SECURE DATA TRANSFER USING WIRELESS INFRARED
COMMUNICATION

MOHD RAHIM BIN MAHYUDDIN

This report is submitted in partial fulfillment of requirements for the award of Bachelor
of Electronic Engineering (Telecommunication Electronics)
with honours

Fakulti Kejuruteraan Elektronik dan Kejuruteraan Komputer
Universiti Teknikal Malaysia Melaka

April 2007

UNIVERSTI TEKNIKAL MALAYSIA MELAKA

FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek: SECURE DATA TRANSFER USING WIRELESS INFRARED COMMUNICATION

Sesi Pengajian : 2006 / 2007

Saya : MOHD RAHIM BIN MAHYUDDIN

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TERENGGANU DARUL IMAN

MOHD SHAHRIL IZUAN B MOHD ZIN
Pensyarah
Fakulti Kej Elektronik dan Kej Komputer (FKEKK),
Universiti Teknikal Malaysia Melaka (UTeM),
Karung Berkunci 1200,
Ayer Keroh, 75450 Melaka

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Specially dedicated to:

My lovely parent, my loving family and all my friends in BENT for everything
of support, caring, co-operation.

ACKNOWLEDGEMENT

I have had the opportunity to work with a great group of knowledgeable people that made my final year project a pleasurable and exciting experience. Their help and support throughout my degree project is greatly appreciated. Firstly, I would like to give a highest gratitude to my supervisor, Mr Shahril Izuan bin Mohd Zin for his help this project especially during give guideline and the documentation phase and always helping me work through difficulties and also not disregard thanks to my beloved parent for their non stop encouragement and moral support. Lastly, thanks to the people who involve direct and indirectly in this project for all their support and providing assistance in this project.

ABSTRACT

This project is about secure data transfer using wireless infrared communication. Wireless communication, as the term implies, allows information to be exchanged between two devices without the use of wire or cable. Infrared is a mature and stable technology that has been around for many years and is on most portable devices whereas Bluetooth has not taken hold as yet and is not included in any of the above operating systems. IrDA infrared is secure as it is purposely limited at one meter line-of-sight and thirty degrees cone. Keeping in shorter distance, infrared uses very little power, which is an important factor to consider when it comes to handed devices. This project is deal match two ways to complete this project. The first one is in software using visual basic 6.0, this software is use to encrypt and decrypt the user data for security form hacker. By study this programming; we can produce the better source code. From this source code we used to encrypt the data and decrypt it back for other person who is define by user. In second step is using hardware by construct one IR transceiver circuit which it connect infrared component. The IR transceiver circuits are connecting to serial port at personal computer. For this circuit, we simulate it using workbench multisim, this simulation is important because it can help us to construct the better IR circuit. At the end of this project, we will be produce one type security data transfer device using wireless infrared communication. As the result, this project can be used to transfer a data from one personal computer to another computer by using wireless infrared communication. In addition, to the data transfer, this project also includes an encryption data transfer for a security purpose

ABSTRAK

Projek ini berkaitan dengan kaedah pemindahan data dengan cara yang selamat menggunakan sistem komunikasi tanpa wayar inframerah. Komunikasi tanpa wayar, bermaksud pemindahan maklumat di antara dua buah alat tanpa menggunakan dawai atau kabel. Inframerah adalah satu teknologi yang agak cangih dan stabil dan telah berada di seluruh dunia sejak bertahun-tahun lalu dan ia adalah alat yang boleh dibawa kemana-mana sahaja sebelum Bluetooth diperkenalkan. System IrDA inframerah lebih selamat kerana pancaran cahayanya adalah terhad pada satu meter garis penglihatan dan pada sudut tiga puluh darjah. Ia dapat Menyimpan data dalam jarak yang pendek. Projek ini menggunakan dua kaedah iaitu melalui perisian dan perkakasan.Pertamanya adalah dengan menggunakan perisian Visual Basic 6.0, perisian ini digunakan untuk penyulitan dan penyahsulitan data pengguna untuk keselamatan daripada penggodam. Daripada kod sumber ini kita digunakan untuk penyulitan data dan penyahsulitan kembali untuk penerimanya dapat membacanya melalui keizinan penghantar. Litar penghantar-terima inframerah ini akan disambungkan kepada port bersiri di unit pemprosesan pusat pada komputer peribadi. Untuk litar ini, kita akan membina litar melalui perisian multisim, simulasi ini adalah penting kerana ianya boleh membantu kita untuk membina lebih baik litar IR. Di hujung projek, kita akan dapat menghasilkan sejenis alat pemindahan data menggunakan sistem komunikasi tanpa wayar inframerah dengan lebih selamat. Hasilnya projek ini boleh digunakan untuk memindahkan satu data daripada satu buah komputer peribadi ke komputer yang lain dengan menggunakan system komunikasi tanpa wayar inframerah. Sebagai tambahan, untuk pemindahan data, projek ini juga akan dimasukan satu sistem penyulitan data bagi bertujuan keselamatan tersebut.

