

WIRELESS VEHICULAR COMMUNICATION NETWORK USING NCTU
NETWORK SIMULATOR(NCTUns)

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Tajuk Projek : WIRELESS VEHICULAR COMMUNICATION NETWORK USING
NCTU NETWORK SIMULATOR (NCTUNS)

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DEDICATION

I would like to dedicate all the rewards and success from this project to my parents. They are all the way behind me to encourage me to full fill this projects requirement. This made me more energetic and creates enthusiasm in me to finish this project in order to complete my degree program.

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Thank You.

Regards,

MATHIVAANAN A/L MARIAPPAN

ABSTRACT

Wireless Vehicular Communication Network is the access able medium for the Intelligent Transportation System (ITS) where it enables to transmit data and receive data between vehicle to vehicle (V2V). The main idea of this project is to design the vehicular movement that coordinates with the wireless communication network and able to perform and evaluate the vehicular movement in particular area. This concept could not be evaluated in real life application with the actual equipment. This is due to the highly costly in terms of the wireless setup and the vehicle to use for the measurement for data collection. Moreover the vehicle speed and setup towards the data exchange is difficult to setup due the in consistent in speed and danger in application. Over look into the issue arise for this project NCTU Network Simulator (NCTUns) is used to design the Vehicular Movement and Wireless Communication Network. In addition NCTUns is the Graphical User Interface (GUI) that able to design and integrate the Vehicular Movement and Wireless Communication Network on the certain area of extracted map. Moreover the results obtain from the simulation will enable to study on the data transmitted and collected between vehicles.

ABSTRAK

Rangkaian Wayerles untuk membina komunikasi di antara kenderaan adalah satu sistem baru yang diwujudkan demi konsep Sistem Pengangkutan Pintar yang dapat mengawal kecelakaan semasa memandu. Salah satu faktor yang penting dalam membina rangkaian komunikasi antara kenderaan adalah mewujudkan sistem komunikasi wayerles untuk menghantar dan menerima data daripada kenderaan. Data ini mengenai situasi dan posisi kenderaan tersebut dalam kandungan perjalanan di sesetengah tempat. Dalam realiti sumber untuk membina sistem ini agar sukar dimana ia perlukan beberapa cubaan yang boleh membahayakan dan amat berisiko tinggi. Malahan perbelanjaan untuk membina sistem wayerles juga amat tinggi disebabkan ia melingkumi antenna, sistem memantau lokasi dan situasi kenderaan. Oleh hal demikian satu program yang dikenali NCTUNS di gunakan untuk menjayakan projek ini. NCTUNS adalah program dimana dapat membina sistem wayerles dan dapat membina sistem untuk kenderaan. Malahan ia juga dapat membuat analisis berkenaan wayerles sistem dan pergerakan kenderaan di lokasi yang di tetapkan.

CONTENTS

CHAPTER	ITEMS	PAGES
	PROJECT TITLE	i
	PERAKUAN	iii
	DEDICATION	v
	ACKNOWLEDGEMENT	vi
	ABSTRACT	vii
	ABSTRAK	viii
	TABLE OF CONTENTS	ix
	LIST OF TABLES	xiii
	LIST OF FIGURE	xv
	APPENDIX	xviii
I	INTRODUCTION	
	1.1 Project Introduction	1
	1.1 Project Objectives	2
	1.3 Scope of Project Report	2
	1.4 Problem Statement	3
	1.5 Methodology	4
	1.5.1 Thesis Outline	5

II LITERATURE REVIEW

2.1	Introduction	6
2.2	Literature Review on Wireless Vehicular Communication	7
2.3	Literature Review on Wireless Communication Standards	11
2.4	Wireless Access in Vehicular Environment (WAVE)	13
2.5	Dedicated Short Range Communications (DSRC)	16
2.6	Literature Review on NCTU Network Simulator (NCTUs)	22
2.7	Propagation Channel Model	26
2.8	Path loss	27
2.9	Fading Models	27
2.10	Standard deviation	28

