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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DESIGN AND DEVELOPMENT OF AUTOMATED FRONT LIGHTING SYSTEM WITH SENSOR INTEGRATED FOR URBAN CAR CONCEPT

This report is submitted in accordance with the requirement of Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Mechanical Engineering Technology (Automotive Technology) with Honours

by

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Tajuk: Design And Development Of Automated Front Lighting System With Sensor Integrated For Urban Car Concept

Sesi Pengajian: 2019

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DECLARATION

I hereby, declare this report entitled 'Design And Development Of Automated Front Lighting System With Sensor Integrated System For Urban Car Concept' is the result of my own research except as cited in references

Signature   :

Author's Name   :   DANIEL JONATHAN DAVE

Date   :

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirement for the Degree of Bachelor Of Mechanical And Manufacturing (Automotive) with Honours. The member of the supervisory is as follows:

………………………………………

(TS. KHAIRUL AMRI BIN TOFROWAIH)

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ABSTRACT

The front headlight for a car system is an important system which serves as an important active safety implication in lessening any collision due to visual impairment during night time or less light illuminance at a specific area. A headlight in a car system needs to be turned on using a mechanical switch or turn switch (modern cars) in order for it to serve its function to aide driver to see the road. However, there are several times where the driver tends to forget to turn on the front headlight when they are supposed to due to the surrounding environment was not dark. Driving without turning on the front headlights when you are supposed to could cause any unwanted accidents to passerby or to the driver itself. This project aims to create an automated front lighting system that could be installed in an urban car concept. The mechanism of the product will be created in order to automatically turn on or turn off the front headlights for a car system at a specific time without any interference from the driver or other people. Moreover, if the specific area has less light illuminance, the front headlight will automatically be turned on as well to give road visibility to the driver. By using Arduino Uno, light sensor and real time clock is integrated together with the system to control the front light. The time difference for night transition might vary in some states, hence an analysis is made in order to set the time correctly for the automated front headlight to turn on and turn off the front lighting system automatically in West Malaysia.

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ABSTRAK

Lampu hadapan untuk sistem kereta adalah sistem penting yang berfungsi sebagai implikasi keselamatan yang penting dalam mengurangkan perlanggaran mana-mana akibat kerosakan visual pada waktu malam atau kurang pencahayaan cahaya di kawasan tertentu. Lampu depan dalam sistem kereta perlu dihidupkan dengan menggunakan suis mekanik atau bertukar suis (kereta moden) supaya ia dapat berfungsi dengan fungsi pemandu pemandu untuk melihat jalan. Walau bagaimanapun, terdapat beberapa kali di mana pemandu cenderung lupa untuk menghidupkan lampu depan apabila mereka sepatutnya kerana persekitaran di sekelilingnya tidak gelap. Memandu tanpa menghidupkan lampu depan apabila anda sepatutnya boleh menyebabkan sebarang kemalangan yang tidak diingini untuk melintas atau kepada pemandu itu sendiri. Projek ini bertujuan untuk mewujudkan sistem lampu hadapan automatik yang boleh dipasang dalam konsep kereta bandar. Mekanisme produk akan diwujudkan untuk menghidupkan atau mematikan lampu depan untuk sistem kereta pada masa tertentu tanpa sebarang gangguan daripada pemandu atau orang lain. Selain itu, jika kawasan tertentu mempunyai kurang cahaya, lampu depan akan secara automatik dihidupkan juga untuk memberikan penglihatan jalan kepada pemandu. Perbezaan masa untuk peralihan malam mungkin berbeza-beza di beberapa negeri, maka analisis dilakukan untuk menetapkan waktu dengan betul untuk lampu depan automatik untuk menghidupkan dan mematikan sistem lampu depan secara automatik di Malaysia barat.

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DEDICATION

To my beloved parents, who have always supported and motivated me. To all my friends that gave me their abundance of motivation and support towards the completion of this project. To my supervisor and academic advisor who have been patiently guiding me during the project.

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First of all thanks to God for giving me the strength and chance to finish this project with success. I have learned a lot and enjoyed working on this project. I would like to sincerely thank all those who helped me throughout the semester. I would like to thank my supervisor Ts. Khairul Amri Bin Tofrowaih for giving me his endless guidance, support and contribution. His valuable advices and insights towards modern car technology have greatly helped me towards completing this project. Last but not least, I would like to thank my family for their words of encouragement throughout the completion of this project.

