CPU, RAM, ROM, I/O and timer are all on a single chip
- fix amount of on-chip ROM, RAM, I/O ports
- for applications in which cost, power and space are critical
- single-purpose

### Choosing a MC

- Speed
- Packaging (Ex. DIP, QFP Quad Flat Package)
- Power Consumption

- Amount of RAM, ROM
- I/O Pins
- Final Cost of The product
- How easy it is Upgraded

### Memory types

In a microcontroller, two types of memory are found. They are, program memory and data memory respectively. Program memory is also known as 'control store' and 'firm ware'. It is non-volatile i.e, the memory content is not lost when the power goes off. Non-volatile memory is also called Read Only Memory (ROM). There are various types of ROM.

1. **Mask ROM:** Some microcontrollers with ROM are programmed while they are still in the factory. This ROM is called Mask ROM. Since the microcontrollers with Mask ROM are used for specific application, there is no need to reprogram them. Some times, this type of manufacturing reduces the cost for bulk production.
2. **Reprogrammable program memory (or) Erasable PROM (EPROM):** Microcontrollers with EPROM were introduced in late 1970's. These devices are electrically programmable but are erased with UV radiation. The construction of a EPROM memory cell is somewhat like a MOSFET but with a control and float semiconductor as shown in the figure

3. **Working:**

The structure of the LED light is completely different than that of the light bulb. Amazingly, the LED has a simple and strong structure. The light-emitting semiconductor material is what determines the LED's color. The LED is based on the semiconductor diode.

When a diode is forward biased (switched on), electrons are able to recombine with holes within the device, releasing energy in the form of photons. This effect is called electroluminescence and the color of the light (corresponding to the energy of the photon) is determined by the energy gap of the semiconductor. An LED is usually small in area (less than 1 mm<sup>2</sup>), and integrated optical components are used to shape its radiation pattern and assist in reflection. LEDs present many advantages over incandescent light sources including lower energy consumption, longer lifetime, improved robustness, smaller size, faster switching, and greater durability and reliability. However, they are relatively expensive and require more precise current and heat management than traditional light sources. Current LED products for general lighting are more expensive to buy than fluorescent lamp sources of comparable output. They also enjoy use in applications as diverse as replacements for traditional light sources in automotive lighting (particularly indicators) and in traffic signals. The compact size of LEDs has allowed new text and video displays and sensors to be developed, while their high switching rates are useful in advanced communications technology. The electrical symbol and polarities of led are shown in fig: 3.4.3.

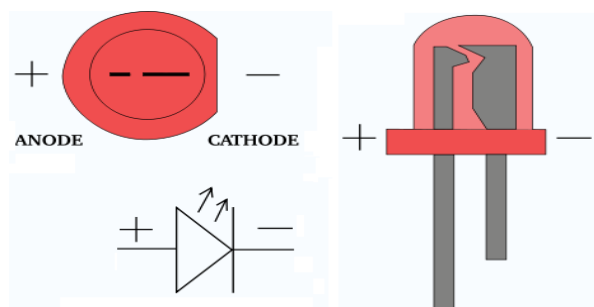


Fig 3: Electrical Symbol & Polarities of LED

LED lights have a variety of advantages over other light sources:

- High-levels of brightness and intensity
- High-efficiency
- Low-voltage and current requirements
- Low radiated heat
- High reliability (resistant to shock and vibration)
- No UV Rays

- Long source life
- Can be easily controlled and programmed

Applications of LED fall into three major categories:

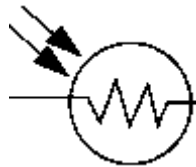
- Visual signal application where the light goes more or less directly from the LED to the human eye, to convey a message or meaning.
- Illumination where LED light is reflected from object to give visual response of these objects.
- Generate light for measuring and interacting with processes that do not involve the human visual system

## VI. LDR

**LDR (light dependent resistor):**

A **photo resistor** or **light dependent resistor** or **cadmium sulfide (CdS) cell** is a resistor whose resistance decreases with increasing incident light intensity. It can also be referenced as a **photoconductor**.

