



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

TRAFFIC CONGESTION DETECTION AND ALERT USING PIC

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor's Degree in Electronics Engineering Technology (Telecommunications) (Hons.)

by

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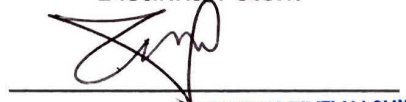


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ABSTRAK

Kesesakan jalan raya terus menjadi masalah utama di kebanyakan bandar di seluruh dunia. Oleh kerana rangkaian jalan raya yang tidak dirancang dengan baik, ia terjadi dikawasan membangun ialah kehadiran kawasan kecil yang biasa terjadinya kesesakan, pengurusan trafik yang teruk di sekitar kawasan ini berpotensi menyebabkan kesesakan lalu lintas yang panjang. Projek ini dapat memberi pilihan kepada penunggang atau pemandu dalam mengambil jalan alternatif yang tidak mempunyai kesesakan lalulintas dan untuk mengelak daripada terperangkap di dalam kesesakan lalulintas. Ini membantu dalam mengurangkan kesesakan di bahagian persimpangan. Tujuan utama projek ini adalah untuk merekabentuk satu sistem yang boleh mengesan dan memberi amaran kepada penunggang atau pemandu untuk mengelakkan daripada kesesakan lalulintas di persimpangan. Projek ini boleh dilaksanakan di lorong dan persimpangan yang mempunyai kesesakan lalulintas yang berat. Logam sensor diletakkan di jalan raya untuk memantau kesesakan lalu lintas. Pada setiap persimpangan, frekuensi radio (RF) modul akan digunakan bersama-sama dengan skrin LCD di litar penerima untuk memaparkan mesej. Apabila kesesakan dikesan oleh sensor logam, pengawal PIC dan mesej akan dipaparkan pada skrin LCD. Dengan itu, penunggang atau pemandu itu dimaklumkan kepada keadaan kesesakan terlebih dahulu dan dapat mengurangkan kesesakan. Analisis telah dijalankan di luar dan keputusan menunjukkan bahawa sistem ini dapat berfungsi pada jarak maksimum 60 meter. Ini membuktikan bahawa projek ini telah berjaya direka dan dilaksanakan.

ABSTRACT

Road traffic jams continue to remain major problem in most cities around the world. Due to poorly planned road networks, a common outcome in many developing regions is the presence of small critical areas which are common hotspots for congestion, poor traffic management around these hotspots potentially results in lengthwise traffic jams. This project able to give choices to the rider or driver in taking an alternate congestion free route and to avoid being stuck in the traffic jam. This helps in reducing congestion at junction. The main purpose of this project is to design a system that can detect and give alert to rider or driver to avoid the traffic congestion at junction. This project can be implemented in the lanes and junctions which carry heavy traffic. Metal is sensor is placed on road to monitor the traffic congestion. At each junction a radio frequency (RF) module will be used along with LCD screen at receiver circuit to display the message. When congestion is detected by metal sensor, PIC controller and the message will be displayed on the respective LCD screen. Thus the rider or the driver is alerted to the congestion condition beforehand and able to divert his way to non-congestion road. This will help to reduce congestion. Analysis was conducted in outdoor and results shows that the system able to function at maximum distances of 60 meters. That is proofed that this project was successfully designed and implemented.

DEDICATION

I would like to express my greatest gratitude to Madam Norlezhah Binti Hashim from Faculty Technology Engineering, supervisor of this project for her advices, dedication, efforts and tremendous support. Special thanks to my peers for their assistance and support throughout this project.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

PIC	-	Peripheral Interface Controller
LCD	-	Liquid Crystal Display
RF	-	Radio Frequency
VANET	-	Vehicular Ad Hoc Network
GSM	-	Global System for Mobile Communications
Tx	-	Transmitter
Rx	-	Receiver
USART	-	Universal Synchronous a Synchronous Receiver Transmitter

CHAPTER 1

INTRODUCTION

1.0 Introduction

This chapter explains about the background, the statement of the purpose, problem statement and scopes of this project.

