UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DRIVE RIGHT: DRIVING SIMULATION TO ALERT THE DRIVER USING ARTIFICIAL INTELLIGENCE FOR PRUDENTIAL DRIVING BEHAVIOUR

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

by

NOOR ANISAH BINTI A SULAIMAN

B071610602

971206385092

FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING

TECHNOLOGY (FTKEE)

2019

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

Tajuk: Drive Right: Driving Simulation to Alert the Driver Using Artificial Intelligence for Prudential Driving Behaviour

Sesi Pengajian: 2019

Saya **Noor Anisah Binti A Sulaiman** mengaku membenarkan Laporan PSM ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM) dengan syarat-syarat kegunaan seperti berikut:

1. Laporan PSM adalah hak milik Universiti Teknikal Malaysia Melaka dan penulis.
2. Perpustakaan Universiti Teknikal Malaysia Melaka dibenarkan membuat salinan untuk tujuan pengajian sahaja dengan izin penulis.
3. Perpustakaan dibenarkan membuat salinan laporan PSM ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. **Sila tandakan (X)

☐ SULIT* Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia sebagaimana yang termaktub dalam AKTA RAHSIA RASMI 1972.

☐ TERHAD* Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan.

☒ TIDAK TERHAD

Yang benar,

.....

Noor Anisah Binti A Sulaiman

Alamat Tetap:

No 40 Jalan Laksamana,

Rumah Awam 1,

35800 Slim River.

Tarikh:

Disahkan oleh penyelia:

.....

Dr Jamil Abedalrahim Jamil Alsayaydeh

Cop Rasmi Penyelia

Tarikh:

*Jika Laporan PSM ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali sebab dan tempoh laporan PSM ini

DECLARATION

I hereby, declared this report entitled Drive Right: Driving Simulation to Alert the Driver Using Artificial Intelligence for Prudential Driving Behaviour is the results of my own research except as cited in references.

Signature: ……

Author : Noor Anisah Binti A Sulaiman

Date:

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 (Computer Systems) with Honours. The member of the supervisory is as follow:

Signature: …….

Supervisor : Dr Jamil Abedalrahim Jamil Alsayaydeh

Signature: …….

Co-supervisor: Dr Adam Wong Yoon Khang

ABSTRAK

Dalam laporan ini, siasatan dilakukan untuk mengenal pasti dan menganalisis kelakuan pemandu di jalan raya. Siasatan yang mendalam dilakukan untuk mengenal pasti bagaimana Kecerdasan Buatan boleh digunakan sebagai penyelesaian untuk mengatasi atau mengelakkan kemalangan yang disebabkan oleh kelakuan berhemat pemandu di jalan raya. Simulator pemandu ini digunakan untuk mencipta tingkah laku yang buruk. Dari senario pra-kemalangan NHTSA, 3 senario dipilih. Semua senario ini akan disimulasikan untuk melihat output dan kesan. Rangkaian saraf bertindak sebagai pengelas untuk senario. Fungsi TensorFlow yang merupakan model pengesanan objek API.A prototaip peranti dibangunkan untuk mengenali senario pra-kemalangan dan akan memberi amaran kepada pemandu untuk mengelakkan. Model TensorFlow akan dilatih untuk melaksanakan senario. Prototaip boleh membantu pemandu memandu dengan selamat. Model yang berbeza akan digunakan dalam pengesanan objek, Prestasi prototaip boleh diuji dengan pemandu di jalan raya. Dari pengujian keputusan dapat disimpulkan kinerja setiap model dan prototipe terakhir.

ABSTRACT

An investigation is conducted in this report to identify and analyze driver behavior on the road. A more in-depth investigation is carried out to identify how to implement Artificial Intelligence as a solution to resolve or avoid collisions induced by drivers ' prudential actions on the road. The bad behavioral was recreated by this driver simulator. Three scenarios were chosen from NHTSA's pre-crash scenarios and observe the performance and effects after all these scenarios be simulated. The neural network functions acts as a scenario classifier. TensorFlow's feature, which is object detection model API. A prototype unit created to recognize pre-crash scenarios and warn the driver to avoid them. TensorFlow models for the implementation of the scenarios to be received training. The model will help drivers to be alert and safely ride on the road. Different models will be used to detect objects design output can be evaluated on the road with driver. The performance of each model and the final prototype can be concluded from the test results.

