UNIVERSITI PUTRA MALAYSIA

DEVELOPMENT OF A MOBILE ROAD TRAFFIC INFRACTION REGISTRATION SYSTEM

HABIBOLLAH ARASTEH RAD

DEVELOPMENT OF A MOBILE ROAD TRAFFIC INFRACTION REGISTRATION SYSTEM

By

HABIBOLLAH ARASTEH RAD

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Master of Science

July 2010

DEDICATION

To my parents, wife, son and my brother

Abstract of thesis presented to the Senate of the Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master.

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Chairman: **Khairulmizam Samsudin, PhD**

Faculty: **Engineering**

The rapid development of roads and the increasing number of vehicles has complicated the road traffic enforcement due to limited resources of the traffic police especially when traffic infraction registration is done manually in many countries. In an effort to improve the efficiency of Iranian traffic police, a computer-based method for mobile road traffic infraction registration is proposed.

The study attempts to obtain results that the Iranian traffic police can make decisions base on them to migrate from manual-method towards computer-based method. In order to capture data in this study, questionnaire and interview were used. The system prototype has been developed based on the requirement of Iranian traffic police. The study then concentrates on the Traffic Police Data Center and evaluates the system performance. To facilitate of the decision, the server (i.e. Traffic Police Data Center) and the clients (i.e. police officers) are collectively modeled as an open queuing network. The details of statistical analysis were conducted to obtain the mean server arrival rate (λ) of model with respect to real historical data. We concluded the process forms as Non-Homogeneous Poisson Processes. Several analysis techniques were also utilized to assure the accuracy of the estimation. The mean service rate was measured by a specially developed benchmark tool. The tool was configured to imitate several

scenarios based on Iranian traffic infraction registration in 2007, and statistics were gathered.

The study has used computer simulation as an effective way to solve the queuing problem and evaluating the performance of the system. Therefore, we obtain closed form expressions for the performance metrics with respect to various arrival rates. The simulation results show that the system is reliable even for more than triple amount of the real load. The system resource is also monitored for various performance tests. The server resources are stable at the expected level even under critical loads. Finally, the study has shown that the mobile method has made possible the electronic submission of ticket data, which will result in cost savings for traffic police.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains.

PEMBANGUNAN SISTEM PENDAFTARAN PELANGGARAN JALAN RAYA BAGI TRAFIK BERGERAK

Oleh

HABIBOLLAH ARASTEH RAD

July 2010

Pengerusi: **Khairulmizam Samsudin, PhD**

Fakulti: **Kejuruteraan**

Beberapa tahun kebelakangan ini pertambahan jalan raya dan kenderaan meningkatkan komplikasi penguatkuasaan jalan raya disebabkan oleh sumber polis trafik yang terbatas. Keadaan ini menjadi lebih sukar kerana sistem pendaftaran kesalahan jalan raya masih dilakukan secara manual. Dalam usaha untuk meningkatkan kecekapan polis trafik Iran, kaedah yang berasaskan komputer bergerak bagi pendaftaran kesalahan trafik dicadangkan.

Kajian ini cuba mendapatkan panduan bagi membolehkan polis trafik Iran menukar cara manual kepada kaedah berasaskan komputer. Sehubung dengan itu satu soal selidik dan temuduga dijalankan bagi mendapatkan data kajian. Sistem prototaip telah dibangunkan berdasarkan kepada keperluan polis trafik Iran. Oleh itu kajian ini tertumpu kepada Pusat Data Polis Trafik dan dinilai prestasinya. Bagi membuat keputusan, pelayan (misalnya Pusat Data Polis Trafik) dan klien (misalnya: pegawai polis) dimodel secara kolektif sebagai 'open queing network'. Perincian analisis statistik dikendalikan untuk mendapat 'mean server arrival rate' (λ) daripada data terdahulu. Kami membuat kesimpulan bahawa proses tersebut mempunyai ciri 'Non-Homogenous Poisson'. Berbagai teknik analisis juga digunakan untuk memastikan

ketepatan anggaran. Min kadar perkhidmatan diukur menggunakan alat penanda aras yang telah dibangunkan secara khusus. Alat tersebut telah di atursemula untuk berbagai-bagai senario berdasarkan sistem pendaftaran kesalahan trafik di Iran dalam tahun 2007, hasil statistiknya dikumpulkan.

Kajian ini telah menggunakan simulasi komputer sebagai satu cara yang efektif untuk menangani masalah 'queueing' dan menilai pelaksanaan sistem. Oleh itu kami memperolehi formula 'closed form' berdasarkan berbagai 'arrival rate'. Keputusan simulasi menunjukkan kebolehpercayaan sistem ini walaupun dibebankan lebih daripada tiga kali ganda jumlah beban sebenar. Sumber sistem ini juga diperhatikan dengan menggunakan berbagai ujian pencapaian. Sumber 'server' adalah stabil pada tahap jangkaan walaupun pada bebanan kritikal. Akhirnya kajian ini menunjukkan penghantaran data saman secara eletronik adalah tidak mustahil dan menjimatkan kos polis trafik.

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In the name of Allah, the Most Beneficent, the Most Merciful

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I certify that a Thesis Examination Committee has met on **July 2010** to conduct the final examination of Habibollah Arasteh Rad on his thesis entitled "**Development Of A Mobile Road Traffic Infraction Registration System**" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

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This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the **Master of Science**. The members of the Supervisory Committee were as follows:

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DECLARATION

I declare that the thesis is my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at Universiti Putra Malaysia or at any other institutions.

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