DATA COMMUNICATION THROUGH RF

SYAHIRDA BT SAMSUDIN

This report is submitted in partial fulfillment of the requirements of the award of Electronic Engineering (Computer Electronic) with Honours

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UNIVERSTI TEKNIKAL MALAYSIA MELAKA
FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

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PROJEK SARJANA MUDA II

Tajuk Projek : **DATA COMMUNICATION TROUGH RF**

Sesi Pengajian : **SESI 2007/2008**

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MASRULLIZAM B MAT IBRAHIM
Pensyarah
Fakulti Kej Elektronik dan Kej Komputer (FKEKK),
Universiti Teknikal Malaysia Melaka (UTeM),
Karung Berkunci 1200,
Ayer Keroh, 75450 Melaka

Tarikh: 9 MAY 2008

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DECLARATION

"I hereby declare that this report is the result of my own work except for quotes as cited in the references."

Signature : ....

Author : SYAHIRDA BT SAMSUDIN

Date : 2 MEI 2008

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" I hereby declare that I have read this report and in my opinion this report is sufficient in terms of the scope and quality for award of Bachelor of Electronic Engineering (Telecommunication Electronics) With Honours."

Signature : ....

Supervisor's Name : MR MASRULLIZAM B MAT IBRAHIM

Date : 9 MEI 2008

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Special to my parents, supervisor, lecturer and friends..

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ABSTRACT

Data Communication through RF is another way of wireless communication that utilizes effective radio frequency, other than handset and internet resource. Communication through radio is unique and has its own extras. Using this project, user can send the texts, folder and graphic to user that has same equipment in another station depending on the transceiver. It is also possible to transmit a voice with the use of handy talkie. This project is important especially when it comes to lack of telecommunication signal, like internet were disconnect and no signal for hand phone or when traveling in the forest and hill or places that don't have a facilities for communication.

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ABSTRAK

Projek Data Communication through RF ini merupakan salah satu cara berkomunikasi tanpa wayar selain dengan menggunakan isyarat radio yang efektif selain menggunakan telefon bimbit dan internet. Komunikasi menerusi radio adalah unit dan mempunyai kelebihannya yang tersendiri. Dengan menggunakan projek ini, pengguna boleh menghantar teks, fail dan grafik kepada pengguna yang menggunakan alatan yang sama (terminal, modem dan penerima/penghantar) bergantung kepada penerima yang digunakan. Perhubungan suara dengan juga boleh di buat dengan menggunakan handy talkie. Selain itu, projek ini boleh digunakan sewaktu kecemasan, iaitu ketika perhubungan lain seperti talian internet terputus atau sewaktu ketiadaan isyarat perhubungan telefon bimbit semasa menjelajah tempat terpencil seperti di kawasan hutan, bukit dan tempat-tempat yang tiada kemudahan komunikasi.

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LIST OF ACRONYMS

RF	Radio frequency
VHF	Very High Frequency
PSK	Phase Shift Keying
SSTV	Slow Scan TV
DigiPan	Digital Panoramic Tuning
RTTY	Radio Telegraphy

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CHAPTER I

INTRODUCTION

1.1 INTRODUCTION

This project is the one of the communicating digitally over radio frequencies. It is a form of digital data transmission used to link computers.

This communications is a computer telecommunications using VHF (Very High Frequency). This project is similar with the communication via telephone. The telephone modem is replaced by a soundcard (act as modem); the telephone is replaced by a transceiver (hand held), and the phone system is replaced by the "free" waves (144Mhz-148MHz). The data sent from a computer and sends that via radio to another radio station similarly equipped.

User can do keyboard chatting, file and graphic transfer (format-JPEG, BMP, GIF, etc). It's used a digital modes and graphic mode in transmission to communicate as RTTY, MMSSTV and DigiPan.

