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LEVEL OF SERVICE (LOS) FOR MULTILANE HIGHWAY AND ROAD ACCIDENT INFORMATION SYSTEM DEVELOPMENT OF BATU PAHAT AREA

MOHD EZREE BIN ABDULLAH

UNIVERSITI TEKNOLOGI MALAYSIA

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Signature : .....

Name of Supervisor I : Prof. Madya Dr Abdul Aziz Bin Chik

Date : 21 October 2005

Signature : .....

Name of Supervisor II : Dr. Mohd. Rosli Bin Hainin

Date : 21 October 2005

** Delete as necessary*

LEVEL OF SERVICE (LOS) FOR MULTILANE HIGHWAY AND ROAD ACCIDENT INFORMATION SYSTEM DEVELOPMENT OF BATU PAHAT AREA

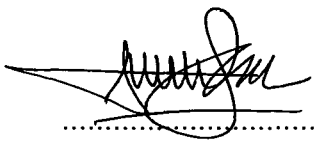
MOHD EZREE BIN ABDULLAH

A project report submitted as a partial fulfillment for the award of the Degree of Master of Engineering (Civil – Highway and Transportation)

Faculty of Civil Engineering
Universiti Teknologi Malaysia

November, 2005

I declare that this project report entitled "Level of Service (LOS) for Multilane Highway and Road Accident Information System Development of Batu Pahat Area" is the result of my research except as cited in the references. This project report has not been accepted for any degree and is not concurrent submitted in candidature of any other degree.

Signature : 

Name : Mohd Ezree Bin Abdullah

Date : 21 October 2005

DEDICATION

This dissertation is dedicated to my lovely wife,
Ida Aryanie Bte Bahrudin
my loving parents,
Tn Hj Abdullah Bin Suramin and Pn Hjh Zabedah Bte Ismail,
my brothers and sister
Mohd Ezath, Herdayanty and Mohd Ezar
and last but not least, my nieces,
Nurul Balqis and Nurul Farah Fisha.

Thank you for all the love, spirit, sacrifices and for having your faith in me.
May Allah S.W.T bless you in possible way.

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Thank you.

ABSTRACT

In recent years, the advance of Database Management System (DBMS) and Software Tools as an information system which can store and analyses various types of data efficiently had prompted many users to exploit its advantages for their respective fields. In Malaysia, the original products of DBMS and Software Tools have been widely used in fields like urban planning, land management and property valuation. As for traffic engineering users, it is still at the beginning stage. Therefore, to enhance this technology into the traffic engineering fields, the Level of Service (LOS) for Multilane Highway and Road Accident Information System (LORIS) is developed. The main function of LORIS is to analyse LOS which is very important issue for traffic engineer because it describes the traffic operational conditions within a traffic stream. Besides that, road accident data and basic highway information was also included in this system. In this study, the potential of using this system in traffic and accident analysis were conducted only at Batu Pahat area, which is among the highest road accident rate in Malaysia. The objectives are to develop a database and information system to determine the LOS, road accident information and basic highway information. To achieve this, Microsoft Access 2003 was utilised incorporating with Microsoft Visual Basic 6.0. As the results, an effective computerised LOS calculation system had been developed together with road accident and highway information system. The system has been calibrated and validated to obtain reliable results.

ABSTRAK

Kebelakangan ini, kelebihan Sistem Pengurusan Pangkalan Data (DBMS) dan Perkakasan Perisian sebagai sistem maklumat yang boleh menyimpan dan menganalisa pelbagai data secara berkesan telah menggalakkan ramai pengguna mempraktikkannya dalam bidang yang mereka ceburi. Di Malaysia, produk yang dihasilkan daripada DBMS dan Perkakasan Perisian telah digunakan secara meluas dalam bidang seperti perancangan bandar, pengurusan tanah dan penilaian harta. Manakala penggunaannya dalam bidang kejuruteraan lalulintas masih pada peringkat awal. Oleh itu, untuk mengaplikasikan teknologi ini dalam kejuruteraan lalulintas, sistem Tahap Perkhidmatan untuk Lebuhraya Berbilang Lorong dan Maklumat Kemalangan Jalanraya (LORIS) telah diperkenalkan. Fungsi utama LORIS adalah untuk menganalisa tahap perkhidmatan jalan (LOS) bagi mengenalpasti keadaan aliran bagi sesuatu lalulintas. Selain itu, maklumat kemalangan jalanraya dan maklumat asas jalanraya juga disertakan dalam sistem ini. Kawasan kajian bagi mengukur kebolehan sistem ini adalah di daerah Batu Pahat yang merupakan antara kawasan yang mempunyai kadar kemalangan yang tertinggi di Malaysia. Objektif bagi kajian ini adalah untuk membina pangkalan data dan sistem maklumat bagi menentukan LOS, menyimpan maklumat kemalangan jalanraya dan maklumat asas jalanraya. Bagi merealisasikannya, kombinasi Microsoft Access 2003 dan Microsoft Visual Basic 6.0 telah digunakan. Hasilnya, sebuah sistem berkomputer yang efektif melibatkan pengiraan LOS yang digabungkan dengan sistem maklumat asas jalanraya dan juga sistem maklumat kemalangan jalanraya. Sistem ini juga telah diuji dan disahkan bagi mendapatkan keputusan yang tepat.

