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LAPORAN PROJEK

SARJANA MUDA

CAR STEERING CONTROL SYSTEM FOR DISABILITY PERSON

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2010

"I hereby declare that I have read through this report entitle "Car steering control system for disability person" and found that it has comply the partial fulfillment for awarding the degree of

Bachelor of Electrical Engineering (Industrial Power)"

Signature : .....

Supervisor's Name : Mr. Muhammad Herman Bin Jamaluddin

Date : 8th May 2010

CAR STEERING CONTROL SYSTEM FOR DISABILITY PERSON

LIM CHEE HOW

This report is submitted in partial fulfillment of the requirements for the degree of Bachelor in Electrical Engineering (Industrial Power)

Faculty of Electrical Engineering

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

MAY 2010

I declare that this report entitle “Car steering control system for disability person” is the result of my own research except as cited in the references. The report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : .....

Name : Lim Chee How

Date : 8th May 2010

Dedicated especially to my beloved mother

and others family members

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ABSTRACT

The report explains the significant activities and experiences gained for the project. The project presents the application of the microcontroller in car steering control system. The objective of the project is to design a car steering control system for disability person usage. The project starts with gather the related information and literature reviews. After that, design the control system, which is met with stated project objective and scope. It is needed to find the alternative way in drive the car steering that even the disabled are able to handle it. A joystick is used to control the steering wheel instead of direct turning the car steering using user hands. A DC motor with belting system is used to drive the steering wheel. Draw and simulate the project hardware by using software Solidworks, followed by the material preparation and assemble the project hardware according to the design. The project is then continues with the software preparation. The programming board is being prepared with program is flashed. PIC186F2685 is used as microcontroller used in the controlling operation. It function as receive the input signal from the joystick and then send the output signal to the motor driver to performs needed operations. The motor rotating speed is design as adjustable so to meet with the conditions and tasks to be performed. The completed project is then being tested its performances for project functionality and safety consideration. The completion of the project enables the disabled to drive a car. An easy handling system is build to control the car steering in car navigation.

ABSTRAK

Laporan ini menjelaskan aktiviti-aktiviti dan pengalaman yang diperolehi daripada projek ini. Projek ini menunjukkan penggunaan mikro pengawal dalam sistem kawalan stereng kereta. Objektif projek ini adalah mereka satu sistem kawalan untuk kegunaan orang kurang upaya (OKU). Projek ini dimulakan dengan proses pengumpulan maklumat dan pengajian kajian berkaitan. Selepas itu, mereka sistem kawalan berdasarkan objektif dan lingkungan projek. Satu alternatif perlulah dicari agar stereng kereta dapat diputar oleh golongan OKU. Rekaan dibuat dengan penggunaan kawalan joystik bagi mengawal stereng kereta. Satu motor arus terus berserta dengan sistem tali digunakan untuk memutarkan stereng tersebut. Lukis dan simulasikan perkakasan projek dengan menggunakan perisian Solidworks, ini diikuti dengan penyediaan bahan dan peralatan digunakan untuk proses pemasangan perkakasan projek. Pemasangan dijalankan berlandaskan rekaan yang dibuat. Projek diikuti dengan penyediaan perisian projek. Papan atur cara disediakan dengan program siap dimuat turun. PIC18F2685 digunakan sebagai mikro pengawal dalam menjalankan operasi kawalan. Ia berfungsi dengan menerima isyarat daripada alat kawalan joystik dan seterusnya menghantar isyarat kepada motor untuk melaksanakan operasi yang diperlukan. Kelajuan putaran motor direka dengan boleh laras untuk kegunaan bagi situasi dan kerja yang hendak dijalankan. Projek yang siap dibentuk diuji prestasinya dalam persepsi keberkesanan dan keselamatan. Projek ini membolehkan golongan kurang upaya dalam memandu sebuah kereta. Satu sistem kawalan yang mudah dioperasi dibina untuk mengawal stereng kereta dalam memandu kereta.

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LIST OF ABBREVIATIONS

F	-	Force
N	-	Newton
V	-	Voltage
W	-	Weight
DC	-	Direct current
PD	-	Parkinson's disease
EDI	-	Emirates Driving Institute
IFC	-	Interface Free Controller
OKU	-	Disability person
PIC	-	Peripheral Interface Controller
PS2	-	Play Station 2
PWM	-	Pulse width modulation
RFT	-	Route following task
RTA	-	Road and Transport Authority
BLDC	-	Brushless direct current

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CHAPTER 1

INTRODUCTION

The title of this project is “Car Steering Control System for Disability Person”. The use of car steering may be a simple task for a healthy person but it is hard for the disability. It is difficult for the disability to steer the car steering due to their physical and healthy condition. This project is to build an easy control system to steer the car steering. In order to build the control system, we are first needed to consider the problem facing for those disability while navigate a moving car using a normal car steering. Their condition is to be considered and an alternative design is done.

