LED STREET L/)TIVE AUTO BEAM

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ABSTRACT

As vehicle population increases, the number of road accidents also increases. Vital problems in transportation such as mobility and safety of transportation considered more, especially in metropolitans and highway. It is because of the reflection or refraction of light from different directions also contributed to this accident. Due from that, the driver could not identify the types of lamps in their environment whether it is street lamp or car lamp from others. When other drivers use the high beam from the opposite direction, will cause the view is blurred and glare. Due to that, many road users can be stuck with unintentional accident. The project of Light Emitter Diode (LED) Street Lamp Detection for Automotive Auto Beam Detection will be developed as addition features of the system to detect LED Street Lamp. Basically, this project is to differentiate between LED Street Lamp and car lamp to ignore LED noise when it is combined each other. The main purpose of this project is to enhance the automated high beam detection system using image processing technique in MATLAB, to detect LED street lamp for automated high beam detection and also to detect the vehicle-rear lamp within its proper distance for automated high beam detection. In order to implement this project, it was conducted with computer simulation (MATLAB) by using image processing method. There are two ways to identify the image or visual by its color or shape of the objects. My expected outcome is to develop the Graphical Using Interface (GUI) by taking the night vision images.

ABSTRAK

Bilangan kemalangan jalan raya meningkat seiring dengan pertambahan bilangan kenderaan. Masalah ini berlaku terutamanya di metropolitan dan lebuh raya. Hal ini adalah kerana pantulan atau pembiasan cahaya dari arah yang berlainan yang juga menyumbang kepada kemalangan ini. Oleh yang demikian, pemandu tidak dapat mengenal pasti jenis lampu dalam persekitaran mereka sama ada lampu jalan atau lampu kereta daripada orang lain. Apabila pemandu lain menggunakan lampu tinggi dari arah bertentangan, akan menyebabkan pandangan menjadi kabur dan silau. Oleh kerana itu, banyak pengguna jalan raya boleh terjebak dengan kemalangan yang tidak disengajakan. Projek "LED Street Lamp Detection for Automotive Auto Beam Detection" akan dicipta sebagai salah satu istem untuk mengesan Lampu LED Street. Secara amnya, projek ini adalah untuk membezakan antara Lampu LED dan lampu kereta untuk untuk menghilangkan gangguan apabila ia digabungkan antara satu sama lain. Tujuan utama projek ini adalah untuk meningkatkan sistem lampu kereta automatic menggunakan teknik pemprosesan imej (image processing) menggunakan MATLAB, untuk mengesan lampu jalan LED secara automatik dan juga untuk mengesan lampu belakang kenderaan dalam jarak yang betul secara automatik. Dalam melaksanakan projek ini, ia menggunakan MATLAB dengan menggunakan kaedah pemprosesan imej. Terdapat dua cara untuk mengenal pasti imej atau visual oleh warna atau bentuk objek. Akhir sekali, project ini adalah untk menghasilakan satu system (GUI) dengan mengambil gambar pada waktu malam.

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LIST OF SYMBOLS AND ABBREVIATIONS

m	-	meter
%	-	percentage
μi	-	mean
σi	-	standard deviation
FKEE	-	Faculty of Electrical and Electronics
BEE	-	Bachelor of Electrical and Electronics
LED	-	Light Emitter Diode
GUI	-	Graphical User Interface
JKJR	-	Road Safety Department
DAS	-	Driver-Assisted-System
FYP	-	Final Year Project
2-D	-	Two Dimensional
B & W	-	Black and White
ANSI	-	American National Standards Institute
HDR	-	High Dynamic Range
EV	-	Exposure Value
PAL	-	Phase Altering Line
CIE	-	International Commission on Illumination
RGB	-	Red-Blue-Green
HSV	-	Hue-Saturation-Volume
PSM	-	Projek Sarjana Muda
MP	-	Mega Pixel
JPEG	-	Joint Photographic Experts Group

CHAPTER 1

INTRODUCTION

1.0 Overview of Project

Vehicles such as transport cars, buses, trucks and motorcycles are among the indispensable transportation in Malaysia to carry people and things from one destination to another using the road as a medium of instruction. Therefore, the automatic vehicle detection is a very important aspect in the road transportation system.

