

INTELLIGENT TRAFFIC SIGN
RECOGNITION SYSTEM FOR AUTONOMOUS
VEHICLE NAVIGATION (ITSRS)

LAW JIA SWEE

BACHELOR OF COMPUTER SCIENCE

UNIVERSITI MALAYSIA PAHANG



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(Student's Signature)

Full Name : LAW JIA SWEE

ID Number : CB15138

Date : 12 DECEMBER 2018

Intelligent Traffic Sign Recognition System for Autonomous Vehicle Navigation
(ITSRS)

LAW JIA SWEE

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ABSTRAK

Kenderaan autonomi biasanya memberikan pengiktirafan tahap tertentu ke atas pengesanan halangan, pengesanan jalan dan pengiktirafan tanda lalu lintas. Terdapat sistem yang dapat memberikan bantuan yang sempurna pada scenario pertama dan kedua. Walau bagaimanapun, pengiktirafan tanda lalu lintas adalah bidang di mana orang ramai tidak banyak belajar. Tanda-tanda lalu lintas memainkan peranan penting dalam menyampaikan mesej penting kepada pengguna jalan raya. Tanda Lalulintas direka dengan menggunakan warna dan bentuk yang berbeza untuk menarik perhatian pengguna jalan raya. Kadang-kadang, ia juga membawa kebingungan. Algoritma yang telah dikaji dalam karya ini telah dipisahkan menjadi dua bahagian. Bahagian pertama akan dijalankan dengan menggunakan Microsoft Azure Custom Vision untuk melatih model yang boleh membezakan tanda lalu lintas. Kemudian diikuti dengan menggunakan Android Studio untuk klasifikasi selanjutnya.

ABSTRACT

An autonomous vehicle generally provides certain level of recognition on obstacle detection, road detection and traffic sign recognition. There are existed system that can provide perfect assistance on the first two. However, traffic sign recognition is a field where people do not study much. Traffic signs play a key role on delivering important messages to the road users. Traffic Sign is designed by using different colors and shapes to attract the attention of road user. Sometimes, it brings confusion too. The algorithm studied in this paper has separated into two parts. First part will be carried out by using Microsoft Azure Custom Vision to train the traffic sign classifier. Then consume the model file in mobile application by using Android Studio.

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LIST OF SYMBOLS

SBPWM	Simple Boost Pulse Width Modulation
ZSI	Z source inverter
UML	Unified Modelling Language
SQL	Structured Query Language
UC	Use Case
GC	Gantt Chart
SSD	Solid-State Drive
RAM	Random Access Memory
GPS	Global Positioning System
SRS	Software Requirement Specification
SDD	Software Design Document

LIST OF ABBREVIATIONS

SBPWM	Simple Boost Pulse Width Modulation
ZSI	Z source inverter

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Autonomous vehicle, this is where computer starts to act a key role in travelling where people hate to drive a very long distance by their own. It is a vehicle that is capable to detect the surrounding and reach our destination without human input but only the destination name. There are a lot of techniques and algorithms to help the autonomous car to detect their surroundings. One of the popular techniques will be computer vision where computer can recognize and classify the substances in an image according to defined tags.

Computer vision is a technology and technique to help computer to become high-level understanding from some data sources such as images, videos and many more. The computer with computer vision can even achieve what our human visual system can do. Artificial intelligent has recently become a trend in all fields. Especially for industry field, the industry who uses automation production is getting more. A computer is always ready to follow command and instruction from the user to start working on the production. It can understand human's natural language like talking to people, but we are not. This scenario shows how amazing an artificial intelligent technology has been applied in the industry aspect and it also proves that the technology nowadays is enough mature to be implemented in our daily life like driving.

Although computer vision plays key role in autonomous driving, computer vision needs to perform more tasks to get more better results as autonomous driving is rising as a trend where people start thinking computer can do better work than human. For getting the most reliable data, there are different approaches can be applied and tested out: color segmentation, shape segmentation, deep neural networks, TensorFlow and many more.

For now, autonomous driving is only available for those luxury car brands like Tesla and BMW. As mentioned, TensorFlow is one of the best practices to make computer vision where it is an open source software library for dataflow programming or as known as machine learning software library. Besides that, TensorFlow model can run in an optimized way on android devices. The performance of the application is standardized in the range of 60ms to 130ms.

The objective of this paper is to study the road sign recognition algorithm of existing system and implement it in any other cars where there is no autonomous driving feature. It could be an app which is working in a smart phone or any small board or device where it can perform simple processing tasks. If a computer or system is capable to do such analysis on road, it could be used as a driving assistant to road users especially for those who are easy to get distracted. Some drivers are easy to get distracted while driving as they can only focus their vision on the road. Distraction that cause the driver to look away from the road can be as simple as reading a text message or receiving calls (DiBella Law Offices, 2015).

In Malaysia, we need to have a driving license to make us be able to drive on road by going through some driving test. However, there are some road signs which will really cause confusion to our road users (StarMetro, 2008). Some places do not even place the signs ideally and many people do not even notice the signs. Furthermore, some traffic signs are not applicable to drivers who are having colour blindness as red-green colour deficiency is the most common form of colour blindness.

This project will be worked on both hardware and software which applies TensorFlow, speaker and a camera device (phone camera). More than 5 requests will be made within a second (200ms per request) as accident can happen within a second while driving (Team, 2018). Besides, this project aims to analyze all road signs while passing by and prioritize the most important road sign among the others. Nevertheless, getting the meaning of the road signs correctly and analyze the traffic lights is one of the objectives to ease the confusion of colour for drivers who are suffering from colour blindness (Bailey, 2018).

1.2 PROBLEM STATEMENT

Nowadays, people love travelling with family and their loved ones. There is one role that we should never forget, a driver. To reach destination, we need to have transportation to bring us there unless the distance is short enough that we can choose to walk. We use road to travel here and there are some traffic signs will be applied to notify or bring messages to the road user like speed limitation, U-turn and many more. The main problem of current situation is detection problem occurs while speeding on road. When driver is speeding on road, they will ignore some important signs because the speed is too fast for them to react. Road signs supposed to assist road user on using the road and reach their destination safely. The chance of getting accident happens will increase if they ignored those important road signs.

The next problem is classification problem occurs to road signs at the roadside. Although all the road users went through the license test where road signs learning is also one of the topics, but road users need time to think and analyze the meaning of the road signs. There are some cases that more than 3 road signs being placed at the same place. It causes confusion to the road users and increase the time to classify the road signs.

The last problem is driving support problem occurs while the drivers is focusing on driving. For most of the time, drivers need to be very alert on the road junction while driving since their hands should always be placed at the steering wheel (Scott Engle, 2014). So, a verbal and voice output are a nice idea for drivers that they can focus on driving and their device will notify them if there are any important road signs.

1.3 OBJECTIVE

The objectives of the research are:

- i. To detect road signs by using the algorithm of road sign analysis.
- ii. To classify the road signs correctly.
- iii. To support verbal and voice output to the drivers.

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