"Saya akui bahawa saya telah membaca karya ini, pada pandangan saya karya ini adalah memadai dari skop dan kualiti untuk tujuan penganugerahan Ijazah Sarjana Muda Kejuruteraan Elektronik (Elektronik Industri)."

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Tarikh : 22 Mei 2006

SPECTRUM ANALYZER MONITORING PROGRAM

MOHD SAIFUDDIN BIN HASSAN

Laporan ini dikemukakan sebagai memenuhi sebahagian daripada syarat untuk penganugeraah Ijazah Sarjana Muda Kejuruteraan Elektronik & Komputer.

Fakulti Kejuruteraan Elektronik & Kejuruteraan Komputer
Kolej Universiti Teknikal Kebangsaan Malaysia

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"Saya akui laporan ini adalah hasil kerja saya sendiri kecuali ringkasan dan petikan yang tiap-tiap satunya telah saya jelaskan sumbernya."

Tandatangan	:	.....
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Tarikh	:	10 Mei 2006

DEDICATION

Khas buat keluarga tersayang

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ABSTRACT

The purpose of this project is to design and build a system that can control spectrum analyzer unit and monitored frequency usage at certain area in certain rate without pushing buttons on the device. It can showed waveform at the screen of the device with transferred signal using serial cable RS-232 and a CPU as input. This kind of monitoring should be done and suitable to be use in telecommunication industry because it can show the frequency that been use by third party or not being use yet. Currently, most existing spectrum analyzer is quite hard to use because there are too many buttons that must be pushed to operate it. This make the usage of the spectrum analyzer is limited only to a people who are expert in the field. Beside, the price of this device is very expensive for every unit. So it can make user more afraid to use it. This Spectrum Analyzer Monitoring program will be created by using Microsoft Visual Basic. With this build programming system, users need no more to push buttons on spectrum analyzer because each analyze that want to be perform can be done by just inserting value and click at specified button on the computer program. A user friendly program called Spectrum Analyzer Monitoring program will analyze the input that been inserted and the result will be showed on the spectrum analyzer screen. This project can be commercialized because it is cheap to built, portable and can be use as learning module because it is easy to use.

ABSTRAK

Tujuan projek ini adalah untuk mencipta dan membina satu sistem yang boleh mengawal unit *spectrum analyzer* dan memantau penggunaan frekuensi di sesuatu kawasan dalam julat yang tertentu tanpa menekan butang pada alat tersebut. Ia boleh memaparkan gelombang pada alat tersebut dengan penghantaran isyarat menggunakan kabel sesiri RS-232 dan komputer sebagai masukan. Pemantauan ini perlu di lakukan dan sesuai digunakan dalam industri telekomunikasi kerana ia dapat mengenalpasti frekuensi yang telah di gunakan oleh pihak lain dan juga frekuensi yang belum digunakan. Kebanyakan *spectrum analyzer* yang digunakan sekarang ini adalah agak sukar digunakan kerana terdapat banyak butang yang perlu di tekan. Jadi penggunaannya adalah terhad kepada seseorang yang mahir menggunakannya sahaja. Satu perkara lagi, alat ini adalah amat mahal setiap satu unit. Jadi ini akan lebih menyebabkan seseorang itu tidak berani untuk mencubanya. *Spectrum Analyzer Monitoring program* ini akan dibuat dengan menggunakan pengaturcaraan Microsoft Visual Basic. Dengan adanya pengaturcaraan ini, pengguna tidak lagi perlu menekan pada *spectrum analyzer* kerana segala bentuk analisa yang ingin dilakukan boleh dijalankan dengan hanya memasukkan nilai dan menekan butang-butang tertentu pada program komputer. Satu program yang mesra pengguna yang dipanggil *Spectrum Analyzer Monitoring program* akan menganalisa masukan yang dimasukkan dan akan memaparkan keputusan pemantauan di dalam unit *spectrum analyzer*. Projek ini boleh dikomersilkan kerana ia adalah satu aturcara yang murah, mudah dibawa ke mana-mana dan sesuai dijadikan modul pembelajaran kerana programnya mudah digunakan.

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LIST OF ABBREVIATIONS

kHz	kilo Hertz
MHz	Mega Hertz
Ghz	Giga Hertz
Rms	root mean square
GUI	Graphic User Interface
RS-232	Serial cable connection
FFT	Fast Furrier Transform
R3132	Spectrum analyzer model
dB	decibel
GPIB	General Purpose Interface Bus
OBW	occupied bandwidth
LCD	Liquid Crystal Display
TFT	Thin film transistor
VGA	Video graphic array
ACP	Adjacent channel leakage power
EMC	Electro-Magnetic Compatibility
TV	Television
EIA	Electronic Industries Association
DTE	Data Terminal Equipment
DCE	Data Communications Equipment
PC	Personal computer
CPU	Central Processor Unit
LSB	Least significant bit
MSB	Most significant bit
GND	ground
I/O	Input/Output

IBM International Business Machines Corporation

CHAPTER 1

INTRODUCTION

1.1 OVERVIEW

In wireless, spectrum is refers to the radio portion of the electromagnetic spectrum. The radio spectrum spans a certain, limited frequency range. Multiple signals can be transmitted simultaneously on different frequencies. But if the frequencies are the same, or even too close, the signals interfere with each other.

Furthermore, radio signals spread out and fade over geographic distance. So while two radio transmitters on the same frequency, in the same area, might interfere with each other - if they were in different area, they would not interfere.