III METHODOLOGY

3.1	Introduction	29
3.2	The Installation of desired software	30
3.3	Background Graph Scaling	32
3.4	The HOST Setting	33
3.5	Mobile Node Setting	35
3.6	Wireless Parameter Setting	36
3.7	Transmitter Antenna Setting	37
3.8	Receiver Antenna Setting	38
3.9	Propagation Channel Model	38

3.10	Node Connectivity Display	39
3.11	Node Connectivity Determination	39
3.12	The Network Protocol	40
3.13	Simulation	41

IV RESULTS AND DISCUSSIONS

4.1	Introduction	42
4.2	Preliminary Results and Discussion For 2.0m Antenna Height	44
4.3	Evaluation on Antenna Height and the Propagation Model Channel	52
4.4	Theoretical Model with Antenna Height 0.5m	53
	4.4.1 Transmission of Collision Packet	53
	4.4.2 Transmission of Drop Packet	55
	4.4.3 Throughput of Incoming and Outgoing From KB/s HOST in	57
4.5	Empirical Channel Model COST 231 HATA for 0.5m Antenna Height	59
	4.5.1 Transmission of Collision Packet	59
	4.5.2 Transmission of Drop Packet	61
	4.5.3 Throughput of incoming and outgoing from the HOST in KB/s	63
4.6	Theoretical Channel Model for Antenna Height 1.0 meter	65
	4.6.1 Transmission of Collision Packet	65
	4.6.2 Transmission of Drop Packet for 1.0 meter Theoretical Channel Model	67
	4.6.3 Throughput of Incoming and Outgoing From HOST in KB/s	70
4.7	Antenna Height 1.0m for Empirical Channel Model	72

4.7.1	Transmission of Collision Packet	72
4.7.2	Transmission of Drop Packet	74
4.7.3	Throughput of Incoming and outgoing from the HOST in KB/s	76
V	CONCLUSION AND SUGGESTION	
5.1	Conclusion	78
5.2	Suggestion	80
	REFERENCE	82
	APPENDIX	85

LIST OF TABLES

NO	TITLE	PAGE
3.1	Transmitter Antenna Setting	37
3.2	Receiver Antenna Setting	38
4.1	Speed Profile for Mobile Nodes	42
4.2	Collision Packet Transmission from Mobile Node	44
4.3	Drop Packet Data (Drop the Mobile Node speed)	47
4.4	Throughput of Incoming and outgoing of Data from Host (KB/s)	50
4.5	Transmission of Collision Packet for 0.5m Theoretical Model	53
4.6	Transmission of Drop Packet for 0.5m Theoretical Model	55
4.7	Throughput of Incoming and Outgoing From HOST in KB/s for 0.5m Theoretical Model	57
4.8	Transmission of Collision Packet for 0.5m Empirical Model COST 231 HATA	59
4.9	Transmission of Drop Packet for 0.5m Empirical Model COST 231 HATA	61

4.10	Throughput of Incoming and Outgoing From HOST in KB/s for Empirical Model COST 231 HATA Transmission of Collision Packet for 1.0m Theoretical	63
4.11	Channel Model	65
4.12	Transmission of Drop Packet for 1.0m Theoretical Channel Model Throughput of Incoming and Outgoing From HOST	67
4.13	in KB/s for 1.0m Theoretical Model Transmission of Collision Packet for 1.0m Empirical	70
4.14	Model COST 231 HATA Transmission of Drop Packet for 1.0m Empirical	72
4.15	Model COST 231 HATA Throughput of Incoming and Outgoing From HOST	74
4.16	in KB/s for 1.0m Empirical Model COST 231 HATA	76

LIST OF FIGURE

NO	TITLE	PAGE
2.2	Animated version of the Wireless Vehicular Communication Network	8
2.3	Electronic Display Board Based on RSU	9
2.4	Architecture of the WAVE	15
2.5	DSRC Channel Allocation	18
2.6	Communication Between RSUs and OBUs	20
2.7	Communication between the OBU and RSU in Reality	21
2.8	Interface protocol stack for Mobile Node and Wireless Network	24
3.1	MITC Junction Map	32
3.2	Simulation Scaling Parameter	33
3.3	HOST Setting	34

