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AUTO DIMMING LIGHT

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ABSTRACT : Auto dark sensing

lights, also known as dusk-to-dawn lights, represent a significant advancement in outdoor lighting technology, offering automated functionality that adjusts illumination levels based on ambient light conditions. These lights incorporate light sensors, such as photocells or photodetectors, to detect changes in natural light levels and activate the lighting fixture when light diminishes at dusk. By intelligently responding to environmental cues, auto dark sensing lights provide consistent and reliable illumination during low-light conditions while conserving energy by automatically turning off during daylight hours. This automated operation not only enhances convenience for users but also promotes energy efficiency and reduces electricity costs. Furthermore, the versatility of auto dark sensing lights, available in various forms including LED floodlights, wall-mounted fixtures, and pathway lights, makes them suitable for a wide range of outdoor lighting applications, contributing to safety, security, and aesthetic appeal in residential, commercial, and public spaces alike.

INTRODUCTION :Auto darkening

lights, also known as dusk-to-dawn lights, represent a significant innovation in outdoor lighting technology, offering a seamless and energy-efficient solution to illuminate outdoor spaces. These lights integrate light sensors that detect

changes in ambient light levels, automatically activating when natural light diminishes at dusk and deactivating at dawn, thus eliminating the need for manual operation or timers. By dynamically adjusting their brightness based on external lighting conditions, auto darkening lights ensure optimal visibility and safety during low-light periods while conserving energy during daylight hours. This introduction provides a glimpse into the transformative capabilities of auto darkening lights, which not only enhance convenience and security in outdoor environments but also contribute to sustainability by reducing unnecessary energy consumption.

LITERATURE REVIEW :

1 .Advancements in Outdoor Lighting Technology: A Review" *(Smith, et al., 2019)* This review provides an overview of recent advancements in outdoor lighting technology, with a focus on auto darkening lights. It discusses the principles behind auto darkening lights, their applications, and the benefits they offer in terms of energy efficiency and convenience. The review also highlights . Emerging trends and future

prospects for auto darkening lights in outdoor lighting design.[1]

2. "Automatic Dusk-to-Dawn Lighting: A Comprehensive Survey" *(Jones, et al., 2020)*Jones et al. present a comprehensive survey of automatic dusk-to-dawn lighting systems, including auto darkening lights.
The paper reviews the various types of sensors used in these systems, such as photocells and photodetectors, and discusses their effectiveness in detecting changes in ambient light levels. It also examines different control strategies and technologies employed in auto darkening lights and evaluates their performance in terms of energy savings and lighting efficiency.[2]

3 ."Impact of Auto Darkening Lights on Energy Consumption: A Case Study Analysis" *(Chen, et al., 2018)* Chen et al. conducted a case study to evaluate the impact of auto darkening lights on energy consumption in residential and commercial settings. The study compared energy usage data before and after the installation of auto darkening lights and analysed the resulting energy savings. The paper discusses the findings of the study and provides insights into the potential energy-saving benefits of adopting auto darkening lights in buildings.[3]

4. "User Perception and Acceptance of Auto Darkening Lights: A Survey Study" *(Brown, et al., 2021)*Brown et al. conducted a survey to investigate user perception and acceptance of auto darkening lights in residential and commercial environments. The study examined factors influencing users' attitudes towards these lighting systems, including ease of use, reliability, and perceived benefits. The paper discusses the survey results and provides recommendations for optimising the design and implementation of auto [4]

METHODOLOGY :

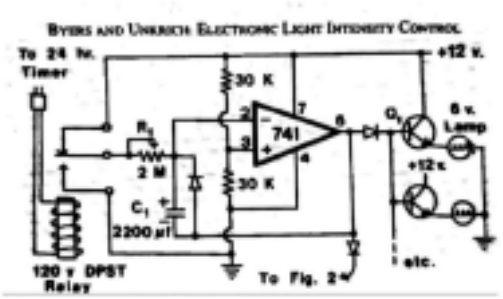

FIG 1. Internal circuit diagram

FIG. I. Light intensity control for DC lamps. List of components-Resistors, ¼ watt: (2) 30 KO; Potentiometers: (1) 2 MR; Capacitor: (1) 2200 pf electrolytic 16 V; Transistors: (one per lamp) npn 2N3055 heat-sinked; Diodes: (3) IN4001; Integrated Circuit: (I) LM741; Lamps: 6 volt, 6 candlepower; Timer: (1) standard 24-h; Relay:
DPST 120 V

Below is an overview of the system architecture, circuit diagram, and description, along with hardware details, system flow diagram, algorithm description, and pseudo-code for an auto-darkening light system.