Sections of spectrum are called "bands". The portions of spectrum set aside for wireless mobile phone service are split into two bands. The first is Cellular, which is centered roughly around 800 MHz. The second centered roughly around 1900 MHz.

A spectrum analyzer can be described as a frequency-selective, peak-responding voltmeter calibrated to display the rms value of a sine wave. It is important to understand that the spectrum analyzer is not a power meter, even though it can be used to display power directly. As long as w know some value of a sine wave (for example, peak or average)

1.2 PROJECT BACKGROUND

Communication technologies and broadcasting is a very fast growing industries and caused the increasing the numbers of frequency users. The usage of this frequency must be monitored to control and reduced the interference in the other channel. The controlling of an illegal frequency existence must be done to specialize the usage of the frequency to its' owner.

The main purpose of this project is to build a computer programming by using the *Microsoft Visual Basic 7.0* programme that base to a menu system that called *Graphic User Interface(GUI).* This programming will be used to monitor a frequency in certain condition at certain place. There are two(2) main components that being used in this project that is computer and spectrum analyzer. Computer will be used as main unit while the spectrum analyzer as a device. The menu that appear on the screen of computer is an interactive system that allow users to input data and the programme will show the results. The output results are the analized data and contains frequency itself, noise, and the power that being used at the signal.

By using this programme, it will be able to store its' results because it has it own storage area. This is a needed for a system because the data that being monitored in such condition will be regain as a reference for certain cases. The already spectrum analyzer don't have a storage area for its' own and only have

storage device using a 3½ foppy diskette. The data then will be transferred to the computer using this device to print out the output results. This computer programming is also contructed to improve the storage for the spectrum analyzer.

1.3 PROBLEMS

Nowadays, communication technologies and broadcasting is a very fast growing industries and caused the increasing the numbers of frequency users. The usage of this frequency must be monitored to control and reduced the interference in the other channel. The controlling of an illegal frequency existence must be done to specialize the usage of the frequency to its' owner.

Referring to the telecomunication industries in Malaysia now, there are some problem about fixing frequency for such situation. To fix certain frequency for some people or company as example telecomunication company, they need to know what and which frequency is active and not been used yet by other telecomunication company. To know the frequency, they must monitor and gain some information before make a conclusion.

Beside, filing system that being used today is seing no more effective and create many problems. Sometime the file that being search in a file rack can't be found and also have been destroyed by cockroaches or ants. So this programming sytem will solve the problem by offering a filing system in the computer and also can be transferred to the secunder drive such as diskette, compact disc, and also other removable drive.

In such situation, complex calculations that doing by human sometimes made themselves being stress and caused them to make mistakes. That mistakes calculations will results wrong data and will continuos if not being corrected. By using this programme, it will calculate itself all data that being collected and can be obtain by put the information that required.

1.4 OBJECTIVE

The main objectives of this project are:

i. ***To make the Spectrum Analyzer user friendly and interesting***

Here the Spectrum Analyzer will be more users friendly and interesting compared with the Spectrum Analyzer that is already had. The interface will be more interesting and the user can use it without push the button on the Spectrum analyzer

ii. ***To give benefit for the*** *Spectrum Analyzer* ***user***

There will be more benefit to the Spectrum Analyzer users with this project. With this project, the Spectrum Analyzer user will not worry to do mistake because all value that required is inserted in computer.

1.5 PROJECT SCOPE

Here is the project scope needs to be done and follow during the duration of the project:

i. Study about Spectrum Analyzer and Microsoft Visual Basic.
ii. Make the programming of the Spectrum Analyzer interface by using Microsoft Visual Basic.
iii. Test the programming made and looks at the result get.
iv. Link the project with the Graphic User Interface project.

1.6 THESIS SUMMARY

This thesis contains five chapters that will explain details about this project. The first chapter is about the introduction of the project. This chapter will explain about the project background, project problems, project objectives and project scopes. The explanation is just the basic explanation of the project.

The second chapter is about the literature reviews of the project. The literature reviews includes the study of the components in the project such as Spectrum Analyzer, Microsoft Visual Basic and RS-232 serial cable. Most of the literature reviews is got from articles from the internet about the characteristic of the components. This chapter will show the theory of each aspect of the projects. Besides the theory of the components will be understand from the literature reviews.

The third chapter is about the project methodology. Here the solution steps of the project will be showed. Here all of the action taken while make this project is

showed such as the source code from Microsoft Visual Basic and understanding the Spectrum Analyzer. All of the steps understands clearly and will be explain in detail in this chapter.

The fourth chapter is the information of result got from the project. Here the output or the result of my project is showed in graphical interface forms. Besides the result is showed to prove that the project is running and have the output. The result is showed in Microsoft Visual Basic interface.

The last chapter is about the suggestion and the conclusion of the project. The overall conclusion of my project is showed here with the suggestion to improve my project. Besides the problems happens while making the projects also show here and the suggestion of the solving methods.

CHAPTER 2

LITERATURE REVIEWS

2.1 INTRODUCTION

This chapter is discussing about the theory and components use on the project. There are three main theories in this project. They were theories of Microsoft Visual Basic, Spectrum Analyzer and RS-232 Serial Cable.

2.2 Microsoft Visual Basic

Microsoft Visual Basic is a computer language that has been developed to help we create programs that will work with the Window operating system. It is an event-driven language that does not follow a predefined sequence of instructions; it responds to events to execute different sets of instruction depending on which event occurs. In addition to being event-driven, Microsoft Visual Basic is an object-oriented language that is it uses identifiable shapes, each of which has certain properties and can respond to a variety of events.