UNIVERSITI MALAYSIA PAHANG

DECLARATION OF THESIS AND COPYRIGHT

Author's Full Name	:	LEONG ZI ZHENG
Identification Card No	:	920827-14-5075
Title	:	MICROCONTROLLER BASED HEAD-LAMP ALIGNMENT SYSTEM FOR AUTOMOBILE
Academic Session	:	2015/2016

I declare that this thesis is classified as:

☐	**CONFIDENTIAL**	(Contains confidential information under the Official Secret Act 1972)
☐	**RESTRICTED**	(Contains restricted information as specified by the organization where research was done)*
☑	**OPEN ACCESS**	I agree that my thesis to be published as online open access (Full text)

I acknowledge that Universiti Malaysia Pahang reserve the right as follows:

1. The Thesis is the Property of University Malaysia Pahang.
2. The Library of University Malaysia Pahang has the right to make copies for the purpose of research only.
3. The Library has the right to make copies of the thesis for academic exchange.

Certified by:

(Author's Signature)

LEONG ZI ZHENG

Date: 9 JUNE 2016

(Supervisor's Signature)

DR. ARSHED ABDULHAMEED OUDAH

Date: 9 JUNE 2016

MICROCONTROLLER BASED HEAD-LAMP ALIGNMENT SYSTEM FOR AUTOMOBILE

LEONG ZI ZHENG

Report submitted in partial fulfillment of the requirements

for the award of the degree of

Bachelor of Engineering (Hons.) in Mechatronics Engineering

Faculty of Manufacturing Engineering

UNIVERSITI MALAYSIA PAHANG

June 2016

SUPERVISOR'S DECLARATION

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the degree of Bachelor of Engineering (Hons.) in Mechatronics Engineering.

Signature : 

Name of supervisor : DR. ARSHED ABDULHAMEED OUDAH

Position : SENIOR LECTURER

Date : 9 JUNE 2016

STUDENT'S DECLARATION

I hereby declare that the work in this thesis is my own except for quotation and summaries which have been duly acknowledged. The thesis has not been accepted for any degree and is not concurrently submitted for award of other degree.

Signature : 

Name : LEONG ZI ZHENG

ID Number : FB12054

Date : 9 JUNE 2016

TABLE OF CONTENTS

CHAPTER 2 LITERATURE REVIEW

CHAPTER 3 METHODOLOGY

CHAPTER 4 RESULTS AND DISCUSSION

CHAPTER 5 CONCLUSION AND RECOMMENDATIONS

LIST OF TABLES

LIST OF FIGURES

LIST OF SYMBOLS

c	Speed of sound
Δt	Time taken for send ping and receive ping

LIST OF ABBREVIATIONS

A	Ampere
CAD	Computer-aided drafting
CAE	Computer-aided engineering
D	Distance
DC	Direct current
I	Current
LCD	Liquid Crystal Display
LDR	Light Dependent Resistor
LED	Light Emitting Diode
PWM	Pulse Width Modulation
S	Second
V	Voltage

MICROCONTROLLER BASED HEAD-LAMP ALIGNMENT SYSTEM FOR AUTOMOBILE

LEONG ZI ZHENG

Report submitted in partial fulfillment of the requirements

for the award of the degree of

Bachelor of Engineering (Hons.) in Mechatronics Engineering

Faculty of Manufacturing Engineering

UNIVERSITI MALAYSIA PAHANG

June 2016

ABSTRACT

This thesis deals with microcontroller based head-lamp alignment system for auto mobile. The objective of this thesis is to design a headlamp system for automobile that can turn angle of headlamp to have a better vision. A driver drives a car on road when goes to sharp corner at night that will some area that the light of headlamp cannot reach. Sometime driver may forget turns off the high beam and cause the other driver uncomfortable and cannot see the front view from opposite lane. Therefore, the design of headlamp alignment system is important to solve this issue. The other objective is to fabricate a headlamp model that can be control with Arduino Mega. Also make a choosing mode for driver to choose auto mode or manual mode operation. In auto mode operation, all input device is use sensor such as ultrasonic and potentiometer to control the alignment system of headlamp; all are automatically control the alignment system without used any switch. While in manual mode operation, all are using toggle switch to control the headlamp alignment system and need to turns on the switch manually.