3.4	Scaling the HOST to Real Life Application	34
3.5	Mobile Node Setting Parameter	35
3.6	Wireless Setting Parameter	36
3.7	The Network Protocol Diagram	40
3.8	Complete Simulation of Mobile Node and Wireless Network	41
4.1	Graph for Transmission of Collision Packet	46
4.2	Graph of Drop packet	49
4.3	Throughput of Incoming and Outgoing of Data from Host,(KB/s)	51
4.4	Transmission of Collision Packet for 0.5m Theoretical Model	54
4.5	Transmission of Drop Packet for 0.5m Theoretical Model	56
4.6	Throughput of Incoming and Outgoing From HOST in KB/s for 0.5m Theoretical Model	58
4.7	Transmission of Collision Packet for 0.5m Empirical Model COST 231 HATA	60
4.8	Transmission of Drop Packet for 0.5m Empirical Model COST 231 HATA	62
4.9	Throughput of Incoming and Outgoing From HOST in KB/s for Empirical Model COST 231 HATA	64
4.10	Transmission of Collision Packet for 1.0m Theoretical Model	66
4.11	Transmission of Drop Packet for 1.0m Theoretical Model	68
4.12	Throughput of Incoming and Outgoing From HOST in KB/s for 1.0m Theoretical Model	71

	Transmission of Collision Packet for 1.0m Empirical Model	
4.13	COST 231 HATA	73
	Transmission of Drop Packet for 1.0m Empirical Model	
4.14	COST 231 HATA	75
	Throughput of Incoming and Outgoing From HOST in KB/s	
4.15	for 1.0m Empirical Model COST 231 HATA	77

APPENDIX

NO	TITLE	PAGE
A	Installation Method of NCTUns	85
B	Wireless system code	87
C	Scenario file	88

CHAPTER I

INTRODUCTION

1.1 Project Introduction

Wireless Communication has its own landmark in this era of technology due to its flexibility and mobility in application for network in reality. Wireless Vehicular Communication Network is one of the important parts in Intelligent Transportation System (ITS) for its function on transmitting data and collecting data.

Basically ITS will provide communication between vehicular to vehicular and vehicular to the road side infrastructure node such as speed limit message, road congestion, and safety information when on road. This system is an integrated system that includes the On Board Unit (OBU) and Road Side Unit (RSU).

In conjunction to that the NCTU Network Simulator (NCTUns) is introduced and applied in this project to design the Network and to construct the Road side infrastructure vehicular communication. Moreover this application also has to simulate and evaluate for the real application for real life system.

1.2 Project Objectives

The Objectives of the project are:

- a) To Design Vehicular Movement and Wireless Communication Network.
- b) To Integrate the Vehicular Movement and Wireless Communication Network.
- c) To Evaluate the Performance of Vehicular Movement and Wireless Communication Network

1.3 Scope of Project Report

The Scopes of this project focus on the designing the car movement on the MITC road side. This will be done by deploy the car on the extracting map of MITC on the NCTUns Software.

The other scope is to design the Wireless Communication Network that based on the IEEE 802.11p. This Wireless application is merged with the Dedicated Short Range Communication (DSRC) network with range from 5.850 to 5.925 GHz bands with bandwidth of 75 MHz based on line of sight of 1km with maximum speed of 140km/hr. Wireless Access in Vehicular Environment (WAVE) also take part in this

wireless protocol to transmit the signals via Road Side Unit (RSU) to On Board Unit (OBU)

Besides that the car movements have to integrate with the wireless communication protocol that has been set along the road side to transmit and receive the data or messages. This will do by the On Board Unit (OBU) that represents by the car and Road Side Unit (RSU) represents by the infrastructure.

In addition this design must be able to simulate and evaluate the data transmitted regarding the safety warnings and data transmitted among the vehicles. This will be study by executing the graph based on the data transmitted and received through a period of time.

1.4 Problem Statement

The number of vehicles increases in our nation as annually due to the individual priority. Proportional to that the traffic conjunction and traffic accident increases day by day. This evaluation is due to the lack of information regarding the traffic element that based on the Intelligent Transportation System (ITS). The ITS will enable to transfer the data regarding the road condition and safety towards the driving attitude. In conjunction to that the attitude of driving can be change according to the geographical situation.