Photo resistor



The symbol for a photo resistor

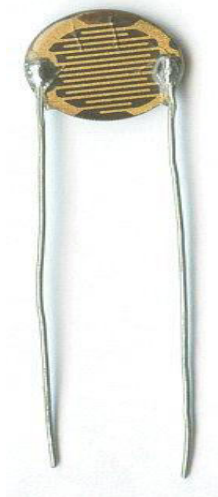


Fig 4..LDR

An LDR is made of a high-resistance semiconductor. If light falling on the device is of high enough frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. The resulting free electron (and its hole partner) conduct electricity, thereby lowering resistance.

## VII. APPLICATIONS

Photo resistors come in many different types. Inexpensive cadmium sulfide cells can be found in many consumer items such as camera light meters, street lights, clock radios, alarms, and outdoor clocks. They are also used in some dynamic compressors together with a small incandescent lamp or light emitting diode to control gain reduction.

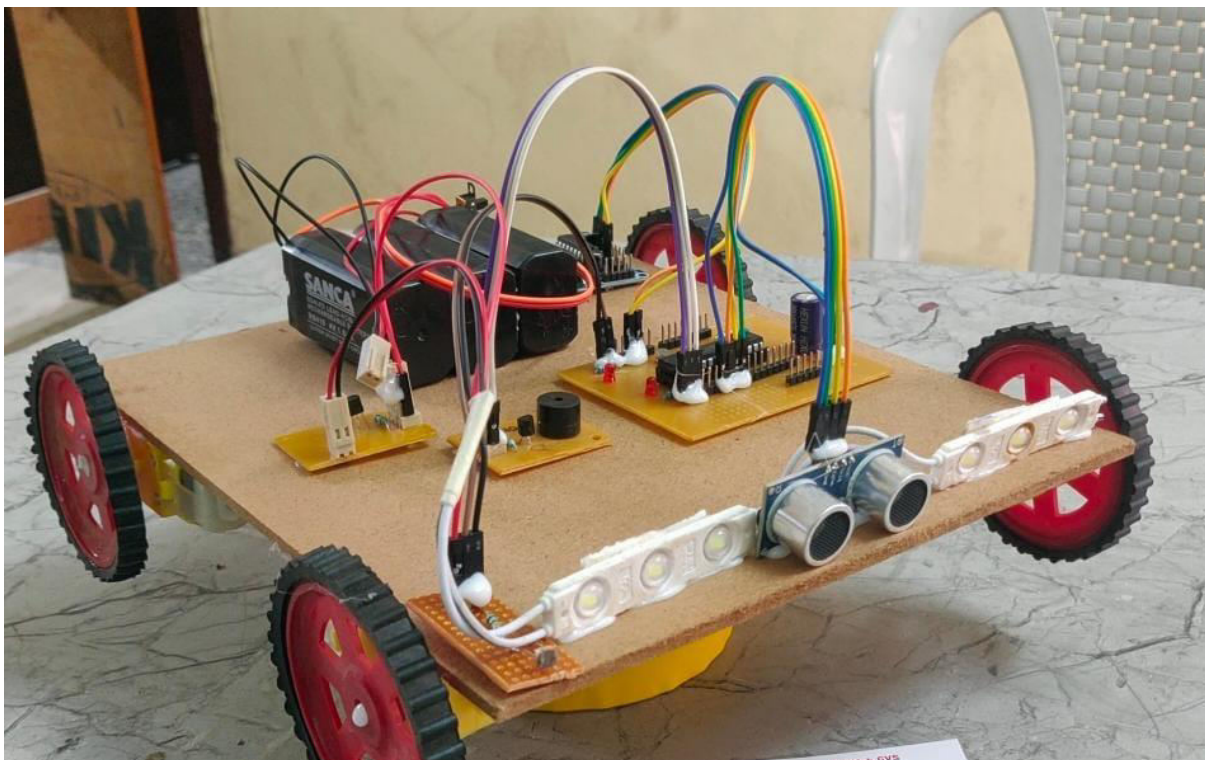
Lead sulfide (PbS) and indium antimonide (InSb) LDR's (light dependent resistor) are used for the mid infrared spectral region. Ge:Cu photoconductors are among the best far-infrared detectors available, and are used for infrared astronomy and infrared spectroscopy.