ABSTRAK

Tesis ini berkaitan dengan mikro-kontroller berdasarkan kepala lampu penjajaran sistem untuk mudah alih auto. Objektif projek ini adalah untuk mereka bentuk sistem lampu untuk kereta yang boleh bertukar sudut lampu mempunyai visi yang lebih baik. Seorang pemandu memandu kereta di jalan raya apabila pergi ke sudut tajam pada malam itu akan beberapa kawasan yang cahaya lampu tidak boleh mencapai. Kadang-kadang pemandu mungkin terlupa mematikan rasuk yang tinggi dan menyebabkan pemandu lain tidak selesa dan tidak dapat melihat pemandangan hadapan dari lorong bertentangan. Oleh itu, reka bentuk sistem penjajaran lampu adalah penting untuk menyelesaikan isu ini. Objektif yang lain adalah untuk mereka-reka model lampu yang boleh menjadi kawalan dengan Arduino Mega. Juga membuat mod dipilihnya untuk pemandu untuk memilih mod auto atau operasi mod manual. Dalam operasi mod auto, semua peranti input adalah menggunakan sensor seperti ultrasonik dan upaya untuk mengawal sistem penjajaran daripada lampu; semua secara automatik mengawal sistem penjajaran tanpa menggunakan apa-apa suis. Semasa dalam operasi mod manual, semua menggunakan suis togol untuk mengawal sistem penjajaran lampu dan perlu untuk menghidupkan suis manual.

CHAPTER 1

INTRODUCTION

This chapter is mainly focus on discussing about the background of study, problem statement, and objectives of the project and also the scope of project to be done.

1.1 BACKGROUND OF STUDY

Headlamp is a lamp which is attached to the front of automobile. The function of headlamp is used to flash up and create a better view at night for someone who drives the car on the road. Nowadays, many vehicles are using two light bulbs in a headlamp. One is create a low beam light and the other one is create a long beam light. Short beam light is a short distance light can reach and suitable for driver drives a car on the road at night. While long beam light is a light can flash up a very far distance and have a better view at night when drives a car alone on the road.

In this project, I will design a headlamp alignment system and fabrication of the headlamp model for automobile by using microcontroller. The microcontroller used to build this project is Arduino Mega. Arduino Mega is used to integrate the hardware and software parts to the headlamp model. The push button, ultrasonic sensor, potentiometer used as input device. While the servo motor and light bulb used as output device.

The purpose of this project is to fabricate a headlamp model by using a light bulb and moving by servo motor to create a better view when driving a car at night.

1.2 PROBLEM STATEMENT

Nowadays, many drivers are still using manual light switching to turn on or turn off the headlamp. Some of the drivers turn on the high beam light at night and forgot to turn into low beam light. This will make the driver in front of the car or on opposite of the car feel uncomfortable due to light too bright and cause the driver cannot see the view in front of the road clearly. This may cause the road traffic accident. While some of the drivers forget to turn on the light when the weather become darkness. This careless also may cause accident occurs because other driver may cannot see the car in the darkness without turn on the headlamp.

1.3 OBJECTIVE

- To design a headlamp system for automobile that can turn angle of headlamp to have a better vision.
- To fabricate a headlamp model that can control with microcontroller Arduino Mega.
- To make a choosing mode for driver to choose auto-mode or manual mode.

1.4 SCOPE OF PROJECT

There had some limitation such as the maximum sense distance for ultrasonic is about 4m. This sensing distance for ultrasonic cannot be use on the road. Other limitation is ultrasonic cannot use to detect that object in front is car or vehicle. Therefore, anything object in front of ultrasonic sensor then the servo motor will moves downward and the light of headlamp will turn low beam. The environment also will effects the accuracy of ultrasonic sensing range such as temperature will change the value speed of sound so the time range also will be affected for the sound wave to deflect back to the receiver.

Besides, the hardware design now no marketing value because this hardware haven fully design yet and just a prototype but the concept is same and can be used in real life. The LDR sensor also I just assume work in dark surrounding but no consider the street lamp on the road.

Last but not least, this prototype only can be used in three lane highway. If drives on the rural place then the headlamp will always keep downward and low beam because the three ultrasonic is used to sense the distance in front of three lane highway. That is why the manual mode operation still needs it like this situation. In addition, manual mode operation is important in safety purpose if some of sensor was malfunction and turn off the light of headlamp. This time driver can use this manual mode operation to continue drives car.

1.5 THESIS OUTLINE

This thesis consists of five chapters which are start from Chapter 1 Introduction, Chapter 2 Literature review, Chapter 3 Methodology, Chapter 4 Results and Discussion and Chapter 5 Conclusion and Recommendations.

Chapter 1 is mainly focus on discussing about the background of study, problem statement, and objectives of the project and also the scope of project to be done.

Chapter 2 discuss about the journals article that involve in this project. Those journals article will enable us to understand the later discussion on this project.

Chapter 3 mainly discuss about the method used in this project. This project divide into hardware and software based. There are three major parts involved in this project which is simulate the circuit design with Proteus software, design a headlamp model, and interface between the hardware and Arduino. The details of the progress in those this project will be explained in this chapter.