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TABLE OF CONTENTS

`

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`

LIST OF FIGURES

`

`

LIST OF TABLES

`

LIST OF SYMBOL

mm	Millimeter
Mhz	MilliHertz
v	Volt
KB	KiloByte
mA	MilliAmpere
C	Celsius
Khz	KiloHertz
A	Ampere
lm	Lumen
lx	lux

LIST OFABBREVIATION

RTC	Real Time Clock
LDR	Light Dependent Resistor
CATIA	Computer-Aided Three-Dimensional Interactive Application
PM	Post Meridiem
AM	Ante Meridiem
LED	Light Emitting Diode
CAD	Computer aided design
HID	High Intensity Discharge
IC	Integrated Circuit
CPU	Central processing Unit
RAM	Random access memory
I/O	Input/output
ROM	Read-Only-Memory
DC	Direct Current
SRAM	Static random access memory
EEPROM	Electrically Erasable Programmable Read-Only Memory
PWM	Pulse Width Modulation
USB	Universal serial bus
PPM	Parts per million
L2C	Layer to control
SPDT	Single pole, Double throw
PDS	Product design specification
ABS	Acrylonitrile butadiene styrene
VCC	Voltage at the Common Collector

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GND	System Ground
COM	Common
NO	Normally Open
IDE	Integrated Development Environment

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LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Background

The front headlight for a car system is an important system which serves as an important safety implication in lessening any collision due to visual impaired during night driving or less light available at a specific area. Specifically, the front headlight of a car system consists of high beam, lo beam, dim light, parking light, fog light and turn signals.
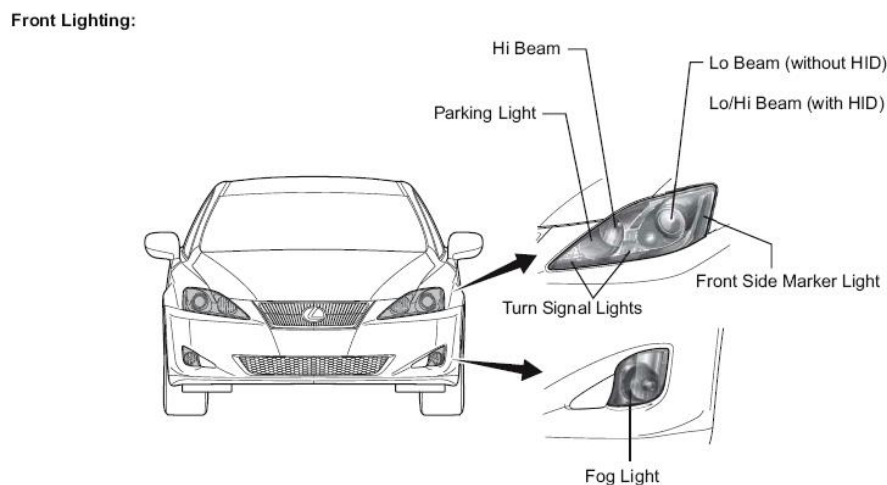
Figure 1.1 Club.Lexus (2016) Front Headlight system [photograph]. Retrieved from https://www.clublexus.com/forums/is-2nd-gen-2006-2013/316812-anybody-change-their-drl-bulbs.html (Lexus, 2016)

The implementation of an automated front light system for urban car concept may help drivers to have a better view while driving through a tunnel or when passing through a sudden dark environment. The main idea of this project is to create an automated front

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headlight system for urban car concept by installing light sensor (photoresistor sensor) to use during daytime and Real Time Clock (RTC) to use during nighttime to set the light to turn on/off at a specific time which then will be integrated with a microcontroller (Arduino R3). Modern car nowadays are built with sensors that help to avoid collision or provide comfort for the driver as well as passengers (John turner, 2009). These are installed to enhance performance, safety and convenience for drivers. Multisensory warning signals offer a particularly effective means of capturing the drivers attention in demanding situations such as driving (Cristy Ho, Nick Reed, 2007).

1.2   Problem Statement

Future cars are evolving each year as well as the technology around us. But somehow the front light of an automobile stays the same or has little improvement that could not prevent a collision of a vehicle. As an important feature in an automobile vehicle, the front lights are important to give us a better view of an object that is in front of us as well as giving the vehicle in front of us to have a better view of the driver behind them during rain or during night time when they decide to switch lanes. It is optimal for road users if the vehicle front lights have an automated front lighting system to automatically turn on their front lights if the environment that they are at has low presence of light. This automated front lighting system could reduce minimal casualties, avoid collision and to illuminate the road during night-time or in low-visibility conditions such as severe rain or fog.