CONTENTS

LISTS OF FIGURES

NOMENCLATURE

WDM	-	Window Driver Model
LED	-	Light Emitter Diode
NPN	-	Negative Positive Negative
PCB	-	Printed Circuit Board
RF	-	Radio Frequency
IR	-	InfraRed
MDS	-	Maximum Distance Separable
PHT	-	Pseudo-Hadamard Transform
VB	-	Visual Basic
CPU	-	Central Processing Unit
LAN	-	Local Area Network
AAC	-	Augmentative and Alternative Communication
ELF	-	Extremely Low Frequency
IrDA	-	Infrared Data Association
SIR	-	Serial Infrared
MIR	-	Medium Infrared
FIR	-	Fast Infrared
VFIR	-	Very Fast Infrared
IrTran-P	-	Infrared Image Transfer
DES	-	Data Encryption Standards
AES	-	Advanced Encryption Standard
PC	-	Personal Computer
PDA	-	Personal Digital Assistance

CHAPTER I

INTRODUCTION

1.1   Application Background

The increasing demand for high bandwidth in communication networks has led to rise in the use of optical communication systems for transmitting voice, video and data. Optical communication can be either guided as in fiber optic wave guides or unguided as in wireless systems. Fiber optic systems are the most reliable means of providing optical communications. But the digging, delays and associated costs to lay fiber often make it economically prohibitive. Moreover, once fiber is deployed, it becomes a "sunk" cost and cannot be re-deployed if a customer relocates or switches to a competing service provider, making it extremely difficult to recover the investment in a reasonable timeframe. Wireless infrared communication system on the other hand, is a line of sight technology that uses air/free space as the medium of transmission and is relatively simple. Unlike radio frequencies, the technology requires no spectrum licenses. It is easily upgradeable, and its open interfaces support equipment from a variety of vendors. Further, it enables optical transmission at speeds up to 2.5 Gbps and in the future up to 10Gbps using WDM. This is not possible using any fixed wireless/RF technology existing today.

In this project, Wireless infrared system has built to communicate between two computers. The communication system consists of two identical transceiver circuits at each end of the link to provide full duplex capability. The transmitter uses

a Laser source and the receiver uses a photo-detector. The two computers transmit and receive data through serial ports using RS232 protocol. The transceiver circuitry and the computer interface are presented in detail in the following sections.

1.2   Problem Statement

There are some technical challenges faced in the design of a low-voltage, battery-operated infrared transceiver for wireless communications. The NPN photo transistor and LED behavior, receiver sensitivity and dynamic range, and transmitter operation will be discussed. The use of infrared (IR) light as a means of wireless communication between computers and computer peripherals. Laser based projects used to be expensive, until the development of solid state lasers. This project is designed for the entry level laser experimenter. The circuit allows any two computers with serial (RS-232) communication capability to communicate over 200 meters using a laser beam. A low cost transmitter only circuit is also presented here for use in one way communication and other laser based projects. This is primarily due to the low cost of implementing IR solutions in contrast to radio-based implementations. The increasing pressure to produce low-power, high-speed consumer products in this arena, however, makes the implementation of IR transceivers, which is an integrated transmitter and receiver, more challenging. This project will address some of the key technical issues that need to be considered when designing IR transceivers circuit.

1.3   Project Objectives

This is five main objectives for secure data transfer using wireless infrared communication project.

(a)   To know about the concept of wireless technology system via infrared communication.

(b)   To find solution for security data when we need to transfer it by using wireless infrared and cryptography.

(c)   To find the better Encryption Algorithms as security data especially using twofish encryption.

