AUTOMATIC "SWITCH ON" SYSTEM FOR CAR HEADLAMPS

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This report is submitted in partial fulfillment of requirements of Bachelor of Electronic Engineering (Industrial Electronic) with honours

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Dedicated to both of my parents and my family

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ABSTRACT

Automatic Switch on System for Car Head Lamp is a system for automatically turning the car head lights on accordance with ambient light. Once the photocells detect the level of lighting that is considered no longer visible and save the system will automatically turn on the headlight while the car is on the move. At the moment most drivers turn on their head lamps based on their own judgment on the level of visibility on the road. Similarly, the drivers often forget to turn their lights on at night or at heavy storm. Automatic Switch on System for Car Head Lamps will automatically switch on the head lamps and tail lamps of a vehicle once a low level of lighting is detected and the car is moving.

When the photocells receive ambient light it will produce signal causing the automobile's lamp to be turned off only when the photocells are sensing day time condition. But when the photocells indicate a nighttime condition, the circuitry response by turning on the lamps after a pre determined time delay.

The advantage of this project is the cost of this project is low and it is easy to troubleshoot. This project can be used to any automobile that needs automatic headlight for safety driving.

ABSTRAK

Sistem suis automatik untuk lampu hadapan kereta adalah sebuah sistem automatik untuk menghidupkan lampu kepala kereta mengikut kesesuaian dengan berpandukan pada cahaya sekitar. Apabila sel foto mengesan tahap pengcahayaan yang dianggap tidak selamat sistem akan memasang lampu depan secara automatik apabila kereta itu sedang bergerak. Pada masa ini, kebanyakan pemandu memasang kepala lampu kereta berdasarkan pada pertimbangan tahap jarak penglihatan di jalan raya. Selain daripada itu, pemandu-pemandu sering melupakan untuk menukar lampu-lampu mereka di pada waktu malam atau pada hujan lebat. Suis automatik untuk lampu hadapn kereta akan automatik menyala apabila kadar chahaya adalah rendah dan kenderaan sedang berjalan.

Apabila sel foto menerima cahaya ia akan menghasilkan signal menyebabkan lampu kenderaan akan terpadam apabila sel foto mengesan keadaan pada waktu siang. Apabila sensor mengesan kehadiran waktu malam, litar akan menyalakan lampu hadapan kenderaan mengikut sela masa yang telah ditetapkan.

Kelebihan bagi projek ini ialah kos bagi projek adalah rendah dan mudah dibaik pulih. Projek ini boleh digunakan pada mana mana kenderaan yang memerlukan suis lampu hadapan automatic bagi pemanduan yang selamat.

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INTRODUCTION

1.1 Synopsis

At the moment most drivers turn on their head lamps based on their own judgment on the level of visibility on the road. Some tend to wait until the day is quite dark before switching on their head lamps. Occasionally, some drivers totally forgot to turn on their head lamps especially driving in town due to the light from other vehicle and the street lightings. Another situation is when the visibility is impaired during a heavy storm. Automatic Switch on System for Car Head Lamps will automatically switch on the head lamps and tail lamps of a vehicle once a low level of lighting is detected.

The system will comprise of light sensors and Hall Effect Sensors to make the system more intelligent, for the first time the lights are automatically switched on depends on the level of visibility and the vehicle is in motion. Once the system is activated, the lights can only be toggled manually.

1.2 Project Objectives

The objectives of the project is to design an automatic switch on system for a vehicle's head lamps and tail lamps once a low level of lighting caused by nightfall or heavy rain is detected and also when the vehicle is moving.

1.3 Project Scope

The scopes of work for the project will focus on the following areas:

1. Literature review to identify smart sensors for light detection and motion and control system for car lightings.
2. Sourcing for suitable and practical circuits for the project.
3. Sourcing for circuit parts and instrument
4. Develop a prototype system to achieve the objectives of the project
5. Conduct analysis and testing on the project
6. Test run and troubleshoot the project by using multisim
7. Design the circuit diagram.
    a. Design and simulate circuit using Multisim software.
    b. Construct and test circuit on the breadboard (hardware).
8. Finally to conduct and verify the functionality of the system.

Other scopes of work include:

- Application of theoretical engineering principles with the proposed project
- Design and production of the required circuit board for the project
- Maintain good log book records
- Prepare the necessary documents
- Project Presentation

Publishing final report

1.4 Problem Statement

From statistical reports, 7.3% of accidents on the road are caused by drivers failing to realize another vehicle approaching among which is caused by poor visibility either at night or during heavy rain. Which means 983 accidents is caused by the driver failing to realize another vehicle approaching.

The risk of being injured or killed in a traffic accident on roads is much higher at night than during the day, in spite of the smaller volumes of traffic. Although only about 33% of accidents occur at dusk or in the dark, the number of persons seriously injured increases by 50% and the number of death by 36% compared with accidents during the day.

Along side factors such as self-dazzling caused by wet road surfaces, higher speeds because of the reduces traffic density and a reduction of about 25% of the distance maintained to the vehicle in front, causes eye physiology play a very important role. The eyes age faster than any other sensory organ, and the human eye's powers of vision begin to deteriorate noticeably from as early an age as 30. The consequences of this is a reduction in visual acuity and contrast sensitivity when the light began to fade, it is a situation that is rarely noticed by the motorist, as these functional deficits only slowly but can cause accidents.

However, the vision even of a person with normal eyes reduced at night. The associated risk factors include delayed adjustment to changes between light and dark, impaired color vision and the slow transition from day to night, trough habituation effect can lull the motorist into a false sense of security.

