SOFTWARE DEVELOPMENT FOR SPEED TRAP RADAR CONTROL UNIT

By

ZULKIFLI BIN ABD RAHMAN

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

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DEDICATION

This thesis is dedicated to my parents for their constant support, love and guidance during all moments of my life.

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

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Faculty : Engineering

Nowadays, speed trap method has been used in most Malaysian states and overseas for reducing road accident rate. Measurement of vehicle speed for the purposes of law enforcement is currently achieved by radar based methods. Radar is one of devices being used by the police enforcer in Malaysia. It is also commonly used abroad where they are fitted in a patrol car. For the past few years, speed trap system in overseas using radar that can be fitted in either the patrol car or at certain fixed location has experienced an interesting development. However, the radar set and other devices that are available in the market today are too expensive. Furthermore, it needs the police enforcer to trap the speed and take picture of targeted speeding vehicle, and storing that information for law enforcement purpose manually.

The main objective of this project is to develop a software system for radar control unit which works together with radar device that can be used by the police enforcer either in the patrol car or placing it at the specific location. The development of the software system in this thesis is focused which that to enable the police enforcer to use the radar device at operating frequencies of X-band (10.525 GHz), K-band

(24.15 GHz), and Ka-band (35.5 GHz), and video camera, to set speed limit, measure and trap the speed, snap the speeding vehicle, and send the information to the base station or a certain destination to be checked automatically once the speed over limit vehicle is detected.

Two main sets of hardware have been considered which are localised and centralised equipments. The localised equipments consist of Doppler radar device, radar control unit, camera and laptop PC as client for use in patrol car or at certain fixed location. The radar control unit for stationary mode operation is built by using 8-bit microcontroller. The centralised equipments consist of a computer as a server, a data display, and a printer machine. All information will be displayed and printed by a printer machine.

The software for radar control unit is developed to act as a 'brain' where it is created by using assembly language programming to control the whole operation of that radar control unit. A version of application software is also built by using Visual Basic programming software to work together with the developed radar control unit, radar device and camera to enable the laptop PC linking with centre equipment, local and centre database for receiving and sending information processes over a transmission control protocol (TCP/IP) network or Internet. Several specific components of object model (COM/ActiveX) software to fulfil that purpose were used. This software system application is also built to enable laptop PC receiving information from radar control unit, checking the vehicle speed, capturing the speeding car image, and sending and saving it into the database automatically when vehicle's speed is over the speed limit is detected. This software also covers data

display and homepage update to display data. Data update is provided for any PC which is connected to the Internet. The software has been tested with the hardware. From the running test, it shows that the software system has trapped the speed and captured the image of speeding vehicle over the speed limit automatically. Thus, the test result has fulfilled this thesis objective and this software system is successfully built and developed.

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

PEMBANGUNAN PERISIAN UNTUK UNIT KAWALAN RADAR PERANGKAP KELAJUAN

Oleh

ZULKIFLI BIN ABD RAHMAN

Oktober 2004

Pengerusi : Wan Zuha Wan Hasan, MSc.

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Hari ini, kaedah perangkap had laju telah digunakan di kebanyakan negeri di Malaysia dan luar negara bagi mengurangkan kadar kemalangan jalan raya. Pengukuran kelajuan kenderaan bagi tujuan penguatkuasaan undang-undang dicapai dengan menggunakan keadah berasaskan radar. Radar adalah salah satu peranti yang digunakan oleh penguatkuasa traffik di Malaysia. Ianyanya juga sering digunakan dimana ianya dipasangkan di dalam kereta peronda polis di luar negara. Beberapa tahun kebelakangan ini, sistem perangkap had laju menggunakan radar dari luar negara yang boleh digunakan di dalam kereta peronda dan juga ditetapkan pada satu kawasan tertentu telah mengalami satu kemajuan yang amat menarik. Tetapi set radar berserta peranti-peranti lain yang sedia ada dipasaran pada masa kini adalah amat mahal dan juga memerlukan penguatkuasa polis memerangkap kelajuan dan mengambil gambar kenderaan sasaran yang memecut serta mengumpul maklumat tersebut bagi tujuan pelaksanakan undang-undang secara manual.