Automated front lighting system feature are only available to high end variant or expensive car brand. This project aims to create an automated lighting system that could be installed in urban car concept. Driving with front headlight turned off during night time

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could cause danger to other roadway user for example if the car is travelling from a highway to a village area, the driver might hit other road user and cause an accident. Meanwhile some driver tends to forget to turn on the light if they enter the vehicle in high lighting area. Some vehicle may have integrated the light with instrument panel meter light, but some do not. If it is synchronized, instrument panel meter is lit when the vehicle lighting is turned on.

1.3   Objective

i.   To design an automatic headlight system that has a light sensor for daytime and real time clock for nighttime integrated by using Arduino Uno Rev3 (Microcontroller) to automatically turn on the lights.

ii.   To develop a proof of concept model of headlight system with light sensor and real time clock integrated for urban car concept.

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1.4   Scope

i.   The source code for the automatic headlight system will be using C++ programming software.

ii.   This proposed modification of system will only cover for front light system function low beam.

iii.   The microcontroller used is Arduino Uno Rev3 to store data and program for the automatic front headlight system.

iv.   The front headlight for the automated lighting system will be using off the shelf part headlight available in the current market.

v.   The automatic headlight system is designed specifically for Malaysia country day night transition.

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CHAPTER 2

LITERATURE REVIEW

2.1   Introduction

This chapter will discuss and explain about the theories and concepts of that will be used throughout completing the fabrication of this project. This chapter will also review about the mechanism, software and process that will be used to achieve the project objective. Throughout the completion of the project, multiple researches have been made about;

- Urban Car Concept

- Car Lighting System

- Light Emitting Diode (LED)

- Photoresistor Sensors

- Electric Circuit System

- Computer Aided Design (CAD)

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2.2   Car Lighting System

The Vehicle Lighting System is responsible to illuminate the road during low presence of light in the direction of the movement (Burkard Wördenweber, Jörg Wallaschek, Peter Boyce, 2010). It consists of a headlamp and indicator light (signaling device) mounted or integrated in front, rear and sides of an automotive vehicle as shown in Figure 2.1 and Figure 2.2 This lighting system serves as a purpose to increase the visibility of other vehicles in front during driving as well to alert pedestrians to see a vehicle's presence, direction of the vehicle is travelling, and vehicle position on the road.
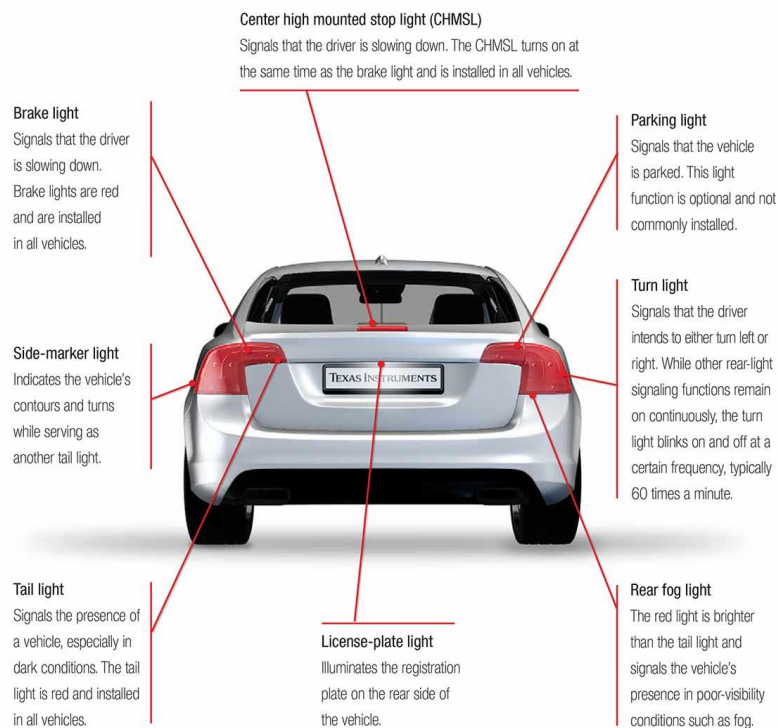

Figure 2.1 Arun T. Vemuri. (2019) Rear Car Lighting System [photograph]. Retrieved from https://e2e.ti.com (Vemuri, 2019)

6