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REMOTE CONTROL AND MONITORING VIA INTERNET ON DISTRIBUTED DATA ACQUISITION

By

ZURINA MOHD HANAPI

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

January 2004

DEDICATION

Thank you

To my loving husband and son, for endless support and comfort

To my family, for everlasting cares and support

To my friends, for their never-ending assistance

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

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January 2004

Chairperson: **Abdul Rahman Ramli, Ph.D**

Faculty: **Engineering**

The concept of remote control and monitoring becomes an essential feature in many systems nowadays. Remote control allows clients to control their homes from any places, whereas remote monitoring provides the clients the ability to monitor their home or premises when they are away. The key advantage of this application is client has the ability to control and monitor their home remotely for security and safety reasons.

From the analysis have been made, in Malaysia, Internet subscribers are growing rapidly from one year to another. The demand of having remote technology using Internet has made this area favourable, thus, it is chosen to be studied and discussed extensively in this thesis. A method of developing a remote control and monitoring system based on distributed data acquisition using the Internet is established. This system is based on client/server system in which the host computer where the program is installed, is set as a server where static IP address is assigned. For the purpose of control and monitoring tasks, the main program that consists the status of appliances is displayed. It is a user-

friendly system with good graphical user interface (GUI). The program is developed using the features in LabVIEW version 6i and its Internet Developer Toolkit. The I/O modules attached to the appliances are connected directly to the server via serial port. These I/O modules are based on the concept of data acquisition system (DAQ). The appliances can be controlled from the client PC by browsing the server website. Some necessary data are required to be sent to the server. Once the server is running, monitoring capability is enabled.

Generally, this system is part of smart technology that has been developed to increase our quality of life, provide convenience environment and also act as an active partner in managing our busy life. It is a very user-friendly system with good GUI that gives a client an easy working environment. In a nutshell, this system gives a better security for the homes owner by giving them an authority to control and monitor their house from anywhere.

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

KAWALAN DAN PEMANTAUAN JARAK JAUH MENERUSI INTERNET DALAM PEROLEHAN DATA SECARA TERAGIH

Oleh

ZURINA MOHD HANAPI

Januari 2004

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Pada masa sekarang, pemantauan dan kawalan jarak jauh telah menjadi satu ciri penting di dalam pelbagai sistem. Kawalan jarak jauh membenarkan pengguna untuk mengawal rumah mereka dari mana-mana tempat, manakala pengawasan jarak jauh membenarkan pengguna untuk mengawasi kediaman mereka walaupun mereka tiada di rumah. Ciri penting yang utama bagi sistem ini ialah pengguna juga boleh mengawal dan mengawasi rumah mereka dari jauh untuk tujuan keselamatan.

Daripada analisis yang dijalankan, di Malaysia, pengguna Internet telah meningkat dengan mendadak dari setahun ke setahun. Permintaan untuk membolehkan teknologi jarak jauh ini menggunakan Internet telah menyebabkan bidang ini menjadi semakin popular dan oleh itu ianya telah dipilih untuk dikaji dan dibincangkan dengan lebih mendalam di dalam tesis ini. Satu sistem kawalan dan pengawasan jarak jauh telah dibangunkan berpandukan perolehan data secara berselerak melalui internet. Disamping itu, ianya menggunakan konsep sistem pelanggan pelayan yang mana komputer utama

akan disetkan sebagai pelayan dimana alamat IP yang statik akan dihasilkan. Untuk tujuan kawalan dan pengawasan, satu program utama yang mengandungi panel hadapan dimasukkan ke dalam pelayan, yang mana ia akan memaparkan status alat-alat elektrik yang terlibat. Sistem in adalah mesra pengguna. Program ini dibina menggunakan LabVIEW edisi 6i dan Internet Toolkit. Modul I/O yang disambungkan kepada alat-alat elektrik dihubungkan dengan pelayan menggunakan port bersiri. Modul I/O ini dikategorikan sangat murah dan berasaskan konsep sistem perolehan data. Di sebelah PC pelanggan, kita boleh mengawal alat-alat elektrik di pelayan dengan melayari laman Web pelayan yang meminta kita untuk menghantar data kepada sistem. Disamping itu juga, kita boleh mengawasi pelayan dengan melayari laman Web yang akan memaparkan status barang elektrik yang dikawal.

Secara umumnya, sistem ini adalah sebahagian daripada teknologi pintar yang telah dibangunkan untuk mempertingkatkan kualiti kehidupan, memberi keselesaan dan juga bertindak sebagai agen yang aktif untuk menguruskan kehidupan kita yang semakin sibuk kini. Ianya juga merupakan sistem mesra pengguna dengan antaramuka grafik yang menarik yang memberi keselesaan kepada pelanggan. Secara keseluruhannya, sistem ini memberi tahap keselamatan yang tinggi kepada seisi rumah dengan memberi mereka kuasa untuk mengawal dan mengawasi rumah mereka dari mana-mana sahaja.

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I certify that an Examination Committee met on 27th January 2004 to conduct the final examination of Zurina Binti Mohd Hanapi on her Master of Science in Computer and Communication System Engineering thesis entitled "Remote Control and Monitoring via Internet on Distributed Data Acquisition" 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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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.

_____

ZURINA MOHD HANAPI

Date:

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LIST OF ABBREVIATIONS

PC	Personal Computer
TCP/IP	Ethernet Transmission Control Protocol/ Internet Protocol
DAQ	Data acquisition
RMON	Remote Monitoring
I/O	Input/Output
PCI	Peripheral Component Interface
PCMCIA	Personal Computer Memory Card International Association
ISA	Industry Standard Architecture
RAM	Random Access Memory
BNC	Bayonet Nut Connector
OS	Operating System
USB	Universal Serial Bus
DMA	Direct Memory Access
TTL	Transistor Transistor Logic
A/D	Analog to digital
D/A	Digital to analog
DHCP	Dynamic Host Configuration Protocol
ARC	Automation Research Corporation
RH	Relative Humidity
HTML	Hypertext Markup Language
GPIB	General Purpose Interface Bus

VXI	Versa-Modular Eurocard eXtensions for Instrumentation
VI	Virtual Instrument
FSR	Free Spectral Range
LSB	least significant bit
DTE	Data Terminal Equipment
DCE	Data Communications Equipment
VISA	Virtual Instrument Software Architecture
FTP	File Transfer Protocol
CGI	Common Gateway Interface
WWW	World Wide Web