Although there is usually less traffic at night, it is common that accidents occurred at night. Some of the reasons for night road accidents are that most drivers are limited in night vision since some roads can be very dark with the absence of road lamps. Hence, the driver will always use the high beam to help them have a better vision during driving on the road without realizing the behavior of the potential indirect hazard for others. Hence, there is a need to have a system that can control the beam's mode to help reduce driver's alertness to beam's mode changes.

Image analysis provides a number of effective techniques to enable it to detect the target object in the image and it is widely used in traffic monitoring system.

Basically, the present invention detects and was also classifies objects in a real-time, in a series of images obtained from cameras mounted on vehicles. The objects that will be detected by image analysis techniques are vehicle headlights, taillights leading vehicle, street lamps and also car rear lights for the car driving in front.

The auto beam control system, is developed by the classification of objects created using image analysis is intended to alert the changes from high beam to low beam or otherwise. Apart from that, the use of high beam is one of visual disturbances and may create a safety hazard by making oncoming vision is blurred and glare.

It is a common thing in the way of road at night when the driver forgot to turn on or off the beam when confronted with an incoming vehicle. This research will facilitate in the automation of head lamp's change using a camera that detects the street lamps, incoming car lamps and rear lights.

1.1 Problem Statement

As shown in Table 1.1 and Figure 1.1, it can be seen that the number of accidents increase every year and these accidents include those that happened at night. The darkness and the glare of vision is a major factor contributing to this accident. This is because, the driver normally is confused between the road lights and car lights coming from the opposite direction.

This will make the driver negligent and forgot to change the high beams to the low beams. Indirectly, it leads to serious consequences to the driver coming from the opposite direction and the cars in front that are in the same direction because the in vision and will be glared. This is because, according to a study conducted by Marizuana

(2010), high beams is suitable for use by the driver if there is no incoming vehicle at a distance of 10 yards to keep from disturbing the vision of other drivers [3].

Table 1.1: The main road accidents statistic of Malaysia from year 2000 to 2006 [1]

Year	Population	Vehicle Registered	Road Accidents	Road Casualties	Road Deaths
2000	23263600	10598804	250429	50200	6035
2001	23795300	11302545	265175	50473	5849
2002	24526500	12068144	279711	49552	5891
2003	25048300	12868934	298653	52741	6286
2004	25580000	13828889	326815	54091	6228
2005	26130000	14816407	328264	47012	6200
2006	26640000	15790732	341252	35425	6287

Perbandingan Jumlah Kes Kemalangan dan Kematian Antara Bulan Disember 2008 - Januari 2009

BULAN	2008	2009		
	DISEMBER	JANUARI	PERBEZAAN	%
JUMLAH KES KEMALANGAN	31,156	31,277	121	0.4
JUMLAH KEMATIAN	551	598	47	8.5
JUMLAH KEMALANGAN MAUT	490	542	52	10.6
JUMLAH KEMALANGAN PARAH	541	615	74	13.7
JUMLAH CEDERA PARAH	687	737	50	7.3
JUMLAH KEMALANGAN RINGAN	906	1,085	179	19.8
JUMLAH CEDERA RINGAN	1,235	1,386	151	12.2

SUMBER : PDRM Analisis : JKJR

Figure 1.1: Comparison on total cases of accident and fatality on roadway from December 2008 to January 2009 [2]

1.2 Objectives of Project

The main purpose of the project as listed:

(i) To enhance the automated high beam detection system using image processing technique in MATLAB.

(ii) To detect LED street lamp for automated high low beam detection.

(iii)To detect the vehicle-rear lamp for automated high low beam detection.

1.3 Scope of the Project

In order to achieve the objectives, the project is focus on image processing of the LED street lamp and detect image of vehicle rear-lamp of high low beam for the algorithm development. On the other hand, for the vehicle rear-lamp, a few assumptions are made, such that speed of the car in front is the same with the speed of car at the back. The systems will only functions at night and the project will be simulated and analyzed using MATLAB.

1.4 Rationale and Significant

The impact of this project is to help the driver to have a good technique of driving on the road environment. The project is intended to improve the efficiency and is a part of Driver-Assisted-System (DAS) so that the driver can drive their vehicle with more effective control.