1.1 Background

Traffic congestion has been one of the fundamental glitches faced by modern cities since the wide usage of automobiles. Just a normal few minutes trip to the facilities store may take up to half an hour due to traffic jam or slowdown (Arnaout & Khasawneh 2010). In Malaysia, many traffic congestion problems faced by motorist, residents and commercial operations in urban areas. This is because the economic development being mirrored an equally high level of car ownership per capital. According to Malaysian Institute of Road Safety Research, vehicle population in Malaysia on 31 December 2011 shows the highest state in Malaysia used the vehicle is a Wilayah Persekutuan Kuala Lumpur.

This is urban area contribute to high congestion compared to other state. As of December 31, 2011, there were 21,401,269 vehicles registered with the JPJ. These include motorcycles, motorcars, buses, taxis, rental vehicles, goods vehicles, excavators, and other vehicles for which registration is required. All data based on statistics supplied by the JPJ.

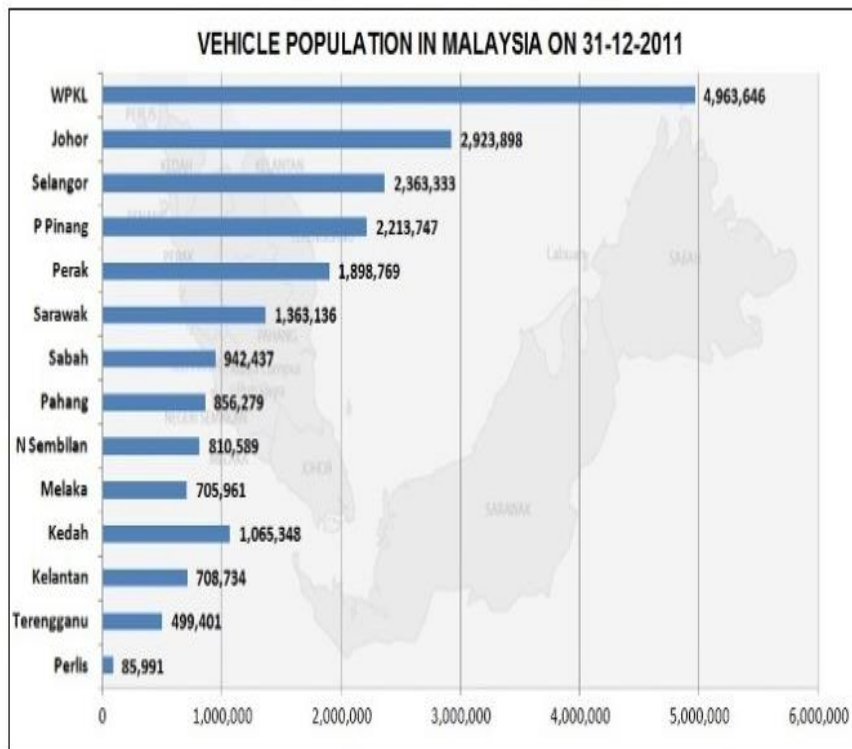


Figure 1.0: Vehicle population in Malaysia on 31st December 2011.

There are many reasons why road users suffer traffic jams every day. One of these is the rapid growth of the population (Mandal et al. 2011). According to Malaysian Institute of Road Safety Research, The table below shows that the number of cars is increasing annually.

Table 1.0: Number of Cars Produced in 1999 until 2013.

Year	Cars Produced
2013	65,140,268
2012	63,069,541
2011	59,929,016
2010	58,264,852
2009	47,772,598
2008	52,726,117
2007	53,201,346
2006	49,918,578
2005	46,862,978
2004	44,554,268
2003	41,968,666
2002	41,358,394
2001	39,825,888
2000	41,215,653
1999	39,759,847

A further point is that there are more women drivers and younger drivers today than in the past. The increase in the number of trucks and commercial vehicles also causes traffic congestion. These vehicles move very slowly, sometimes stopping to unload goods, and blocking traffic. Road works are another major problem that can lead to streets being very crowded (Mandal et al. 2011). With over 3 million cars registered in the Federal Territory of Kuala Lumpur, which is only 243 square km/s in size, it is not surprising that there is severe congestion daily.