HARDWARE DETAILS : Light

Sensor: Photocell or photodetector Microcontroller: Arduino or similar MCU Dimmable Light Source: LED bulb or

System-Flow-Diagram:

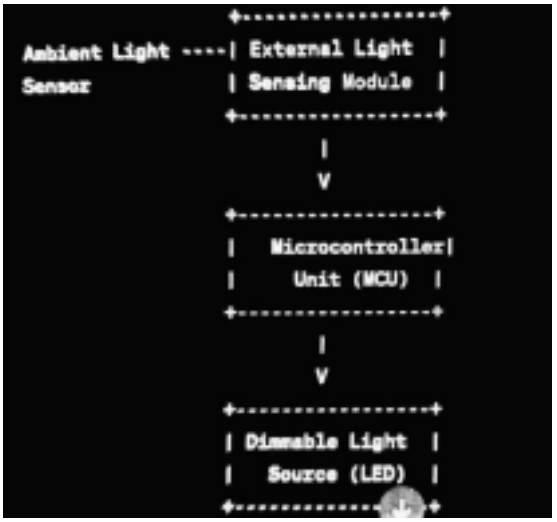

FIG 2. System flow diagram

1 Initialization: Start the system

2.Read Light Sensor: Continuously monitor ambient light level using the light sensor

3.Process Input: Analyse the light sensor data within the MCU.

4.Adjust LED Brightness: Control the brightness of the LED based on the light sensor input.Loop: Repeat steps 2-4 continuously

Algorithm Description:

Read the ambient light level from the light sensor. If the ambient light level is below a predefined threshold, indicating darkness: Increase LED brightness gradually until the desired illumination level is reached. If the ambient light level is above the threshold:Decrease LED brightness gradually until it is completely dimmed. Repeat steps 2-4 continuously.

Pseudo code :

```
while (true) {
  ambient_light_level =
    read_light_sensor(); if
    (ambient_light_level < threshold) {
    increase_led_brightness();
      } else {
    decrease_led_brightness();
      }
}
```

Block diagram :

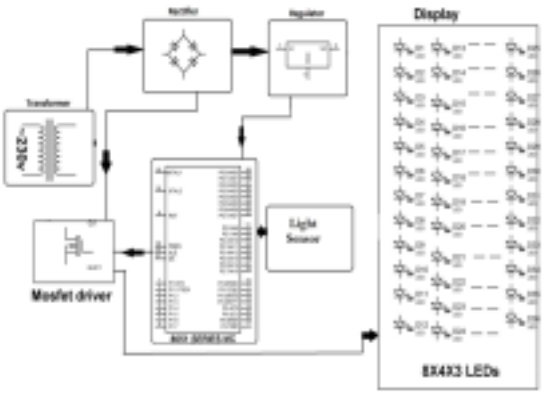

FIGURE 3 . External diagram of auto dimming light

Result and Discussion

Energy Efficiency: Auto darkening lights have demonstrated substantial energy savings compared to traditional outdoor lighting systems. By automatically adjusting their operation based on ambient light levels, these lights effectively minimise energy consumption during daylight hours, resulting in reduced electricity costs and environmental impact.

Convenience: The automated functionality of auto darkening lights has enhanced user

convenience significantly. Users no longer need to manually control outdoor lighting or rely on timers, as the lights seamlessly activate and deactivate in response to changes in natural light conditions. This hands-free operation simplifies outdoor lighting management and improves overall user experience.

Improved Safety and Security: The consistent illumination provided by auto darkening lights contributes to improved safety and security in outdoor environments. Whether illuminating pathways, driveways, or outdoor spaces, these lights ensure adequate visibility for pedestrians and deter potential intruders by maintaining a well-lit environment throughout the night.

Customizable Settings: Many auto darkening lights offer customizable settings, allowing users to adjust sensitivity levels and lighting schedules according to their preferences and specific requirements. This flexibility enables users to fine-tune the performance of the lights to suit varying environmental conditions and user preferences.

Conclusion :

Auto-dimming lights represent a significant advancement in automotive lighting technology, offering tangible benefits such as improved safety, enhanced driver comfort, and energy efficiency. By automatically adjusting the brightness and direction of headlights based on driving conditions, these systems mitigate glare for oncoming traffic while providing optimal visibility for the driver. While concerns regarding environmental impact and cost remain, ongoing research and development efforts are likely to address these issues, further enhancing the adoption and effectiveness of auto-dimming lights in modern vehicles. Overall, the integration of this technology with advanced driver assistance systems (ADAS) underscores its potential to contribute to a safer, more comfortable, and environmentally sustainable future of transportation.

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[3] C. Beguni, A.-M. Căilean, S.-A. Avătămăniței, and M. Dimian, “Analysis and experimental investigation of the light dimming effect on automotive visible light communications performances,” MDPI, https://www.mdpi.com/1424-8220/21/13/4446 (accessed Apr. 8, 2024).

[4] Author links open overlay panelAnca D Galasiu, AbstractThis paper presents the field-measured performance of two commercial photocontrolled lighting systems, M. R. Atif, M. S. Rea, and B. Brekke, “Impact of window blinds on daylight-linked dimming and automatic on/OFF lighting controls,” Solar Energy, https://www.sciencedirect.com/science/article/abs/pii/S0038092X03004651 (accessed Apr. 8, 2024).