

Sudan University of Science and Technology

College of Engineering

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IMPLEMENTATION OF **REMOTELY CONTROLLED** **ROBOT OVER INTERNET**

*A Research Submitted In Partial fulfillment for the Requirements
of the Degree of B.Sc. (Honors) in Electronics Engineering*

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الإستهلال

قال تعالى : " وَابْتَغِ فِيمَا آتَاكَ اللَّهُ الدَّارَ الْآخِرَةَ وَلَا تَنْسَ نَصِيبَكَ
مِنَ الدُّنْيَا وَأَحْسِنْ كَمَا أَحْسَنَ اللَّهُ إِلَيْكَ وَلَا تَبْغِ الْفُسَادَ فِي الْأَرْضِ
إِنَّ اللَّهَ لَا يُحِبُّ الْمُفْسِدِينَ "

صدق الله العظيم

سورة القصص الآية (77)

DEDICATION

*To our families, Teachers, friends and colleagues who supported as
and believed in our capabilities.*

ACKNOWLEDGMENT

We are heartily thankful to our supervisors Dr. Alaa-Aldain Awaoda and Dr.Sami Hassan Omer who we are greatly indebted for their sincere and keen supervision with their known open heart and mind and flooding generosity we are also grateful for their encouragement and guidance.

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ABSTRACT

Controlling over Client/server Technique devotes the Internet technologies to link industrial electronics applications over the grid , this is beneficial in providing an obvious and clearly demonstrated interface that is access remotely from anywhere over the globe , also this approximately a free service it's only cost the Internet connection fees , since the Internet service approximately is available in any where even in the harsh terrain and that's mean the accessibility is high , lastly the updating for the sensory data is happening instantaneously relatively .

In this thesis remote control system has been implemented so as to control a wheeled robot remotely Through the Internet, for the purpose of monitoring and controlling, the first part of the system is the wheeled robot, which can be controlled remotely through Internet, the second part is the Internet technologies and the GUI, the Internet is used to provide the link between the GUI and the robot. The communication between the desired application and the end user could be simplex or half-duplex; in this Thesis the used way of communication is full-duplex, the wheeled robot is controlled with microcontroller which is connected to the Internet through a computer server, this computer server will receives control commands from the remote PC, to enable the user to master and manage the robot efficiently and in an easy manner a GUI is developed using visual basic programming language.

المستخلص

التحكم عن طريق تقنية المخدم والمستخدم بواسطة الأنترنت يكرس التقنيات المستخدمة في الإنترنت لربط تطبيقات تشتمل على جانب الإلكترونيات الصناعية عبر الشبكة ، تتمثل الاستفادة من ذلك في توفير واجهة واضحة المعالم و سهولة الإستخدام للوصول إليها في أي مكان حول العالم ، و أيضا هي تكاد تكون خدمة خالية التكاليف نظرا لأنها تكلف فقط توصيل خدمة الإنترنت ، نظرا لأن خدمة الإنترنت متوفرة في كل مكان تقريبا حتى في الأماكن وعرة التضاريس مما يعني يعني توفر الخدمة عالى ، و أخيرا عملية التحديث للبيانات القادمة من الحساسات تتم بصورة لحظية نسبيا .

في هذه الأطروحة نظام تحكم عن بعد قد تم بنائه بحيث يتم التحكم في روبوت ذو عجلات عبر الإنترنت ، لغرض التحكم و المراقبة ، الجزء الأول من النظام هو عبارة عن روبوت ذو عجلات ، الذي يمكن التحكم فيه عن بعد عن طريق الإنترنت ، الجزء الثاني من المشروع هو تقنيات الإنترنت و وجهة المستخدم الرسومية ، الإنترنت إستخدم لتوفير وصلة مابين واجهة المستخدم الرسومية و الروبوت .

الإتصال ما بين المخدم و المستخدم قد يكون في إتجاهين أو إتجاه واحد ، في هذه الأطروحة الطريقة المستخدمة في الإتصال هي في إتجاهين ، الروبوت يتم التحكم فيه بإستخدام متحكم دقيق الذي بدوره يتصل بالإنترنت عبر جهاز خادم الذي يستقبل الأوامر من حاسب المستخدم ، لتكمين المستخدم من التحكم في الروبوت بسهولة تم تصميم واجهة مستخدم رسومية بإستخدام لغة الفيجوال بيسك البرمجية .