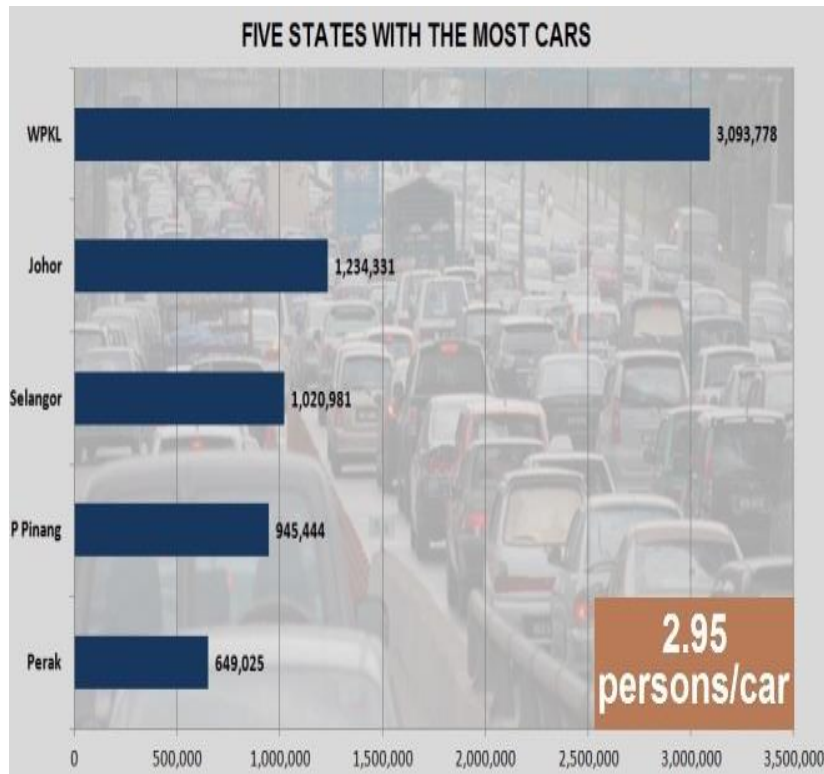


Figure 1.1: The average of 2.95 persons per car refers to the national average and is based on a projected population figure of around 28.725 million shown on the website of the Statistics Department.

“Traffic congestion detection and alert using PIC” is a project that alerts the driver regarding the traffic congestion condition. It can be implemented in the lanes and junctions which carry heavy traffic. Sensors are placed on roads to monitor the traffic congestion. At each junction a transmitter and receiver will be used along with LCD screen to display the message. When congestion is reported an interrupt is sent to the controller and the corresponding alert. The message will be displayed on the respective LCD screen. Thus the rider or the driver is alerted to the congestion condition beforehand. This helps the driver in diverting his way from the traffic.

1.2 Statement of the Purpose

There are several factors that contribute to the occurrence of traffic congestion and the rapid increase in the numbers of private automobile ownership due to the development of the country and the economy is certainly an undeniable one. From that, the purpose of the project is to design a system that can detect and give an alert regarding the traffic congestion to rider or driver before passing the junction. The second objective is to analyse the system in terms of reception of distances and delay measurement.

1.3 Problem Statement

Road traffic jams continue to remain a major problem in most cities around the world. Due to the poorly planned road networks, a common outcome in many developing regions is the presence of small critical areas which are common hotspots for congestion, poor traffic management around these hotspots potentially results in lengthwise traffic jams. Based on the project objective, the ability for a driver to know the traffic conditions on the road ahead will enable him or her to seek alternate routes. Otherwise, there can save time and fuel. When many drivers have this ability, traffic congestions, specifically those related to localized incidents such as accidents or temporary disruptions will be less severe and only the vehicle in the immediate vicinity of the incident, at the time of the incident, will be affected. This would lead to a much more efficient use of our road infrastructure. This project able to give choices to the riders or driver in taking an alternate congestion free route and to avoid being stuck in the traffic jam. This helps in diverting the traffic and hence reducing congestion.