(d)   To research and development the new high-technology in wireless infrared communication

(e)   To practice our self about circuit (IR transceiver) design in PCB as hardware for this project to match it with software (VB 6.0)

1.4   Scope of Work

The Infrared Performance Consideration for Applications. The performance of infrared LAN access and network synchronization depends upon the following factors:

(a)   CPU speed

(b)   Infrared speed

(c)   Synchronization software

(d)   Application program design

(e)   Network infrastructure

This project will focus more on IR transceiver circuit design which is to connect in serial at pc. The IR communication protocols illustrate that the transceiver must be able to receive and transmit optical pulses of varying duration and duty cycle. Design the IR transceiver circuit by using MULTISIM software to obtain the expected result from the simulation. The source code generated to encrypt and decrypt data by using visual basic 6.0. By using pc interface, the two computers can transmit and receive the data.

1.5   Project Methodology

This project has 4 phases which every phase has a description of project overcome. The literature review can be done by gathering information about this project via Internet, journals, magazines, published work and reference books. In same time, study of the software implementation. The next steps are built a transceiver circuit schematic in multisim and simulate the design the circuit to obtain the result. The other step in this project is to learn Visual basic 6.0 by create one user interface to link serial port RS 232. This interface also must evaluated encryption data as secure in transfer data. The last step in this project is to design IR transceiver circuit base on the simulation in multisim.

1.6   Report Structure

This report have five chapter which every chapter will be discuss how to combine software and hardware in implementation and development to complete secure data transfer using wireless infrared communication. In first chapter, it has 6 sub topics which related to discuss overall this project and give the feature detail about project objective. It also narrates the overview of the Project including application background, problem statement and scope of project. The second chapter is about literature review regarding to the project. It will give more basic information about this project. In third chapter is about methodology and approach taken and a closer look on how the project is actualized. It will explain what method is use for this project to solve project problem. In chapter four, there is all about result and discussion of this project. Here shows the entire discovery from this project and result of analysis from data that have gain. In this chapter also state how far this project has achieved the project objective. Lastly for chapter six for this report will state conclusion for this report and suggestion for this project future development.

CHAPTER II

LITERATURE STUDY

2.1 What Is Infrared?

Infrared is an energy similar to visible light, but with a longer wavelength. Infrared energy is invisible to the human eye, however, while visible light energy is emitted by objects only at a very high temperature; infrared energy is emitted by all objects at ordinary temperatures.

Since thermal imager's sense infrared energy which varies with the temperature of objects in a scene, the image generated provides a thermal signature of the scene. This image can be displayed on a standard video monitor. Infrared energy from objects in a scene is focused by optics onto an infrared detector. The infrared information is then passed to sensor electronics for image processing. The signal processing circuitry translates the infrared detector data into an image that can be viewed on a standard video monitor. These systems are affordable and reliable. Thermal imaging systems not only let we see in the dark, but they also enhance our ability to detect critical objects. Warmer objects such as people and animals stand out from typically cooler backgrounds. Thermal imaging systems see better than the unaided eye in daylight, night and most poor weather conditions.

2.2 Background Study

The concept for this project is about wireless system via infrared as shown in Figure 2.1 which it is the operation flow for these projects. Position for infrared is line of sight about 30° in 5 meter each other.