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LIST OF ABBREVIATIONS

AC	Alternating Current
ALU	Arithmetic Logic Unit
API	Application Programming Interface
AT	Attention
AVR	Advanced Virtual RISC
CD	Carrier Detect
CMOS	Complementary Metal–Oxide–Semiconductor
COM	Communication
CTS	Clear To Send
DAQ	Data Acquisition
DB	D-subminiature electrical connector
DC	Direct Current
DIN	Data In
DIP	Dual in-line package
DTMF	Dual-tone multi-frequency
EEB	Ethernet embedded board
EIA	Electronic Industries Association
GSM	Global System for Mobile
GUI	Graphical User Interface
HTTP	Hipster Text
I/O	Input/output
IC	Integrated Circuit
IDE	Integrated Development Environment
IP	Internet Protocol
ISP	In System programming
ITU	International Telecommunications Union

LCD	Liquid Crystal Display
LED	Light Emitting Diode
MSCOMM	Microsoft Communication
NASA	National Aeronautics and Space Administration
PC	Personal Computer
QoS	Quality of Service
RAM	Random Access Memory
RISC	Reduced Instruction Set Computer
ROM	Read Only Memory
RPM	Revolutions Per Minute
RTS	Request To Send
SMS	Short Message System
TCP	Transfer Control Protocol
TCP/IP	Transfer control Protocol/Internet protocol
TIA	Telecommunications Industry Association
TTL	Transistor to transistor Logic
UDP	User Datagram Protocol
VB	Visual Basic
VS	Visual Studio
VSM	Virtual System Modeling
WINSOCK	Windows Socket
XML	Extensible Markup Language
μC	Microcontroller

Chapter One
INTRODUCTION

1.1 Overview:

“ In April 24, 1997, at the International Conference on Robotics and Automation in Albuquerque, an operator pulled a joystick in Albuquerque that controlled the motions of a Puma robot in Tarn's laboratory more than 1,500 kilometers away. The teleoperations feat was a major step for the burgeoning field of robotics, and it was a giant leap for telecommunications, adding a previously unexplored dimension to the Internet-remote control and providing new horizons for other applications in long-distance learning, research opportunities, and hands-on experimentation. The event-based planning and control scheme has been extended to solve the challenging problem in intelligent control of manufacturing systems.” (Fitzpatrick, 1999)

1.2 Problem statement:

A distant device that is need to be controlled and it's user is a roamer that is far away thousands kilometers, the device need to be manipulated instantaneously.

1.3 Proposed solution:

The Client/server Technique is a viable, A remote access over Client/server Technique to the desired device is to be considered as a good solution for this problem, the device connected to a computer server via Internet to provide the end user with an interface to their device, It allows user full control over the target device from any computer with Internet

access, potential uses of this technology include ground-station control for unmanned missions and vehicles operations.

1.4 Aim:

To send, transfer and receive commands from a user in both directions, transfer it over a secure link and deliver it to the desired end device.

1.5 Objectives:

The main objective of this thesis is to design a remote control system through client-server technique. To achieve these objectives:

1. Design a proposed control circuit for the system.
2. Simulation of the proposed control will be done using PROTEUS and visual basic.
3. Practical implement of the robot design in hardware.
4. Develop a user-friendly GUI to manipulate the robot.
5. Linking the GUI and robot over a secure link using client-server technique.

1.6 Methodology:

To accomplish this project the work was divided into three phases:

- I. **Phase one:** client-server technique over Internet developed by VS2012 software. Serial interface was tested by creating virtual ports. The client can send the commands (forward, backward, left, right and stop) by using API application through the Internet to the computer server which receive the command. both applications secured with a hashed password , the client application adds a preamble to the command and then encrypt it before transfer it through the Internet , in the other side the server application receives the command , decrypt it and then compare the preamble with an specific value to either accept or drop the command .
- II. **Phase two:** a study about atmega16L μ C, DC motors, driver circuit and COM ports. A simulation was created and tested for the μ C by using proteus ISIS and bascom software. Then an implementation of the control circuit was created.
- III. **Phase three:** communication between client-server technique and control circuit has been done using VB components.

1.7 Scope:

The area of knowledge of this project consists of two broad areas, computer networks area and industrial automation area, so the scope of this project is client-server model along with μ C serial communication technologies.

1.8 Thesis organization:

Chapter 1 Introduce the problem and the proposed solution , Chapter 2 About previous work , Chapter 3 Gives an overview of the components used to implement the system , Chapter 4: Describes the system design and the process in details , Chapter 5 Discuss results , Chapter 6: Concludes the thesis.