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1.2 OBJECTIVE PROJECT

The objective of this project is are to design an economical communication using radio frequency, to introduce the Amateur Radio to campus environment especially in our university, to create a system which particularly helps to reduce the noise and interfere so that the accurate signal can be sent as data transmission and to create communication that can used when it comes to lack of telecommunication signal, as in rural area.

1.3 PROBLEM STATEMENT

This project is one of communication system using radio frequency. This communication system was economical. It can overcome the problem when they are problem on telecommunication signal, due to earthquake, and rural area and the forest.

1.4 SCOPES OF WORK

This project only used the higher radio frequency (VHF) where the range of the transmission is limited. The transmission range is influenced by the transmitter power and the type and location of the antenna as well as the actual frequency used and the length of the antenna feed line (the cable connecting the radio to the antenna). Another factor influencing the transmission range is the existence of obstructions for example groups of buildings.

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1.5 SUMMARY OF PROJECT METHODOLOGY

Overall, this report is divided into five chapters. Below is the summary of each chapter within this report. Chapters II is elaborate of the Literature Review. This chapter is explanation how all that implemented to create this communicating through radio frequency. Chapter III is about Project Methodology. In this chapter overall project and function of equipment is an explained and also describe the design and simulation. Chapter VI is describing the result and discussion of this project and the analysis that have been done to justify its function and to make sure it meets the objectives of project. Lastly Chapter VII is the conclusion that will conclude the project and how it can be improved for further development.

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CHAPTER II

LITERATURE STUDY

2. 1 VERY HIGH FREQUENCY (VHF)

Very high frequency (VHF) is the radio frequency range from 30 MHz to 300 MHz. VHF frequencies' propagation characteristics are ideal for short-distance terrestrial communication, with a range generally somewhat farther than line-of-sight from the transmitter. Unlike high frequencies (HF), the ionosphere does not usually reflect VHF radio and thus transmissions are restricted to the local area (and don't interfere with transmissions thousands of kilometers away). VHF is also less affected by atmospheric noise and interference from electrical equipment than low frequencies. Whilst it is more easily blocked by land features than HF and lower frequencies, it is less bothered by buildings and other less substantial objects than higher frequencies. Table 2.1 shows the band of frequency range. [1]

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Table 2.1- The Band of Frequency Range [1]

Band	Frequency range	Origin of name
HF band	3 to 30 MHz	High Frequency
VHF band	30 to 300 MHz	Very High Frequency
UHF band	300 to 3000 MHz	Ultra High Frequency Frequencies from 216 to 450 MHz were sometimes called P-band: Previous, since early British Radar used this band but later switched to higher frequencies.
L band	1 to 2 GHz	Long wave
S band	2 to 4 GHz	Short wave
C band	4 to 8 GHz	Compromise between S and X
X band	8 to 12 GHz	Used in WW II for fire control, X for cross (as in crosshair)
K_u band	12 to 18 GHz	Kurz-under
K band	18 to 26 GHz	German Kurz (short)
K_a band	26 to 40 GHz	Kurz-above
V band	40 to 75 GHz	
W band	75 to 111 GHz	W follows V in the alphabet

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2.2 PSK

Phase-shift keying (PSK) is a digital modulation scheme that conveys data by changing, or modulating, the phase of a reference signal (the carrier wave).

Any digital modulation scheme uses a finite number of distinct signals to represent digital data. PSK uses a finite number of phases; each assigned a unique pattern of binary bits. Usually, each phase encodes an equal number of bits. Each pattern of bits forms the symbol that is represented by the particular phase. The demodulator, which is designed specifically for the symbol-set used by the modulator, determines the phase of the received signal and maps it back to the symbol it represents, thus recovering the original data. This requires the receiver to be able to compare the phase of the received signal to a reference signal such a system is termed coherent (and referred to as CPSK).

Alternatively, instead of using the bit patterns to set the phase of the wave, it can instead be used to change it by a specified amount. The demodulator then determines the changes in the phase of the received signal rather than the phase itself. Since this scheme depends on the difference between successive phases, it is termed differential phase-shift keying (DPSK).