The configuration of the system into real life will bring along with the wireless technology and networking system for vehicle. The setting of the wireless system and network coverage will be expensive and required multiple tasks to be experimented.

1.5 Methodology

First of all, before go into the project the title and the requirements of project have to understand clearly. This will enable to conduct the project request and have flow as well as right guide line to refer when facing problem regarding the project carried. Then literature review is compulsory for the period of project carried out to understand more in detail about the measurement and ideology of project requirement.

As part of learning and understands the project in detail verified the software required and installation process in conducted with the aid of the supervisor. The Software required are Fedora and NCTU Network simulator (NCTUuns). Both of the software installation required coding to handle. There are some problem regarding the version and application that has been rectify from the supervisors advice.

The NCTUuns software is newly developed software for network simulator and emulator that has unique features. This software runs on Linux and it has complete package of designing and integrating the signal agent with network. After the complete installation the literature review on the software has to be done and have to practice.

Later on the designing process has to begin that includes the road vehicular movement and network designing. The design process has to simulate and evaluate so that the appropriate results can be obtain. If the design have problem or error then the guidance from supervisor is necessary.

After the road vehicular movement and the network that design have to integrate at the base frequency range. This will produce the result required and simulation has to carry out. Then the emulation process is carried out to finalize the output of the project.

1.6 Thesis Outline

In the thesis outline contain of the thesis will be discussed and summarizes according to the chapter. The chapter I will be based on the project introduction, problem statement, objectives and scope of the project. The chapter II will be based on the literature review on the wireless vehicular movement. On this chapter the reference for the vehicular movement and the wireless setting is studied and analysis according to the IEEE 802.11(p) protocol that emerged for Intelligent Transportation System (ITS).

Chapter III will be part of the methodology that explain on the method carried for the design and evaluation process. The design method will be based on the mobile node setting and the wireless setting for the integration between vehicular and wireless system. Chapter IV discussed about the results obtain and its discussion for the further understandings and development of this project.

The later part will be the conclusion and suggestion for the conducted project. This will enable to obtain the application of the design system for the real life application. Then followed by the reference for this project and the appendix.

CHAPTER II

LITERATURE REVIEW

2.1 Introduction

Wireless vehicular communications facilitate the exchange of particular information concerning safety and hazards among vehicles and other support systems through internet wireless connection. It is an emerging technology which provides safety and efficiency in transportation systems. Since Wireless Communication has been broad up to the next level the communication for vehicle also has been advanced to the higher level by introducing wireless communication protocol IEEE 802.11p.

There are two types of devices involved in vehicular communication that based on the wireless protocol 802.11p that are Roadside Units (RSUs) and On-Board

Units (OBUs). These devices are important to transmitting data and receiving data that transmit from the host and also transmit by the vehicles.

An RSU is a device that operates at a fixed position whereas an OBU is a mobile device in vehicles that supports information exchange with RSUs and other OBUs. RSUs and OBUs communicate with each other.

2.2 Literature Review on Wireless Vehicular Communication

Vehicular Communication System is the newly implemented technology based on the wireless network protocol. This system has been well emerging in most of the developed nation such as in United States, London and many more European countries. This system is developed with highly integrated levels of networks that vehicles and roadside units are able to communicate by referring to the node. Wireless vehicular communications is covering Vehicle-to-Vehicle (V2V), Vehicle-to-Infrastructure (V2I), and Vehicle -to-Person (V2P) communications that aims to increase road safety and transport efficiency and provide ubiquitous wireless connectivity to the Main database [1].

The basic information that will be transmitting is the safety warnings such as road condition, speed limits, and traffic information. The emerging wireless vehicular communication network is closely relates with the Intelligent Transportation System (ITS) that base on collecting data packets that transmits between vehicle to vehicle and vehicle to the road side infrastructure such as traffic signals.

The ITS is the technology developed in order to manage some factors that is typically when on roadside. ITS seeks to achieve safety and productivity through intelligent transportation which integrates communication between mobile and fixed nodes. The mobile communication will be represents by the moving object in this case