1.4 Scopes

This project is focused on traffic congestion for a simple model of traffic to detect congestion using radio frequency. In particular, this project will be implemented in the lanes and junctions which carry heavy traffic. More complex road layouts and traffic scenarios are a subject for future work, however the general ideas presented in this work for congestion detection and propagation, as well as the simulation and visualization tools developed can be extended to more complex traffic models. This project is using radio frequency (RF) link to transmit and receive the signal. The reason to use the RF is due to lower cost, the range, reliability and more security compare to another application such as Bluetooth, VANET network and GSM. This project also used metal sensors to detect traffic congestion. Many types of sensor can use in this project such as dual loop detectors, image sensors and reed switch as a sensor but in this project only use the metal detector. The next scope of this project is the maximum detectable distances between the junction and metal detector are 60 meters. Other than that, microprocessor use in this project is a PIC16F877A. PIC16F84 and PIC16F877A are the basics of microcontrollers. Compared both, the PIC16F84 does not support USART (Universal Synchronous Asynchronous Receiver Transmitter). Therefore, it cannot perform serial communications such as RS-232 (comport) communications unless very unconventional attempts are made to create it in firmware (software programmed into the chip).

1.5 Conclusion

There are many reasons why road users suffer traffic jams every day. Road traffic jams continue to remain major problem in most cities around the world. Due to poorly planned road networks, a common outcome in many developing regions is the presence of small critical areas which are common hotspots for congestion, poor traffic management around these hotspots potentially results in lengthwise traffic jams. This project able to give choices to the rider or driver in taking an alternate congestion free route and to avoid being stuck in the traffic jam. This helps in reducing congestion at junction. The main purpose of this project is to design a system that can detect and give alert to rider or driver to avoid the traffic congestion at junction. This project is focused on traffic congestion for a simple model of traffic to detect congestion using radio frequency. This project also can be implemented in the lanes and junctions which carry heavy traffic.

CHAPTER 4

RESULT AND DISCUSSION

4.0 Introduction

In this chapter presents the output of the designed system as well as analysis was conducted in outdoor environment to test and verify the designed system. Other than that, this chapter have the circuit operation, the diagram for the prototype, experiment Setup, analysis of findings and the output at the LCD screen.

4.1 Circuit Operation

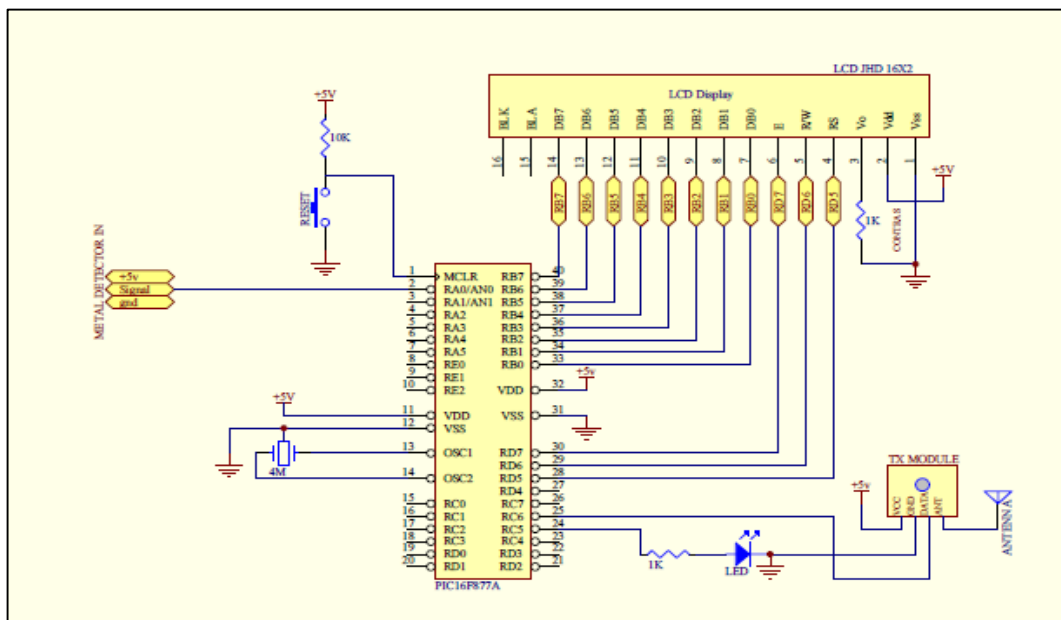


Figure 4.0: Transmitter Circuit