LOW-COST AUTOMATIC HEADLIGHT DIMMER SYSTEM

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This report is submitted in partial fulfillment of the requirements for the award of Bachelor of Electronic Engineering (Computer Engineering) With honors.

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To all people have been supported me, from start to the finish

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ABSTRACT

Headlight dimmer system has been evolving since it was first introduced but the evolution of this system is still small compared to the evolution of engine, Global Positioning system, and audio and visual system on the vehicle especially cars. The headlight system nowadays still relies on the 'Dimmer switch' that needs to be adjusted manually by the driver. So, an automatic system that can change the dimmer switch is the answer. This project is based on headlight that could be changed from high-beam to low-beam or vice versa and switching on and off the fog light automatically according to visibility. For this project, the idea is to invent the low-cost automatic dimmer. To make it cost-low, this system will be designed based on PIC microcontroller technology. So, the objective of this project is to introduce the low-cost Automatic Headlight Dimmer System using PIC microcontroller and also to design a sensor circuit that can monitor visibility on the road and make the dimmer switch change accordingly. After achieving the objectives than only we can implement this invention into our national car industry. But before taking a big step into it, we need to start from making literature review on light sensor as it is very crucial part in this system. Without sensor performing at its best, for sure, this system cannot perform as it is required to work. This system was designed using MPLAB for the software and Proteus for the hardware simulation. The design is ready to be downloaded if there is no error occurred in simulation. This system can be implemented in the national car industry for its low cost.

ABSTRAK

Teknologi lampu hadapan kenderaan hanya mengalami sedikit perubahan semenjak ia kali pertama kali diperkenalkan. Perubahan atau inovasi keatas lampu hadapan kereta boleh dikatakan tidak secanggih teknologi enjin, sistem audio dan sistem navigasi satelit, GPS. Lampu hadapan kenderaan masih bergantung kepada 'suis pemalap' untuk mengubah kecerahan cahaya lampu tersebut. Projek ini berdasarkan idea lampu hadapan kereta yang mampu berubah secara automatik, daripada lampu tinggi ke lampu rendah atau berubah kepada lampu kabus mengikut keamatan cahaya di sesuatu tempat. Untuk projek ini, ideanya adalah untuk membina sistem pemalap lampu hadapan automatik berkos rendah. Jadi, bagi mengurangkan kos projek, sistem ini akan menggunakan teknologi pengawal mikro PIC. Objektif projek ini adalah untuk memperkenalkan Sistem Pemalap Lampu Hadapan Kereta Automatik berkos rendah menggunakan pengawal mikro PIC dan juga merangka litar pengesan yang dapat mengawasi sebarang perubahan cahaya seterusnya menukar cahaya lampu hadapan kereta mengikut keadaan tersebut. Jadi, objektif utama bagi projek ini adalah untuk membangunkan sistem lampu hadapan kereta automatik berkos rendah yang dapat berubah mengikut keamatan cahaya dan berjaya mengubah kecerahan lampu hadapan secara sendirinya. Setelah objektif ini dicapai, sistem ini akan dicadangkan untuk digunakan pada kereta-kereta nasional.

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LIST OF TERMINOLOGY

LDR -	**LIGHT DEPENDENT RESISTOR**
HID -	**HIGH INTENSITY DIODE**
ECE -	**UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE**
JDM -	**JAPANESE DOMESTIC MARKET**
DRL -	**DAYTIME RUNNING LAMP**
RAM -	**RANDOM ACCESS MEMORY**
ROM -	**READ ONLY MEMORY**
EEPROM-	**ELECTICAL ERASEABLE PROGRAMMABLE READ ONLY MEMORY**
ADC -	**ANALOG TO DIGITAL**
A/D -	**ANALOG TO DIGITAL**
D/A -	**DIGITAL TO ANALOG**
CPU -	**CENTRAL PROCESSING UNIT**
I/O -	**INPUT/OUTPUT**
LED -	**LIGHT EMITTING DIODE**
MOSFET-	**METAL – OXIDE-SEMICONDUCTOR FIELD – EFFECT TRANSISTOR.**

CHAPTER I

INTRODUCTION

1.1 Introduction of the project

This project is really focus on the conventional headlight system that still never been revolutionized through out the century. As one of the leading automobile company, BMW, have been developing this system since it was first introduced in it 5 series model. This project idea was to develop a system that mirror to what BMW did with its headlight system but in a cheap way. Choosing the right component to build the system can bring down the cost. So, in order to do that, there will be a lot of studies regarding the component that can be used in the system without spending much money.

1.1 Objectives of the project

As for this project, the main objectives are:-

1. To introduce the low-cost Automatic Headlight dimmer system using PIC microcontroller.
    a. For a car that has sophisticated and high tech equipment, it is not surprising that the price tag for that particular car can start from RM 250 00 to RM 500 000 in range. We try to introduce a system that is really similar to what expensive car can offer by using a very basic principle of electronic and programming. Microcontrollers consist of both hardware and software. It may be difficult to choose as there are many type of microcontroller. PIC microcontroller is one of the best answer as it offers the cheapest and most handy microcontroller compared to other type of microcontrollers.