DEDICATION

To my beloved parents, thanks for the help, concern and understanding while I'm in developing this project.

ACKNOWLEDGEMENTS

I would like to thanks my supervisor, Dr Jamil Abedalrahim Jamil Alsayaydeh for his guiding during my final year project period so that I will be able to done through the Projek Sarjana I subject successfully. I also would like to thanks my co-supervisor, Dr Adam Wong Yoon Khang for his concern and care about my project during my final year project period. Besides that, I would like to give my appreciation to my final year project panels, Sir Aiman Zakwan Bin Jidin and Madam Dayanasari Binti Abdul Hadi for giving their time to observe my presentation and evaluate my work. I want to thanks them because giving a recommendation and advices in this project.

In addition, I would like to thanks to my beloved parents. My father Mr. A Sulaiman and my mother, Mrs. Sarifah for their understanding and giving support during my hardship. Thanks also to them for their patience to understand me.

Lastly, I would like to thanks my beloved friends at Universiti Teknikal Malysia Melaka who giving me support, advices, and help me when I need them throughout my project.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS

PCA Principal Component Analysis

FYP Final Year Project

LDAS Lane Departure Assistance Systems

NHTSA National Highway Traffic Safety Administration

MIROS Malaysian Institute of Road Safety Research

ADAS Advanced Driver Assist Systems

PCAM Pedestrian Crash Avoidance/Mitigation (US)

DAS Driver Assistance System

FPS Frame Per Second

ITS Intelligent Transportation System

CHAPTER 1

INTRODUCTION

1.1 Background

Over the past 30 years, autonomous vehicle growth has made quick progress, but major challenges persist, including the ability to review that systems are safe and robust to perform. Nonetheless, semi-autonomous security systems can already gain from this progress today. A good example is the Lane Departure Assistance Systems (LDAS), which already has great potential on their own to improve traffic safety. Many major car manufacturers currently offer several types of lane keeping aid. The spectrum varies from pure collision avoidance systems to lane servicing systems that actively maintain the car in the middle of the lane. D Hoehener (2016). These are sight-based systems which use the vehicle's place in the lane, its heading and a limited look-forward horizon (focused on the capability of the sensor) to ascertain whether alert or steering input is needed.

Techniques can be found primarily in the autonomous vehicles literature to make sure the vehicle continues to remain in a provided line of traffic. As they are constantly trying to keep the automobile in the middle of the lane, this very safety equipment is commonly referred to as lane support structures. One way to accomplish this objective would be to consider the task of getting the lane as a stabilization challenge where one attempts.

Advanced driver assists systems (ADAS) also support the person who drives the car during the travelling. They need to increase the safety features in vehicle and specifically in traffic safety if it is engineered in such a secure human-machine operating

system. Major road accidents were caused by faulty. Advanced driver support technologies are automation, adaptation and improvement systems for car safety and driving. By reducing human error, the automatic system produced by ADAS to the automobile have been shown to minimize traffic fatalities. Security features are aimed at preventing crashes and fatalities by offering systems that warn the driver to possible issues, or by applying protections and assuming vehicle control to prevent injuries and deaths.

Optimized functionalities can optimize lighting, include automatic braking and lane departure warning, minimize pedestrian crash avoidance/mitigation (PCAM), integrate navigation and traffic alerts, link up to gadgets, notify drivers whenever the potential risk is high, warning road alert system for departure, centering the vehicle on the lane automatically and view objects or people in the peripheral vision. The latest vehicles have developed hardware compatibility system such as digital stability control, warning given when the driver moves to another the lane marking, parking sensors and brake assist. Mechanical alignment adjustments can affect these systems. This kind of systems can be influenced by retailers to allow digital restarts for such technologies, ensuring the tyre aligner to meet these regulatory standards after a mechanical calibration is performed.

1.2 Problem Statement

According to MIROS, percentage of traffic accidents are occurred from human error are 80%. In addition, the loss of 65,850 individuals in road crashes between 2004