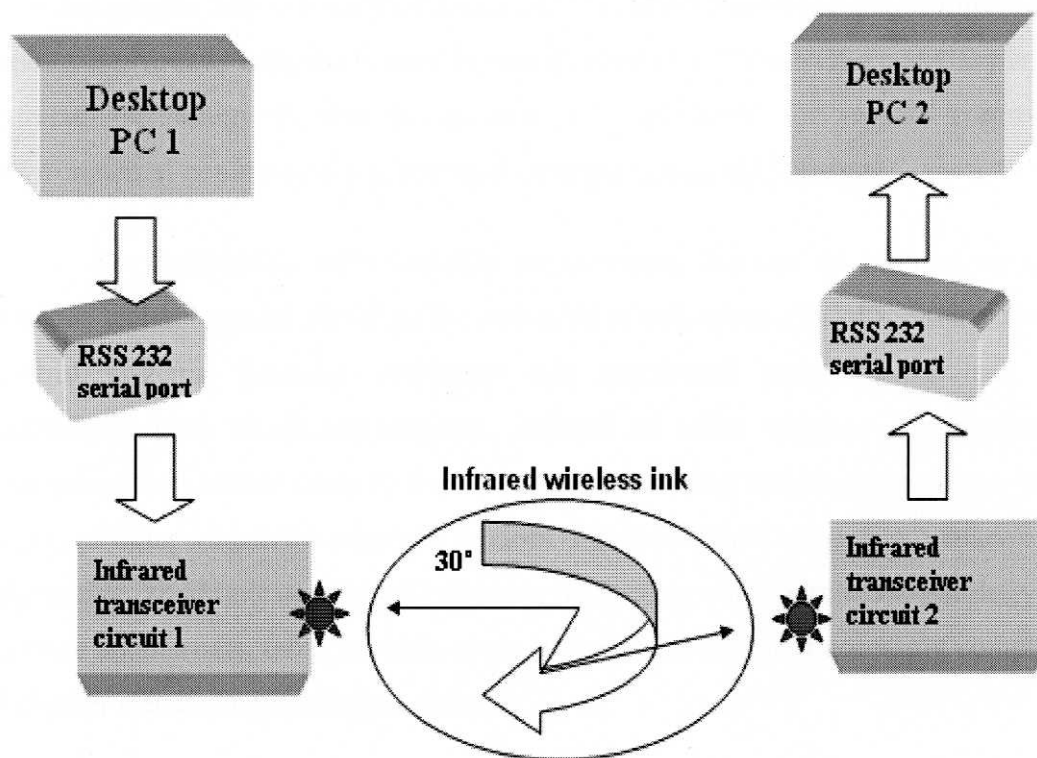Figure 2.1: Block diagram process flow

2.3   Introduction

As next-generation electronic information systems evolve, it is critical that all people have access to the information available via these systems. Examples of developing and future information systems include interactive television; touch screen based information kiosks, and advanced Internet programs. Infrared technology, increasingly present in mainstream applications, holds great potential for enabling people with a variety of disabilities to access a growing list of information resources. Already commonly used in remote control of TVs, VCRs and CD players, infrared technology is also being used and developed for remote control of environmental control systems, personal computers, and talking signs.

For individuals with mobility impairments, the use of infrared or other wireless technology can facilitate the operation of information kiosks, environmental control systems, personal computers and associated peripheral devices. For individuals with visual impairments, infrared or other wireless communication technology can enable users to locate and access talking building directories, street signs, or other assistive navigation devices. For individuals using augmentative and alternative communication (AAC) devices, infrared or other wireless technology can provide an alternate, more portable, more independent means of accessing computers and other electronic information systems.

In this project, an introduction to wireless communication in general is first presented. A discussion specific to infrared technology then follows, with advantages and disadvantages of the technology presented along with security, health and safety issues. The importance of establishing a standard is also discussed with relevance to the disability field, and future uses of infrared technology are presented.

2.4   Wireless Communication

Wireless communication, as the term implies, allows information to be exchanged between two devices without the use of wire or cable. A wireless keyboard sends information to the computer without the use of a keyboard cable; a cellular telephone sends information to another telephone without the use of a telephone cable. Changing television channels, opening and closing a garage door, and transferring a file from one computer to another can all be accomplished using wireless technology. In all such cases, information is being transmitted and received using electromagnetic energy, also referred to as electromagnetic radiation. One of the most familiar sources of electromagnetic radiation is the sun; other common sources include TV and radio signals, light bulbs and microwaves. To provide background information in understanding wireless technology, the electromagnetic spectrum is first presented and some basic terminology defined.

The electromagnetic spectrum classifies electromagnetic energy according to frequency or wavelength (both described below). As shown in Figure 2.2, the electromagnetic spectrum ranges from energy waves having extremely low frequency (ELF) to energy waves having much higher frequency, such as x-rays.
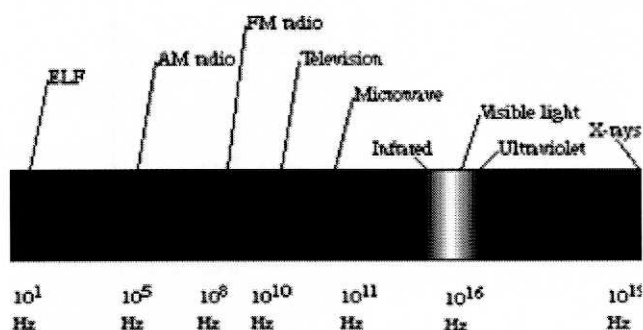

Figure 2.2: The electromagnetic spectrum is depicted

A horizontal bar represents a range of frequencies from 10 Hertz (cycles per second) to 10 to the 18th power Hertz. Some familiar allocated frequency bands are labeled on the spectrum. A typical electromagnetic wave is depicted in Figure 2.3,