DPSK can be significantly simpler to implement than ordinary PSK since there is no need for the demodulator to have a copy of the reference signal to determine the exact phase of the received signal (it is a non-coherent scheme). In exchange, it produces more erroneous demodulations. The exact requirements of the particular scenario under consideration determine which scheme is used. Figure 2.1 shows the fixed bandwidth, channel capacity vs. SNR for some common modulation schemes [2]

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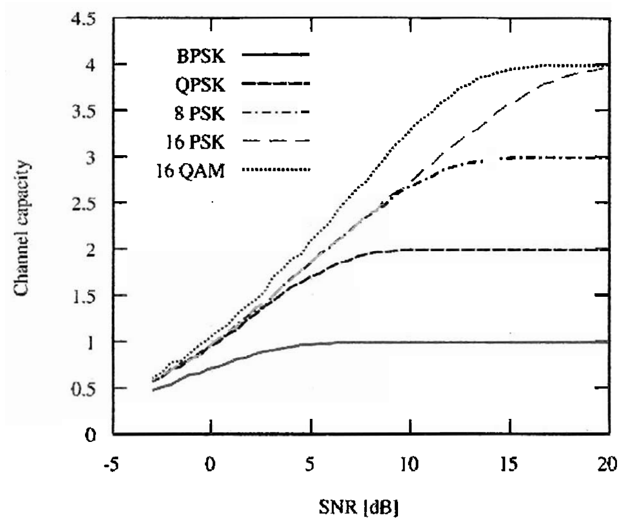

Figure 2.1 - Given a fixed bandwidth, channel capacity vs. SNR for some common modulation schemes [2]

2.3 CALLSIGNS

Upon licensing, a radio amateur's national government issues a unique callsign to the radio amateur. The holder of a callsign uses it on the air to legally identify the operator or station during any and all radio communication. In certain jurisdictions, an operator may also select a "vanity" callsign. Callsign structure as prescribed by the ITU, consists of three parts which break down as follows, using the callsign ZS1NAT as an example:

1. ZS - Shows the country from which the callsign originates and may also indicate the license class. (This callsign is licensed in South Africa, and is CEPT Class 1).
2. 1 - Tells you the subdivision of the country or territory indicated in the first part (this one refers to the Western Cape).
3. NAT - The final part is specific to the holder of the license, identifying that person specifically. [3]

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2.4 BAND PLANS AND FREQUENCY ALLOCATIONS

The International Telecommunication Union (ITU) governs the allocation of communications frequencies world-wide, with participation by each nation's communications regulation authority. National communications regulators have some liberty to restrict access to these frequencies or to award additional allocations as long as radio services in other countries do not suffer interference. In some countries, specific emission types are restricted to certain parts of the radio spectrum, and in most other countries, International Amateur Radio Union (IARU) member societies adopt voluntary plans to ensure the most effective use of spectrum. [3]

2.5 BASIC TYPES OF ANTENNAS

There are two basic types of antennas most commonly used applications are omni directional and directional (point-to-point). Omni-directional antennas are the easiest to use and the most common. As the name suggests, the omni-directional antenna does not require aiming. The electromagnetic energy from the antenna radiates in all directions but typically is strongest perpendicular to the body of the antenna. Omni directional antennas are often used indoors and when the needed range is usually tens of meters. [4]

2.5.1 OMNI-DIRECTIONAL "RUBBER DUCK" ANTENNA

The following figure 2.2 depicts a typical omni-directional antenna radiation pattern (looking down along the axis of the antenna); directional antennas are generally used when the application requires a longer range. Unlike omni-directional antennas, directional antennas emit signals in a more focused and directional way. As a result, the directional antenna must be aimed at the target antenna. The advantages of directional antennas include increased range and the ability to be aimed through openings. Various

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