The significant of this research is to study the possibility detection of LED street lamp and car rear lights for the car driving in front in order to make the high and low beam changing automatically for solvents road accidents especially in highway and hence give an alternative how to reduce or decrease the number of accidents in Malaysia. Besides that, this study will help to establish a suitable parameter (7 m to 10 m) to overcome the beam detection for the car rear lights for the car driving in front.

1.5 Summary

This section or chapter is all about an overall project and explains the objectives as well as the scope of the project in order to give an insight and idea of the project. On the other hand, this section also comes out with the problem statement and the significant of the system. On the next chapter will discuss about the literature review on the functions, principles and application on each component of this project.

1.6 Project Outline

This thesis comprise 5 chapters altogether. Chapter 1 is on introduction, Chapter 2 is literature review, Chapter 3 contains methodology, Chapter 4 is on result and discussion followed by last chapter which is Chapter 5 is conclusion.

Chapter 1 is the section where the introduction of the thesis of project will be discussed. The overview of the project will be outlined including problem statement, the projects' objective and also the project scope.

Chapter 2 there will be discussing the literature review of previous works from thesis, journals and experiments that related to the project. The review includes LED street lamp, vehicle-rear lamp and the methods that they used to analyze the image.

Chapter 3 represents the research methodology of this project. The step by step procedure use to run this project from the beginning till end will be explained in detail. This will also include the procedures or flow chart and processes involved for the software development of the entire project.

Chapter 4 was consists of the experimental results and its respective analysis. The result obtained will be discussed and explained here with the aid of figures. The comparison of the every case will be discussed here.

In Chapter 5, here would be the summarized of the thesis and further recommendation for the research.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

Several related researches have been done to develop the system in order to detect street lamp and vehicle-rear lamp of this project. The references for this project are taken from journals, conferences and also articles that was cited directly from reliable internet sources regarding the lamps detection.

2.1 Statistic of Road Accidents

As shown in the graph of Figure 2.1, it was stated the normalized road accidents, accident casualties and deaths by population for Malaysia in six years from 2000 to 2006.

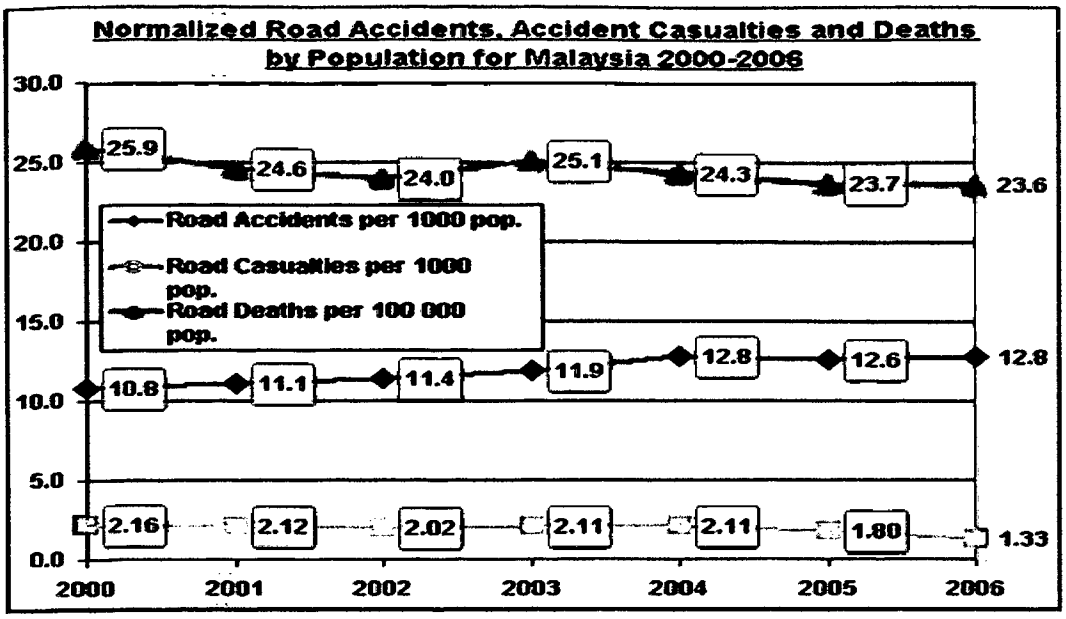

Figure 2.1: Normalized road accidents by population for Malaysia year 2000 to 2006 [1]