REFERENCES

[1] Meftah Hrairi, Anwar B. Abu Bakar. (2010, May 13). Development of an Adaptive Headlamp Systems. Retrieved October 21, 2015.

[2] What is Arduino? - Definition from Techopedia. (n.d.). Retrieved November 16, 2015, from https://www.techopedia.com/definition/27874/arduino

[3] Mohammad, T. (2009). Using Ultrasonic and Infrared Sensors for Distance Measurement. *World Academy of Science, Engineering and …*, *3*(3), 293-298.

[4] Asyraf Bin Amir, "The Development of Adaptive Lighting System For Motorcycles", May 2011

[5] Mohite, H., Mahangade, B., Gholase, M., Kattgihalimath, S., & Kumbhar, S. (2015). Intelligent and Adaptive Headlight with Electronic Controlled Power Steering System (IAEPS), *5*(2), 1026-1029.

[6] Cytron. 3 pins Toggle Switch (Online). Available: http://www.cytron.com.my/p-sw-to-mts-102-a2?search=toggle switch

[7] Webtronico. LDR 5mm - Sensor de luminosidade(Online). Available: http://www.webtronico.com/ldr-5mm-sensor-de-luminosidade.html

[8] Cytron. Ultrasonic Ranging Module (Online). Available: http://www.cytron.com.my/p-sn-hc-sr04?search=ultrasonic

[9] Potentiometer (Online). Available: http://store.fut-electronics.com/products/rotary-potentiometer-1-mega-ohm

[10] Cytron. RC Servo Motor (Plastic Gear) (Online). Available: http://www.cytron.com.my/p-hd-3001hb?search=servo

[11] ITeadStudio TFT Display for ARDUINO. (2012). (Online). Available: https://hifiduino.wordpress.com/2012/04/13/iteadstudio-tft-display-for-arduino/

[12] Bullough, J., Fu, Z., & Van Derlofske, J. (2002). Discomfort and disability glare from halogen and HID headlamp systems. *SAE Technical Paper Series*, *2002-01-00*(724), 0.

[13] Manassero, G., & Dalmasso, M. T. (1998). Adaptive Headlamp: A contribution for Design and Development of Motorway Light. *SAE Technical Papers*. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-34249658028&partnerID=tZOtx3y1

[14] Kim, Z., & Malik, J. (2003). Fast vehicle detection with probabilistic feature grouping and its application to vehicle tracking. *Proceedings Ninth IEEE International Conference on Computer Vision*, 524-531.

[15] Bullough, J. D., & Rea, M. S. (2010). Visibility from Vehicle Headlamps and Roadway Lighting in Urban , Suburban and Rural Locations. *Scenario, SP-2266,* 67-73. Retrieved from http://papers.sae.org/2010-01-0298/

[16] Chintalacheruvu, N. (2012). Video Based Vehicle Detection and its Application in Intelligent Transportation Systems. *Journal of Transportation Technologies,02*(04), 305-314. Retrieved from https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0CCwQFjABahUKEwj30JPsnYbHAhWJlQ0KHR7-Cek&url=http://www.scirp.org/journal/PaperDownload.aspx?paperID=23832&ei=0927Vbcbias2nvynyA4&usg=AFQjCNHs87l-iZJfHgm01b6XQCjVLJV7rA&sig2=ty4jfEXi_5WAS

[17] Oh, J. H., & Kwak, N. (2012). Recognition of a Driver's gaze for vehicle headlamp control. *IEEE Transactions on Vehicular Technology*, *61*(5), 2008-2017.

[18] Bevilacqua, A., Gherardi, A., & Carozza, L. (2010). An automatic system for the real-time characterization of vehicle headlamp beams exploiting image analysis.*IEEE Transactions on Instrumentation and Measurement*, *59*(10), 2630-2638.

[19] G??mez Garc??a, J., G??mez Ortega, J., Satorres Mart??nez, S., & S??nchez Garc??a, A. (2011). Expert system based controller for the high-accuracy automatic assembly of vehicle headlamps. *Expert Systems with Applications,38*(10), 12818-12825.

[20] Tamburo, R., Nurvitadhi, E., Chugh, A., Chen, M., Rowe, A., Kanade, T., & Narasimhan, S. G. (2014). Programmable automotive headlights. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)* (Vol. 8692, pp. 750-765). Springer Verlag.

[21] Hacibekir, T., Karaman, S., Kural, E., ??zt??rk, E. S., Demirci, M., & G??ven??, B. A. (2006). Adaptive headlight system design using hardware-in-the-loop simulation. *Proceedings of the IEEE International Conference on Control Applications* (pp. 915-920).