Matlamat utama projek ini adalah untuk membina satu sistem perisian untuk unit pengawal radar yang berfungsi bersama peranti radar yang boleh digunakan oleh penguatkuasa polis samada di dalam kereta peronda atau dengan meletakkan pada satu kawasan tertentu secara tetap. Pembangunan sistem perisian di dalam tesis ini difokuskan untuk membolehkan penguatkuasa polis menggunakan peranti radar yang beroperasi pada frekuensi (jalur-X (10.525 GHz), jalur-K (24.15 GHz) dan jalur-Ka (35.5 GHz), dan kamera video, menetapkan had laju, menyukat dan memerangkap kelajuan serta mengambil gambar kenderaan yang memecut dan menghantarkannya ke stesen tapak atau satu destinasi tertentu untuk diperiksa secara automatik apabila kenderaan yang melebihi had laju dikesan.

Terdapat dua jenis perkakasan yang diambilkira, peralatan setempat dan berpusat. Peralatan setempat terdiri daripada peranti radar *Doppler*, unit pengawal radar, kamera dan komputer riba sebagai pelanggan untuk kegunaan di dalam kereta peronda atau di letakkan di satu kawasan tertentu secara tetap. Unit pengawal radar untuk penggunaan radar mod tidak bergerak dibangunkan dengan menggunakan pengawalmikro 8-bit. Peralatan berpusat pula terdiri daripada komputer yang berfungsi sebagai pelayan, satu paparan data, sebuah mesin pencetak dan sebagainya yang ditempatkan di stesen tapak. Semua maklumat akan dipaparkan pada paparan data dan dicetak oleh mesin pencetak.

Perisian dibangunkan pada unit pengawal radar untuk bertindak sebagai otak di mana ianya dicipta dengan menggunakan bahasa pengaturcaraan perhimpunan bagi mengawal keseluruhan operasi unit pengawal radar tersebut. Satu versi perisian applikasi juga dibina dengan menggunakan program perisian Visual Basic untuk

tujuan berfungsi bersama unit pengawal radar yang telah dibangunkan, peranti radar dan kamera dimana ianya membolehkan komputer riba berhubung dengan peralatan pusat dan pangkalan data tempatan dan pusat untuk proses penerimaan dan penghantaran maklumat melalui satu rangkaian protokol kawalan penghantaran (TCP/IP) atau Internet. Beberapa komponen khusus dalam perisian model objek (COM/ActiveX) untuk memenuhi tujuan tersebut digunakan. Sistem perisian applikasi ini juga dibina bertujuan untuk membolehkan komputer riba menerima maklumat daripada unit pengawal radar, memeriksa kelajuan kenderaan dan mengambil gambar kenderaan yang memecut serta menghantar dan menyimpannya ke dalam pangkalan data secara automatik apabila kenderaan melebihi had laju dikesan. Perisian juga meliputi paparan data dan kemaskini 'homepage' untuk memaparkan data. Pengemaskinian data disediakan untuk mana-mana komputer yang disambungkan ke Internet. Perisian yang dibina diuji bersama dengan perkakasan. Daripada ujian yang dijalankan menunjukkan sistem perisian menngambil bacaan kelajuan serta gambar kenderaan yang memecut melebihi had laju secara automatik. Hasil ujian memenuhi matlamat tesis ini dan perisian ini akhirnya berjaya dibina dan dibangunkan.

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I certify that an Examination Committee met on 18th October 2004 to conduct the final examination of Zulkifli Bin Abd Rahman on his Master of Science thesis entitled "Software Development for Speed Trap Radar Control Unit" in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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

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DECLARATION

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

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ZULKIFLI BIN ABD RAHMAN

Date:

TABLE OF CONTENTS