## RESULTS AND DISCUSSION

Automatic headlight systems improve road safety by automatically adjusting brightness and beam mode based on surroundings. This reduces glare for oncoming drivers and improves visibility for the driver, 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 levels and oncoming vehicles. The system's decision-making software needs to be well-tested to ensure it switches beams appropriately in different environments (city vs highway).

## VIII. RESULTS AND DISCUSSION

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

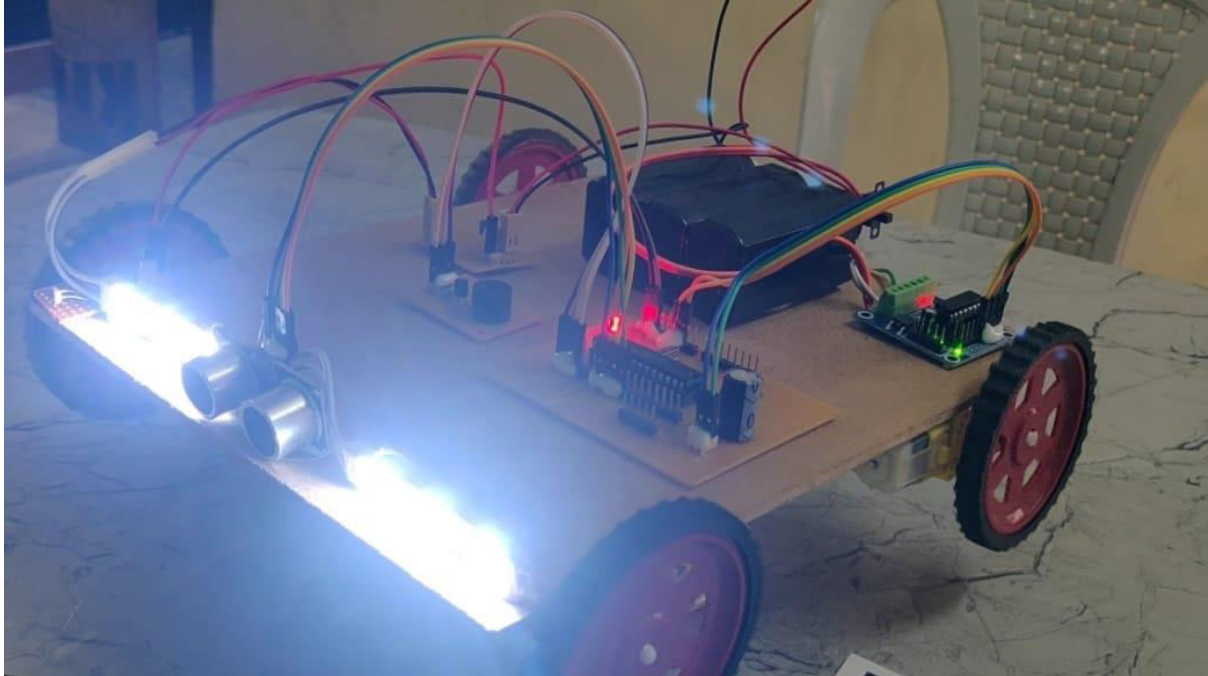


Fig.5.Smart vehicle headlight in environmental at light position and dark position

## IX. 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.

## X. 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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