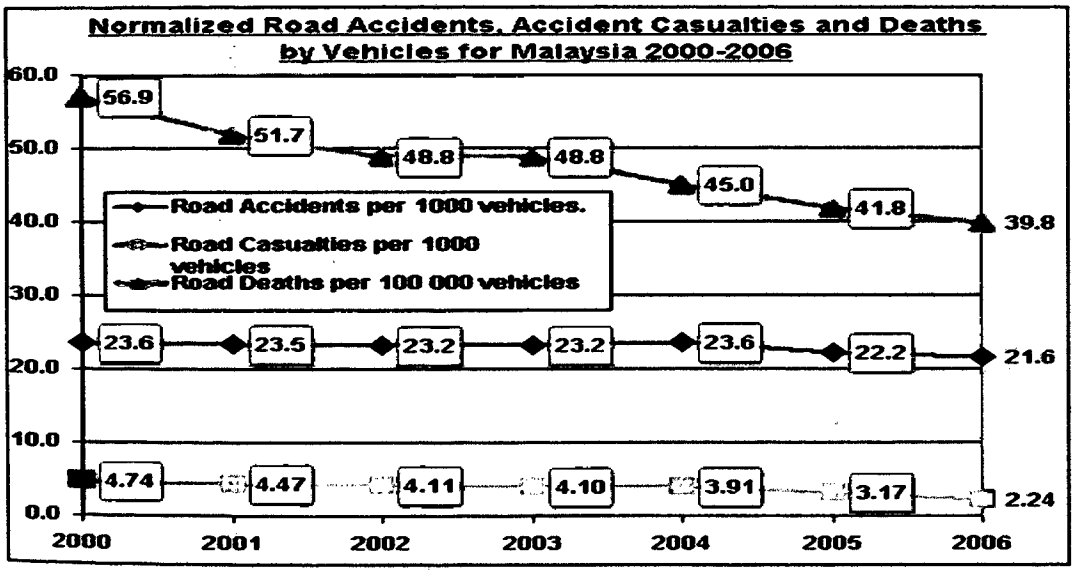

Figure 2.2: Normalized road accidents by vehicles for Malaysia year 2000 to 2006 [1]

In 2007 there were 247,780 victims of all severities were 4% lower than in 2006. The comparison of road accidents and death between 2000 until 2006 can be see based on graph in Figure 2.2. In addition, 2,946 people were killed contributed to 7% lower

than in 2006. 27,774 people were seriously injured in 2000 which decreased to 3% from 2006 and 217,060 injured persons were below the 4% compared to 2006. Accordingly, the government published a road safety strategy that is called More Secured Tomorrow than Today [4]. This strategy is made is to achieve:

(i) 40% reduction in the number of people killed or seriously injured.

(ii) 50% reduction in the number of children killed or seriously injured.

(iii)10% reduction in bit rate for the number of injured victims.

Jabar Sadiq (2011) said, due to the increased number of deaths that occurred during the holiday festival, operation of 'Ops Sikap 24' was carried out to overcome this problem. 16.6% of fatal accidents there in the 259 and 289 people dying in them. In Addition, the average time most of the accidents which occurred between 2.00pm to 6.00pm and 8.00pm to 10.00pm. A police study has shown that 85% of accidents are caused by behavior, negligence and casual attitude while passing drivers. All the information about the number of accidents at every state will show in Table 2.1 below [6].

Table 2.1: The number of accidents at every state in Malaysia [6]

States	Number of Accidents	States	Number of Accidents
Selangor	4380	Pahang	806
Johor	2346	Kelantan	640
Kuala Lumpur	1956	Melaka	638
Pulau Pinang	1392	Sabah	543
Perak	1377	Terengganu	536
Kedah	833	Sarawak	482
Negeri Sembilan	820	Perlis	68

2.2 Contributory Factors to Road Accidents

The failure of drivers to see properly is the most frequent contributing factor was reported in 35% of all accidents. It is because; the driver is difficult to see clearly the environmental conditions of road. This includes lighting, glare, rain and foggy weather. In addition, four of the five factors most frequently reported are caused by the drivers' carelessness in driving on the road and lost control of vehicle driven. These factors resulted in 33% of fatal accidents [4].