A joystick is used in controlling the car steering instead of direct turning the car steering using user hands. This easier the steering handling task and even a disability may able to navigate a car using new built control system. User insert the needed commands by using arcade joystick, the signal is then send to the microcontroller (PIC118F2685) and being analyzed. The microcontroller received the signal and sends the output signal to the motor driver and drives the DC motor. The rotating motor will then drive the car steering wheel due to its mechanical construction.

1.1 PROBLEM STATEMENT

Unlike a normal person, it is a difficult task for a disability person to turn the steering wheel to navigate the car. Their actions are being limited due to their physical or healthy condition. This causes them facing many problems regarding transportation since they can't drive. These disability people could not actively participate in the society in which a person lives due to the problem facing. There are also many talented people who could make a wonderful contribution to the future of their country but lack the motivation because of mobility [1]. A number of tests have done by Rajiv Singh, Brian Pentland, John Hunter, Frances Provan J. Neurol. Neurosurg and Y. Uc, Matthew Rizzo, Steven W. Anderson, Jon David Sparks, Robert L. Rodnitzky and Jeffrey D. Dawson [2], [3] in study the problems regarding the issues of disabled in driving, there are results show that some disabled may reflect well through their mind but not their physical response during the tests. In order to put them into a safe driving condition, an easier control system needed to be introduced.

This project is done in order to solve the problems mentioned above. The solution is an easy operate joystick is use as tool in controlling car direction so the user needs only to operate a joystick to move a car. By the completion of the project, disabled is able to travel to any place independently and lives on normal life.

1.2 PROJECT OBJECTIVE

The objectives of the project are:

i. To design a car steering control system for disability person usage
ii. To study and apply DC motor applications in the system
iii. To study PIC controller applications and languages and implement into the project
iv. To design draw the project hardware using software Solidworks
v. To develop student theory and practical and enrich in communication skill

1.3 PROJECT SCOPE

The project scope including study the car steering control system, understand the operation of the parts used in constructing the system. The functions and role of each single part contribute to the system. Design and built the project hardware. Beside, the microcontroller PIC 18F2685 is studied its applications and languages. Study LINIX DC Brushless Motor's applications and operations and followed by simulate the system hardware by using software Solidworks. Apply the designed controller used to drive the car steering and lastly test the system performances.

CHAPTER 2

LITERATURE REVIEW

The literature review is done so to find related information needed in completing the project. It is done by studying the related electrical control engineering and mechanical engineering books and journals, surf the internet to get the related information and also with the help and explanation from the supervisor.

2.1 PROBLEM STATEMENT LITERATURE

The literature reviews done to identify the problem faces that result in the project progress. The literatures review have done support the project objective that mainly solving problems regarding the disabled driving issues.

Driving Lessons for the Disabled

Learning to drive is an important part of any teenager's life. With the availability of adaptive driving lessons, the feelings of accomplishment and freedom can be shared with physically disabled student drivers [8].

The article explains the disabled driving lessons and the path to getting a driver's license as a disabled person. The tests taking to get the driver license are driver aptitude assessment, vehicle adaptations, driver’s training, written test, and driving test. There are a number of vehicle adaptations that can be made to make driving possible for disabled persons.

The disabled driver will be expected to take the final driving test to get their license in their own vehicles.

Individualized Assessment of Driving Fitness for Older Individuals with Health, Disability, and Age-Related Concerns

The study identify driver strengths and limitations and options available to increase mobility independence via consideration of adaptive mobility equipment, vehicle choice, driver training, or alternative transportation if necessary [2].

The article concludes with a review of current literature that examines the claim that detailed clinical and on-road assessment, as provided by driver rehabilitation specialists, is currently the best method for assisting drivers with complex health, disability, or aging-related issues to resume or retain driving privileges.

Emirates Driving Institute introduces Disabled Driver Training in Dubai

Emirates Driving Institute (EDI), in cooperation with Road and Transport Authority (RTA), Rashid Hospital, Arabian Automobiles Nissan and a leading Swedish company, has initiated the first Disabled Driver Training Programme in Dubai for people who are unable to drive using foot pedals. There are many talented people who could make a wonderful contribution to the future of Dubai but lack the motivation because of mobility [5].