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LIST OF SYMBOLS

D	-	Density (pc/km/ln)
DBMS	-	Database Management System
DFD	-	Data Flow Diagram
ERD	-	Entity Relationship Diagram
GUI	-	Graphical User Interface
HCM	-	Highway Capacity Manual
HPU	-	Highway Planning Unit
MAAP	-	Microcomputer Accident Analysis Package
MARRIS	-	Malaysian Road Records Information System
MIS	-	Management Information System
LORIS	-	Level of Service for Multilane Highway and Road Accident Information System
LOS	-	Level of Service
PDRM	-	Polis Di-Raja Malaysia
PWD	-	Public Work Department
S	-	Average passenger-car travel speed (km/h)
SDLC	-	System Development Life Cycle
SPSS	-	Statistical Package for Social Science software
TWRTL	-	Two Way Right Turn Lane
VB 6.0	-	Microsoft Visual Basic 6.0
v_p	-	Flow Rate (pc/h/ln)
v/c	-	Volume / Capacity

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CHAPTER I

INTRODUCTION

1.1 Introduction

Twenty years ago only a limited number of practitioners had access to the large-frame computers required to use computerised traffic modelling tools. Highway or transportation departments, large metropolitan areas, universities, and large companies were the fortunate few. Others had to use analytical, manual techniques, or pay a high price for commercial computer services.

Now, microcomputers are as commonly available as the electronic calculators of the 70s and, while more expensive than calculators, are easily within the economic reach of virtually every transportation professional in most locations throughout the world.

Developers of computerised traffic tools, such as the universities and private organisations have promulgated a substantial suite of software tools for every phase of transportation planning and engineering in the past decades.

The largest single group of software concerns traffic analysis, road accident and basic highway information. Traffic analysis software tools have a wide range of applications. Some of them provide an alternative to manual applications of widely

used highway capacity analysis procedures. Others utilise simulation for evaluation of the impact of changing traffic patterns, geometric designs and control strategies. Also a number of tools have imbedded optimisation capabilities to allow the development of the best control strategies (Sabra, *et al.* 2000).

Despite the abundance of traffic operations software, the lack of understanding of such software among the executive and management levels of the transportation engineering profession has inhibited software applications. Many public and private leaders in the profession do not know what software is available or about its capabilities.

Besides the software tools, databases have been in use since the earliest days of electronic computing in Malaysia, beginning with the custom programs written to access custom databases. Today, modern systems can be applied to widely different databases and needs, these systems were tightly linked to the database in order to gain speed at the price of flexibility. The technology is widely used in many agencies like the City Hall and Town Council as their town information system for territory planning (Keat Leong,1998).

1.2 Problem Statement

Before this research was done, several analysis on related problems and needs have been identified such as time management for data collecting and data analysing. Problem from time management; some data are stored in different source(s). It is inconvenience if the data are at difference source(s) at the same time. On the analysis side, user(s) have to spend more time on reference table while conducting the LOS analysis.

1.3 Aim of the Research

The aim of the research is to design and develop a computerised system in order to help user in accessing information and analysing LOS data accurately. The system that had been developed will replace the existing manual system used by traffic engineers and the person who involve in the road accident analysing process.

1.4 Objectives of the Research

Based on the stated problem statement, an information storage system is needed to ensure all the data and information are organize. Therefore, the maintenance and traffic system can be done easily. So, the objectives for this research are:

i. to develop a database and information system for road accident information and basic highway information,

ii. to create a user friendly system, i.e. to obtain information from the provided databases, and

iii. to develop a system, i.e to analyse the LOS for Multilane Highway.

1.5 Scope of the Research

The scope in this research covers the development of database that would be able to determine the level of services (LOS) for a Multilane Highway. The analysis is based on Highway Capacity Manual, HCM 2000. Besides that, development of database and information system for road accident and basic highway information which is based on Malaysian Road Records Information System, MARRIS 2000 Report was also included. The study area used in this study is the Batu Pahat district.

1.6 Limitation of the Research

This research limitation is basically due to the time constraint to perform the study. The problems occur because of the data needed are stored at different government department. The other reasons are the data are manually stored and the existing system is not very user friendly. Hence, the limitations of this research are:

i. the LOS system, the analysis is for the operational and planning only,

ii. database development for road accident and highway information system is for expressway, federal and state roads in Batu Pahat only,

iii. sample of accident data is only from 1st June 2005 to 30th June 2005.

1.7 Research's Importance and Contributions

This research fulfils the need of the person who involves in analyzing and manages the traffic system in Batu Pahat. The existing manual system will be replaced by the computerised system:

Therefore, the contributions of this research are:

(i) to simplify the management information process,

(ii) to assist the traffic engineer or traffic analyst to analyse the Level of Service (LOS) easily and accurately,

(iii) to provide a secured database system with a security protection,

(iv) to reduce the used of paper in order to create a paperless society in managing and analysing traffic and road accident, and

(v) to provide automatic information browsing process.

1.8 Methodology of the Study

Generally the methodology for this study is shown in Figure 1.1. During initial stage, work planning process were done to determine the problems in analyses, collecting and management data for Level of Service (LOS) for Multilane Highway and road accident in Batu Pahat. Observations show that the works is done manually.

Based on these problems, methods of analysis were planned and listed. Then, a plan to identify the related data and information that needed for this researched was done. This is to ensure the smooth process in collecting all the sources.

The next process was to analyse the data and information that were collected from the specific agencies and departments. Then the databases and system development was done by using Microsoft Access 2003 and Visual Basic 6.0 There were two types of data in this system which are graphic and non graphic data. The map of Batu Pahat has been used as graphical data while road accident information and basic highway information had been used as non graphical data.

The system has undergone several testing to improve its capability. There were minor and major corrections before the system is completed. Besides that, the system was also tested by samples of users based on the given questionnaire. Lastly, the conclusions and recommendations were made for this researched.