UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DESIGN & DEVELOPMENT OF VOICE COMMAND VEHICLE TURN SIGNAL SYSTEM FOR URBAN CAR CONCEPT

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

by

AFIF DANIAL BIN ALI

B071610540

970331125463

FACULTY OF MECHANICAL AND MANUFACTURING ENGINEERING TECHNOLOGY

2019

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.....

Afif Danial Bin Ali

Alamat Tetap:

Beverly Hills Apartment Phase 3 Lot J4-0

Jalan Bundusan

88300 Kota Kinabalu

Sabah

Tarikh:

Disahkan oleh penyelia:

.....

Cop Rasmi Penyelia

Tarikh:

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I declare that this thesis entitled “Design & Development Of Voice Command Vehicle Turn Signal System For Urban Car Concept” is the result of my own research except as cited in the references.

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APPROVAL

This report is submitted to the Faculty of Mechanical and Manufacturing Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Mechanical Engineering Technology (Automotive Technology) with Honours. The member of the supervisory is as follow:

Signature :…….

Supervisor Name :TS.KHAIRUL AMRI BIN TOFROWAIH

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ABSTRACT

The turn signals is one of the safety features that is mandatory for vehicles all around the world where its intended use is to show or signal intentions before making or taking a turn. Turn signals are generally operated using a lever mechanism by drivers and that way of operations has not changed for years. However, a recent studies emerged describing that the current turn signals as “defective” and also contributes to 2 million accidents annually in the United States of America alone. Innovations regarding turn signals are long overdue in this technological era where innovations are flourishing. Therefore, the aim of this project is to design voice command operated turn signals for urban car concept and develop concept of proof for it. The product is expected to innovate how turn signals are activated by using the human voice as an input instead of the hand to operate an electronical mechanism that can recognize commands to activate the turn signal. This feat is possible by using microcontroller that are based off the Arduino UNO and a voice recognition module to control turn signals. Since the idea is fairly new, an analysis to test the efficiency of the said product were conducted.

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ABSTRAK

Isyarat giliran adalah salah satu ciri keselamatan yang wajib untuk kenderaan di seluruh dunia di mana penggunaannya bertujuan untuk menunjukkan atau memberi isyarat sebelum membuat atau mengambil giliran. Isyarat isyarat biasanya dikendalikan menggunakan mekanisme tuil oleh pemandu dan cara operasi itu tidak berubah selama bertahun-tahun. Walau bagaimanapun, satu kajian baru-baru ini muncul yang menggambarkan bahawa isyarat giliran semasa sebagai "cacat" dan juga menyumbang kepada 2 juta kemalangan setiap tahun di Amerika Syarikat sahaja. Inovasi mengenai isyarat putaran telah lama tertangguh dalam era teknologi ini di mana inovasi pesat berkembang. Oleh itu, matlamat projek ini adalah untuk merangka isyarat pusingan yang dikendalikan arahan suara untuk konsep kereta bandar dan membangunkan konsep bukti untuknya. Produk ini dijangka akan berinovasi bagaimana isyarat putar diaktifkan dengan menggunakan suara manusia sebagai input dan bukannya tangan untuk mengendalikan mekanisme elektronik yang dapat mengenali arahan menggunakan suara untuk mengaktifkan isyarat putar. Pencapaian ini dapat dilakukan dengan menggunakan mikrokontroler yang berdasarkan Arduino UNO dan modul pengiktirafan suara untuk mengawal isyarat putaran. Oleh kerana idea ini agak baru, analisis untuk menguji kecekapan produk tersebut telah dijalankan.

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DEDICATION

To my beloved mother and father, Ali Bin Bahrum and Runaini Binti Abdul Mumin who have endlessly and tirelessly supported me. To my supervisor and academic advisor who have been guiding me throughout the entire journey of the project. To my all my friends that helped motivates me and all the individual in UTeM that have directly or indirectly helped towards the completion of this project.

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ACKNOWLEDGEMENTS

First and foremost I would like to praise the Almighty God for giving me the strength throughout the journey in making this project from the beginning until the completion of this project. I have gained valuable experience and knowledge from this project. I would like to express my thanks to all those who had helped me throughout the semesters. I would like to thank my wonderful supervisor Ts. Khairul Amri Bin Tofrowaih for his endless support, guidance and contribution. His broad experience in the Automotive Industry has helped tremendously in the completion of this project. I would like to thank my parents for their supports that gives me the courage and encouragement to finish the project. Last but not least, I would like to thank my friends, UTeM lecturers and those that directly or indirectly has contributed and involved in the completion of this project.