Disabled driver training program launched by EDI can add enormous value to the rehabilitation of disabled individuals. A driving license brings with it independence, self esteem and great opportunity to actively participate in the society in which a person lives.

Driving experiences of disabled drivers

This is a study on the influence of non-standard controls on return to driving after disability, including prevalence of accidents/retraining difficulties. The conclusion made are disabled drivers returning to drive using non-familiar controls had lower success and a higher proportion of accidents and/or problems with retraining than people using conventional controls [13],[15].

Adapted Vehicles Driving for the Disabled

Driving an adapted vehicle instead of being the passenger is the difference between being dependent on others for transportation and being independent. Owning an adaptive vehicle means choosing where and when you want to go to the store, to work or just out for the fun of it. Adapted vehicles can be used by paraplegics, people with spinal chord injuries, severe arthritis and anyone with limited use of their legs.

Cars with an automatic transmission can be modified into adapted vehicles by having either permanently installed hand controls or portable hand controls. A car or van with permanent controls can be driven by anyone [7]. The article supports the adaption of the vehicle used by the disabled.

Top Tips for Driving If You Suffer With a Disability

Having a medical condition or a disability does not necessarily mean that you can't or won't be able to drive. There are many disability people that suffer with a mobility problem and to find that getting out and about is becoming a real struggle. There are many people whose quality of life has improved greatly since applying for a driving license and buying disabled vehicles or having their current vehicle adapted; it can greatly improve levels of

independence and confidence. This article supports the disability in driving and encourages them in owning disabled vehicles or having their current vehicle adapted [9].

Impaired navigation in drivers with Parkinson's disease

The study tested the hypothesis that patients with mild–moderate Parkinson's disease **(**PD) commit navigation errors on a route following task (RFT) that resembles the real-world situation in which a driver must follow verbal directions to a destination. All the active and licensed drivers were tested with a battery of visual, cognitive and motor tests of abilities. Each driver also performed a RFT administered on the road in an instrumented vehicle. Main outcome variables included: number of incorrect turns, times lost and at-fault safety errors [13], [6].

The findings in this study are drivers with PD make more navigational errors than neurologically normal drivers on the road. A small number of drivers with PD performed completely normally on the RFT.

2.2 MOTOR CONTROL LITERATURE

DC motor control predictive models

DC motor speed and position controls are fundamental in vehicles in general and robotics in particular. The study presents a mathematical model for correlating the interactions of some DC motor control parameters such as duty cycle, terminal voltage, frequency and load on some responses such as output current, voltage and speed by means of response surface methodology [14].

The results obtained show that the mathematical models are useful not only for predicting optimum DC motor parameters for achieving the desired quality but for speed and

position optimization. Using the optimal combination of these parameters is useful in minimizing the power consumption and realization of the optimal speed and invariably position control of DC motor operations.

Speed Controllers

The purpose of a motor speed controller is to take a signal representing the demanded speed, and to drive a motor at that speed. The speed of a DC motor is directly proportional to the supply voltage. The speed controller works by varying the average voltage sent to the motor [11]. Figure 2.1 show the relation between motor speed and supply voltage.

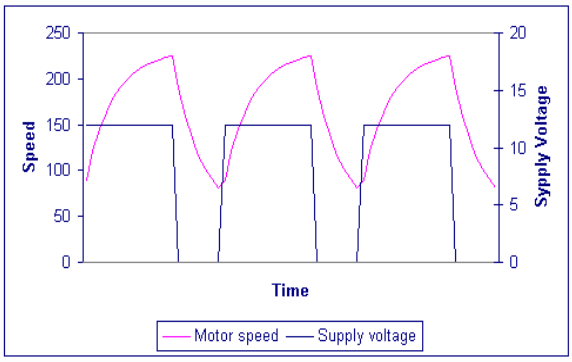

Figure 2.1: Relation between motor speed and supply voltage

If the supply voltage is switched fast enough, it won't have time to change speed much, and the speed will be quite steady. Thus the speed is set by PWM – Pulse Width Modulation.

DC Motor Speed Control

The article shows the way in controlling a DC motor though an H-bridge driver chip using the PWM output from a PIC to achieve speed control. PWM would in affect turn the motors on and off very fast resulting in an average voltage across the motors [12].