On the other hand, S.C Donald Lim (2002) has a different opinion in New Straits Times, where road accidents are caused by driver's behavior that fails to give proper signal when turning. Some other bad behaviors are when driver are the use of mobile phone while driving and smoking while driving. These are also a factor that contributed to the accident [5].

Meanwhile, H.M Heeza (2011) appears and claimed in Bernama Newspaper to support the opinion expressed by the New Straits Times claimed; the negligent driver and bad road conditions are the main cause of the increasing number of road accidents in the country. Director of Kuala Lumpur Road Safety Department (JKJR) stressed that 70% of road accidents are caused by human negligence, 20% due to road conditions and 10% for vehicle problems [7].

2.3 Car Lamp

Marizuana (2010) claimed in her Final Year Project (FYP) thesis, basically the car lights are a member who holds a number of other lights in the shape of the loop.

Members who hold the light and hold the hole in the vicinity of each hole holding the lamp. Some passages of light to communicate with every corner of the hold. Light sources will be protected behind those passages of light, respectively. Each of the members of the ring-shaped light thereon equidistantly spaced bumps condensed light, and installed in one corner of their holdings to the parent. Therefore, the light source changes are allowed, and the light in the shape of the closed-loop will run at all members of the ring-shaped light when powered light source [3].

Moll and Gregory R (2004) claimed, the vehicle lighting systems consisting of several parts of the mounting base has an elongated body and the body has a central portion with a central bearing surface to contact the mounting surface. Parts of the body including a pair of flanges having upwardly depending portion extends from the center and downwardly depending on the parts that form a bearing surface spaced from the central bearing surface for contacting the mounting surface. The center has opposed longitudinal grooves of said bearing surface and the center of the longitudinal grooves extending along said base. Longitudinal grooves and the inner surface of said flange and defining the former elongated flexible strip light and kept in position by the flange of the container. Significant band of light contained in the container, where bands of light consist of a transparent polymer material body and the diversity of light sources contained within the polymer body. In addition, the band of light with electrical contacts for coupling light into the power supply source [8].

Moll and Gregory R (2004) also said, the vehicle lighting systems consisting of a base having a longitudinal body, which has a longitudinal groove and against the distal end. Each groove against the distal end with a pair of recessed mounting axis extending into the distal end and extending generally parallel to the longitudinal grooves. Flexible strip light beam position and stored by the band of light that is found in the longitudinal grooves. At least one end cap coupled to the base of the distal end. End cap has a shoulder abutting the distal end of the distal end of the base shoulder and projections, including projections of axially extending up to the mounting recess for coupling to the distal end of the base [8].

2.4 Edge Detection

Claypoole R, Lewis J, Bhashyam, and Kelly (2009) entitlement, the most effective way to do edge detection is divided into two categories; there are the gradient and laplacian. Where the gradient method is detect edges by find the first derivative of maximum and minimum image. Whereas, the laplacian method is to do a detection of edges by find zero crossing in the second derivative image. The Figure 2.3 shows the edge detected image using the gradient method (Roberts, Prewit, Sobel) and laplacian method (Marrs-Hildreth) [9].

Claypoole R, Lewis J, Bhashyam, and Kelly (2009) also said, the Marr-Hildreth not only has a lot more noise than the other methods, the low-pass filtering it uses distorts the actual position of the facial features. Due to the nature of the Sobel and Prewitt filters we can select out only vertical and horizontal edges of the image as shown on Figure 2.4 below. This is very useful since we do not want to morph a vertical edge in the initial image to a horizontal edge in the final image. This would cause a lot of warping in the transition image and thus a bad morph [9].

On the other side, Jason Nearing, Rob Pickel and Anil Maliyekkel (2009) were give their explanation about the first step to segmenting images into regions is to determine where the edges are. The several different edge-detection filters including true sobel, true prewitt, Laplacian of Gaussian, and a mix of sobel and prewitt had been tried. Due to that, one of the sources which are combination of sobel and prewitt could provide a more optimal detection scheme. This 3x3 did in fact seem to work better than either one of them alone. Another attempt was to use a Laplacian edge detector, but it picked up so much noise that it was nearly impossible to determine any regions. Also, the Laplacian filter did give thin edges, yet some were so thin that when tried filling in the enclosed regions, many of the regions ended up bleeding together [10].