2. To design a sensor circuit that can monitor visibility on the road and make the dimmer switch change accordingly.
    a. Circuit sensor is the most crucial part of this system as the entire system really rely on its accuracy to detect different visibility on the road.
3. Propose this system into national car industry.
    a. Our national car really need some innovation like this system to boost it sales.

1.2 Problem statement

Headlight has been crucial parts in many moving vehicle such as car, lorry and ships as well. This system has been evolving since it first introduce but the evolution of this system are still small compared to the evolutionary of engine, Global Positioning system, and audio and visual system on the vehicle especially cars. The headlight system nowadays still relies on the 'Dimmer switch' that needs to be adjusted manually by the driver. The automatic system that can change the dimmer switch is the answer. This idea is based on BMW 'Adaptive Light system' that have been introduced a couple of years ago.

1.3 Scope of work

Scope of work in this project

1. Gathering all the information's about light sensors.
2. Varying the light intensity for the sensor to ensure accuracy of the dimmer switch. All the calibration is done in software.
3. Constructing the circuit and the source code for the system operation.
4. Creating HEX files and hardware simulation will be done by using MPLAB and PROTEUS respectively.

1.4 Limitations

While choosing a good sensor for this project, some considerations need to be taken such as relationship between sensor and LUX, sensor working range and cost. In this project selecting a very durable sensor is necessary. Full consideration in this project must be kept. Test will be done on the sensor.

Since we will be using a very durable sensor, it may be not so accurate. It was made in mass production. Quality of sensor may affect the result. This error needs to be constantly monitored from time to time to eliminate the errors from reading that will be taken during the observations.

1.5 Methodology

To achieve the objectives mentioned earlier, the first step is to do a literature review on light sensor, that includes testing and developing the sensor circuit using MPLAB and Proteus. After finish designing all parts of the system, the circuit component will be install and tested on the breadboard. If the circuit operates according to specification, then the design will be permanently transferred on the Printed Circuit Board (PCB).

CHAPTER II

LITERATURE REVIEW

2.1 INTRODUCTION

In this chapter, we will be discussing about all the method that have been used in the development of this project. Researching consist of gathering information using all kinds of medium such as graphical material, journal, newspapers, pamphlet, magazines, and datasheets. Also in this chapter, there will be explanations about the 'Headlight Dimmer System' and how PIC used in this system.

2.2 HISTORY OF THE AUTOMATIVE HEADLAMP

2.2.1 MECHANICS

The earliest headlamps were fueled by acetylene or oil and were introduced in the late 1880s. Acetylene lamps were popular because the flame was resistant to wind and rain. The first electric headlamps were introduced in 1898 on the Columbia Electric Car from the Electric Vehicle Company of Hartford, Connecticut, and were optional. Two factors limited the widespread use of electric headlamps: the short life of filaments in the harsh automotive environment, and the difficulty of producing dynamos small enough, yet powerful enough to produce sufficient current. "Prest-O-Lite" acetylene lights were offered by a number of manufacturers as standard equipment for 1904, and Peerless made electrical headlamps standard in 1908. In 1912, Cadillac integrated their vehicle's Delco electrical ignition and lighting system, creating the modern vehicle electrical system.

"Dipping" (low beam) headlamps were introduced in 1915 by the Guide Lamp Company, but the 1917 Cadillac system allowed the light to be dipped with a lever inside the car rather than requiring the driver to stop and get out. The 1924 Bilux bulb was the first modern unit, having the light for both low (dipped) and high (main) beams of a headlamp emitting from a single bulb. A similar design was introduced in 1925 by Guide Lamp called the "Duplo". In 1927, the foot-operated dimmer switch was introduced and became standard for much of the century. The last vehicle with a foot-operated dimmer switch was the 1991 Ford F-Series. Foglamps were new for 1938 Cadillacs, and their 1954 "Autronic Eye" system automated the switch between high and low beams.

The standardized 7 in (178 mm) round sealed beam headlamp was introduced in 1940, and was soon required for all vehicles sold in the United States. Britain, Australia and other Commonwealth countries, as well as Japan, also made extensive use of 7 in. sealed beams. With some exceptions from Volvo and Saab, this headlamp size format was never widely accepted in Europe, leading to different front-end designs for each side of the Atlantic for decades.

The first halogen headlamp for vehicle use was introduced in 1962 by a consortium of European bulb and headlamp makers. Halogen technology makes incandescent filaments more efficient and can produce more light than from non-halogen filaments at the same power consumption. These were prohibited in the US, where non-halogen sealed beam

lamps were required until 1978. From 1978 to 1983, all halogen headlamps in the U.S. were sealed beams with halogen bulbs inside. These *halogen sealed beams* remain available, 25 years after replaceable-bulb headlamps returned to the US in 1983.

High-intensity discharge systems were introduced in 1991's BMW 7-series. European and Japanese markets began to prefer HID headlamps, with as much as 50% market share in those markets, but they found slow adoption in North America. 1996's Lincoln Mark VIII was an early American effort at HIDs, and was the first and only car with DC HIDs.