Occasionally, some drivers totally forgot to turn on their head lamps especially driving in town due to the light from other vehicle and the street lightings. Often a driver forgets to turn on their head lights on at night or dawn. Another situation is when the visibility is impaired during a heavy storm. They may say that it didn't cause much but they may create a very dangerous situation leading to a severe accident.

Automatic Switch on System for Car Head Lamps is a system designed to prevent that accidents from accruing due to human judgment. The system will automatically turn on the head lights when the condition of the day deems fit based on the level of lighting and not on the discretion of the driver or the carelessness. The system will only turn on the head lights when it detects a low level of light and when the car is moving. This will prevent the battery from draining because the driver forgets to turn off the headlight before leaving the car.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

Light is produced by the release of energy from the atoms of a material when they are excited by heat, chemical reaction or other means. Light travels through space in the form of an electromagnetic wave. A consequence of this wave-like nature is that each "color" can be completely defined by specifying its unique wavelength. The wavelength is defined as the distance a wave travels in one cycle.

Since the wavelengths of light are very short they are normally measured in nanometers, one nanometer being equal to 1×10^{-9} meters. The spectral response of photoconductors is specified by lots of relative response versus wavelength (color) for various material types.

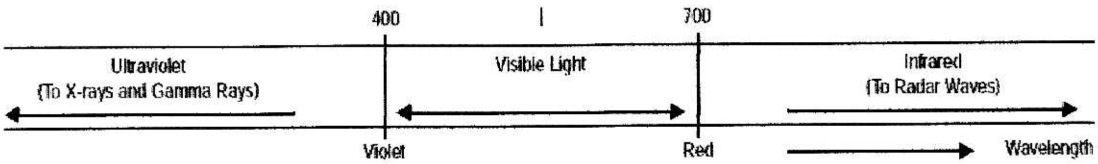

Figure 2.1: Spectral response

2.1.1 Light Resistance Measurement Techniques

The light resistance or "on" resistance (RON) of a photoconductor cell is defined as the resistance of the cell as measured at a special light level using a light source with a known output spectrum. Furthermore, the cell must be "light adapted" for a specific period of time at an established level of illumination in order to achieve repeatable results.

The industry standard light source used for light resistance measurements is a tungsten filament lamp operating at a color temperature of 2850 K. Specifying the 2850 K color temperature for the light source fixes the spectral output (i.e. the tungsten filament light has fixed amounts of blue, green, red, and infrared light).

For consistency and ease of comparing different cells, the light resistance values for photocells is divided into two standard light levels which is 2 fc (footcandles) and at 10 lux. The footcandle is the old, historical unit for measuring light intensity and is defined as the illumination produced when the light from one standard candle falls normally on a surface at a distance of one foot. The lux (the metric unit of light measurement) is the illumination produced when the light from one candle falls normally on a surface of one meter. The conversion between footcandle and lux. is as follows:

$$1.0 \text{ fc} = 10.76 \text{ lux} \quad (2.1)$$

$$1.0 \text{ lux} = 0.093 \text{ fc} \quad (2.2)$$

As explained in the section on "Selecting a Photocell", the "light history" effect necessitates the pre-conditioning of the cell before a light resistance measurement is made. All cells must be stored at room temperature for 16 hours minimum at 30 – 50 fc (about 320 – 540 lux) prior to making the test measurement.

Sky Condition	Light Level (Typical)
Direct Sunlight	10000 fc
Overcast Day	1000 fc
Twilight	1 fc
Full Moon	0.1 fc
Clear Night Sky (moonless)	0.001 fc

Table 2.1: Natural Illuminance

Lighting Condition	Light Level (Typical)
Candle - Lit Room	5 fc
Auditorium	10 fc
Classroom	30 fc
Inspection Station	250 fc
Hospital Operating Room	500 - 1000 fc

Table 2.2: Room Illumination

2.2 Photocell

Semiconductor light detectors can be divided into two major categories: junction and bulk effect devices. Junction devices, when operated in the photoconductive mode, utilize the reverse characteristic of a PN junction. Under reverse bias, the PN junction acts as a light controlled current source. Output is proportional to incident illumination and is relatively independent of implied voltage as shown in Figure 2.1. Silicon photodiodes are examples of this type detector.

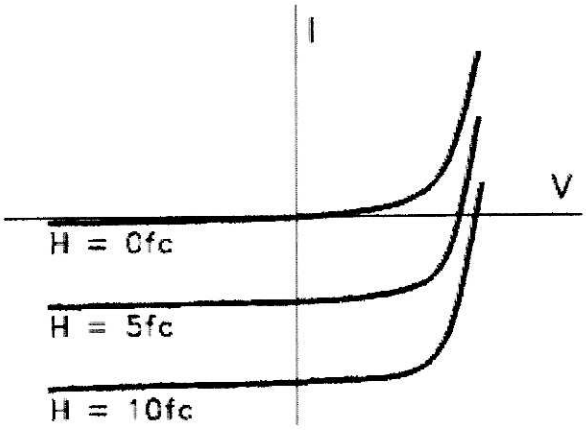

Figure 2.2: Junction Photoconductor (Photodiode)

In contrast, bulk effect photoconductors have no junction. As shown in Figure 2.2, the bulk resistivity decreases with increasing illumination, allowing more photocurrent to flow. This resistive characteristic gives bulk effect photoconductors a unique quality: signal current from the detector can be varied over a wide range by adjusting the applied voltage. To clearly make this distinction, the bulk effect photoconductors is known as photoconductive cells or simply photocells.