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LIST OF SYMBOL

mm	Millimeter
v	Volt
dB	Decibel
lm	Lumen
lx	lux
Ω	Ohm
℃	Celcius

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LIST OF ABBREVIATION

SAE	Society of Automobile Engineers
IDE	Integrated Development Environment
CATIA	Computer-Aided Three-Dimensional Interactive Application
NHTSA	National Highway Traffic Safety Administration
LED	Light Emitting Diode
IC	Integrated Circuit
I/O	Input/Output
SRAM	Static Random Access Memory
EEPROM	Electrically Erasable Programmable Read-only Memory
TTL	Transistor-Transistor Logic
ECU	Engine Control Unit
PWM	Pulse Width Modulation
DRL	Daytime Running Light
TX	Transmit pin
RX	Receive pin
MCU	Microcontroller Unit
ISO	International Organization for Standardization

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VCC	Voltage at the Common Collector
GND	System Ground
PDS	Product Design Specification

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CHAPTER 1

INTRODUCTION

1.1 Background

A turn signals is a device usually in vehicle that work as a mean for people to signal their intention whether they are making a turn or merging into a lane. It serves as indicator for possible hazardous manoeuvre to alert other drivers. Turn signals has evolved over the years from hand signs to the common stalk or lever operated inside the cabin. Despite being an essential feature in a vehicle and has been introduced on some of the earliest automobiles, turn signals is one of the most underutilized features on car. The possible reason for this might be from the outdated design of the conventional ones we are using now in terms of the mechanism used and this reflect on their attitude of not caring about safety. An introduction of a new design of using turn signal might encourage the increase in usage of turn signals.

The rapid technology advancement has open new windows for the automotive industry to venture into a more electronically based vehicle. Analog switches are replaced with electronic ones and becomes rare day by day. But turn signals design has stayed the same over the years with its stalk/lever design. The time has come for the old design to have an alternative new way of operation such as voice command operated system.

Since this project focus on urban concept car the voice command operated turn signals will be a suitable system to go for because it lacks the space compared with a conventional car.

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This system implemented on the urban car concept can result in better ergonomics for driver inside the cabin.

1.2 Problem statement

When it comes to accidents involving vehicles, distracted driving or driver error is usually the main culprit but according to recent studies, it may be otherwise. The turn signal as we know is vital vehicle safety feature in the automotive industry as it shows the intention of drivers whether it's for changing lanes or making a turn. As for the statistics on usage of turn signals, it is vogue until Society of Automotive Engineers (SAE) conduct a research in the United States of America on this matter that reveals a bigger problem that contributes to vehicular accidents. According to statistics published by the researcher, 25% of drivers fail to use turn signals appropriately when making a turn and 48% of drivers fail to use turn signal when changing lanes. Also, it is stated in the journal that the statistic of crashes involving turn signals neglection is supposedly higher than distracted driving in the United States. Moreover, conventional turn signals is shown as defective by the author as it has lower reliability percentage compared to other safety system in a vehicle and in need of a new reliable solution.(Ponziani, 2012)

Therefore, the conventional turn signals used in most vehicle today might not be as reliable and needed to be replaced with a new system such as voice command operated or other similar system that is possible to be acquired with today's technology advancement.

With the advancement of today's technology, the cabin of vehicle is becoming more refined such as many lever operated switches replaced with more advanced electronic switches thus making it ergonomic for drivers as well as passengers inside the cabin in terms of comfortability and safety. Less gestures inside the cabin equals to more time focusing on

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the road ahead but one thing has stayed the same is the operation of handling the turn signals with slight advancement along the years. More time than not that drivers have to manually turn on the signals with their fingers or hands. This results in less time for the hands to grip on the steering wheels and for some, not very ergonomic. Some countries such as Australia make it mandatory for drivers to always put both of their hands on the steering wheel with an exception of a manual transmission vehicle as it improves reaction and responsiveness when handling a vehicle, hence reducing distracted driving(Ryan, 2018). Voice command system will remove the movements of hands and increase the time for both hands on the steering wheel. This is a plus for urban car concept since the dimensions of the concept is smaller than that of a regular car.

1.3 Objectives

- To design voice command operated turn signals for urban car concept.
- To develop proof of concept model for voice command operated turn signals system for urban car concept.

1.4 Scope

The main concept is to design a voice command operated turn signals that will be working in an urban car concept. This involves finding a suitable electronic component for voice recognition that can be translated into the output which is the turn signals. This will involve proper circuit wiring and also coding for the system which will be done in C++ language. Next, is to design specifically for the use of urban car concept condition regarding the interior volume of the car and with a single driver set up. Made to be functional without consideration of visibility to others or any visibility criteria/standards/regulations. Maker

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UNO and a voice recognition module will be used for the speech recognition prototype along with the C++ language codes control an offshelf sequential LED strip. The voice recognition module can only recognize 1 group of commands out of the 3 groups with each group containing 5 commands.The approximate duration for completion on this product will take two semesters in estimated 8 months. The first 4 months of semester one will be focusing more on designing and researches. Development and testing will be done in the remaining 4 months of semester two.

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CHAPTER 2

LITERATURE REVIEW

2.1 Turn signals

“Direction indicators” or “direction blinkers” which is the formal term for turn signals that are usually flickering lamps located on the near left and right front and rear corners of an automobiles, also on the side fender or on the side mirrors of the vehicle. It is usually activated manually by the driver from inside the vehicle cabin to display intention to turn or lane changing when driving on public road to avoid miscommunication with other drivers.

Figure 2.1 ISO symbol for turn signals

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