2.3 REQUIREMENT AND REGULATIONS

Modern headlamps are electrically operated, positioned in pairs, one or two on each side of the front of a vehicle. A headlamp system is required to produce a low and a high beam, which may be achieved either by an individual lamp for each function or by a single multifunction lamp. High beams (called "main beams" or "full beams" or "driving beams" in some countries) cast most of their light straight ahead, maximizing seeing distance, but producing too much glare for safe use when other vehicles are present on the road. Because there is no especial control of upward light, high beams also cause backdazzle from fog, rain and snow due to the retroreflection of the water droplets. Low beams (called "dipped beams" in some countries) have stricter control of upward light, and direct most of their light downward and either rightward (in right-traffic countries) or leftward (in left-traffic countries), to provide safe forward visibility without excessive glare or backdazzle.

2.3.1 FUNCTIONS

i. LOW BEAM

Low beam (dipped beam, passing beam, meeting beam) headlamps provide a distribution of light designed to provide adequate forward and lateral illumination with limits on light directed towards the eyes of other road users, to control glare. This beam is intended for use whenever other vehicles are present ahead. The international ECE Regulations for filament headlamps and for high-intensity discharge headlamps specify a beam with a sharp, asymmetric cutoff preventing significant amounts of light from being cast into the eyes of drivers of preceding or oncoming cars. Control of glare is less strict in the North American SAE beam standard contained in FMVSS / CMVSS 108 .

Figure 2.1 E-code dipped/low beam.

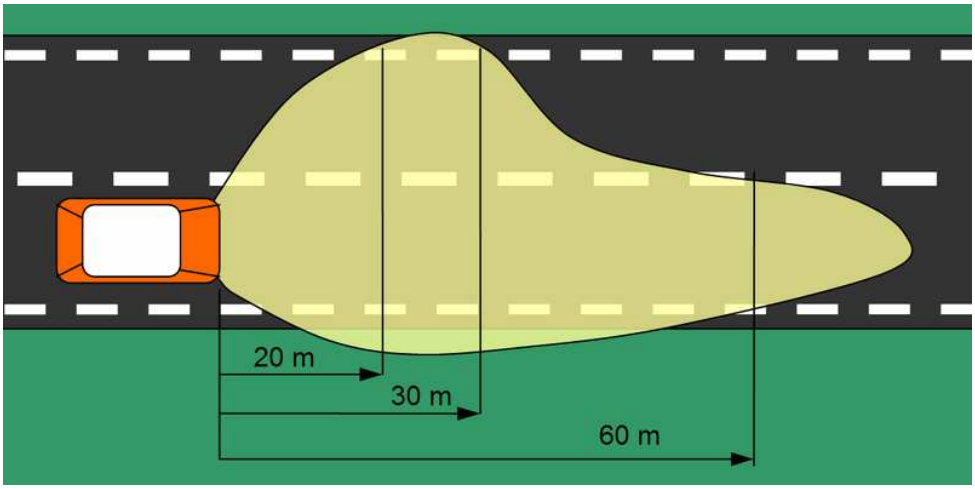

Figure 2.2 Cutoff in the European lamp.

i. HIGH BEAM

High beam (main beam, driving beam, full beam) headlamps provide a bright, centre-weighted distribution of light with no particular control of light directed towards other road users eyes. As such, they are only, suitable for use when alone on the road as the glare they produce will dazzle other drivers. International ECE regulations permit higher-intensity high-beam headlamps than are allowed under North American regulations.

Figure 2.3 European E-code high/Full beam

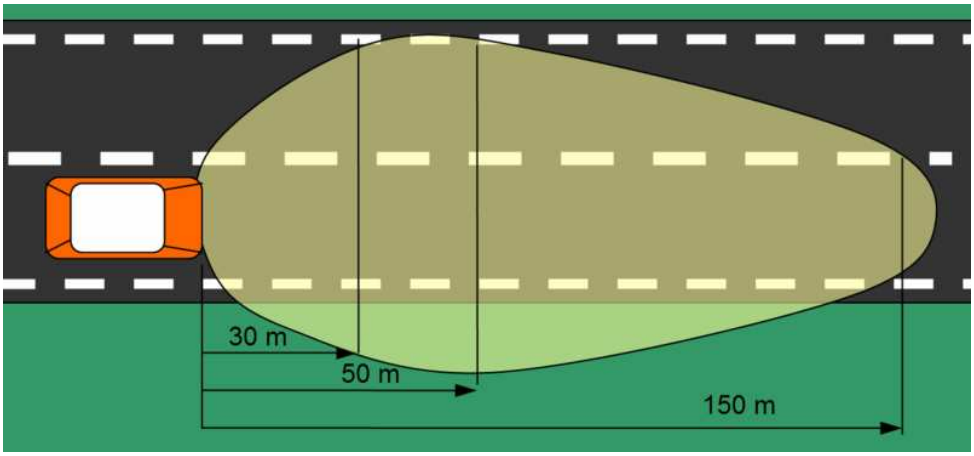

Figure 2.4 Top view of the illuminated area of European lamps