DIGITAL PERSONAL COMPUTER OSCILLOSOCPE

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This report is submitted in partial fulfillment of requirement for the award of Bachelor of Electronic Engineering (Computer Engineering) with honours

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To Beloved Father, Mother and members of Family....

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ABSTRACT

This project is aim to design and assemble the complete model of Digital Personal Computer (PC) Oscilloscope. Digital Personal Computer Oscilloscope is a new version of oscilloscope is emerging that consists of an external analog-to-digital converter which is connected to a PC are provides a display, control interface, disc storage, networking and power supply. The main objective for this project is to use Visual Basic as a heart of the operating system. This software will integrate software and hardware part, and finally design and assemble a model of Digital Personal Computer Oscilloscope. This project is attempts to achieve the same functionality as a Cathode Ray Tube (CRT) oscilloscope by using a data acquisition card (DAQ) which transfers the data to the PC via Universal Serial Bus Technology (USB). The most important part of this project is on screen graphics which is display the signal. The data will be directed to the screen of PC and will display the waveform that represents the signals.

ABSTRAK

Projek ini bertujuan untuk merekabentuk dan memasang satu model lengkap Digital Osiloskop Komputer Peribadi. Digital Osiloskop Komputer Peribadi adalah satu versi osiloskop yang baru yang mengandungi perkakasan luaran yang menukarkan analog kepada digital yang disambung ke komputer peribadi yang menyediakan paparan, kawalan paparan, simpanan dalam cakera, sistem rangkaian dan kuasa elektrik. Objektif utama projek ini ialah untuk membangunkan sistem dengan menggunakan Visual Basic. Perisian ini akan menghubungkan antara bahagian perisian dan perkakasan, dan akhir sekali ialah untuk merekabentuk dan memasang satu model Digital Osiloskop Komputer Peribadi. Projek ini cuba untuk mencapai fungsi yang sama seperti Osiloskop Sinar Tiub Katod (CRT), dengan menggunakan kad perolehan data (DAQ) yang dapat memindahkan data ke komputer peribadi melalui teknologi Bus Selari Universal (USB). Bahagian yang paling penting dalam projek ini adalah paparan grafik isyarat di skrin. Data akan diarahkan terus ke skrin komputer dan akan menghasilkan satu gelombang yang yang mewakili isyarat tersebut.

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LIST OF ABBREVIATIONS

PC   -   Personal Computer

I/O   -   Input/Output

VB   -   Visual Basic

GUI   -   Graphical User Interface

CRT   -   Cathode Ray Tube

DAQ -   Data Acquisition

USB -   Universal Serial Bus

DC   -   Direct Current

AC   -   Alternating Current

Hz   -   Hertz

ADC -   Analog-to-Digital Converter

DAC -   Digital-to-Analog Converter

DIO   -   Digital Input/Output

GPIB -   General Purpose Interface Bus

SE   -   Single Ended

RAM -   Random

CPU -   Central Processing Unit

TTL   -   Transistor Transistor Logic

DAO -   Data Access Objects

RDO -   Remote Data Objects

ADO -   ActiveX Data Objects

PDLC -   Program Development Life Cycle

BASIC -   Beginner's All-Purpose Symbolic Instruction Code

GND -   Ground

RSE -   Reference Single Ended

FIFO -   First-In-First Out

MUX -   Multiplexer

PGA -   Programmable-gain Amplifier

AI -   Analog Input

AO -   Analog Output

VDC -   Voltage Direct Current

V -   Volts

PSM -   Projek Sarjana Muda

LIST OF APPENDIX

CHAPTER I

INTRODUCTION

1.1   CHAPTER OVERVIEW

This first chapter will explain more about the introduction of project. Firstly, the project introduction will explain a simple description about the project that has been implemented. It will show the project's importance and several about the research that have been implemented. Then, this chapter will expound about the objectives of the project and the problem statement of the project also will be described briefly. Next, the scope of work will be described simply and any assumptions that have been made in this project will be explained. Project's methodology also will be shown in this chapter but the briefly explanation of this topic only will be describe in other chapter. Finally, this report will be end by showing the overall thesis structure including the summary from each chapter.

1.2   BACKGROUND OF PROJECT

The aim of this project is to design and assemble the complete model of Digital Personal Computer (PC) Oscilloscope. This digital oscilloscope can monitored the output from PC. This project contains several stages of operation. Firstly is how to find the suitable interface part. The other stages are involves in computer such as I/O card interface and Visual Basic programming which displayed the data. This project will produce a complete working model that is user friendly and accurate value. The final demonstration will include the external hardware control system connected through a port to the computer by I/O card. The heart of the system will be executable program that is programmed by Visual Basic. The most important part will be the on screen graphics display of the signal. The data will be directed to the screen of the PC and will reproduce a wave form that represents the signals. The importance of this project is to create an easy technology compare to existing oscilloscope technology. This Digital PC Oscilloscope is low cost and also portable especially when the user uses a laptop PC.

1.3   OBJECTIVES

In this project there are three objectives. Below is the list of this project's objectives;

i)   To design the system (GUI) by using Visual Basic

ii)   To integrate between software (VB) and hardware to make a complete working process of Digital Personal Computer Oscilloscope.

iii)   To design and assemble the complete model of Digital Personal Computer Oscilloscope.

Visual Basic is used in design the graphical user interface (GUI) because it encompasses a set of tools and technologies that are used by more than three million developers worldwide to create computer software components and applicants. Then, the

suitable interface part to communicate between PC and external hardware must be obtained. The suitability of the hardware is depends to the cost, portability and user friendly. Integrate the hardware and software part one of crucial process and try to solve this most complicated step or work of project.

1.4   PROBLEM STATEMENT

Oscilloscopes are one of the most widely used electronic instruments because they provide easily understood displays of electrical waveforms and are capable of making measurements over an extremely wide range of voltage and time. Oscilloscopes traditionally are hardware based using a CRT (Cathode Ray Tube) designed to display voltage variations (periodic or otherwise). This traditional oscilloscope has it own weakness and problem compare to Digital PC oscilloscope. Firstly, the cost of CRT oscilloscope is high if we compare to Digital PC oscilloscope. If CRT oscilloscope wants to use PC's networking and disc storage functions, it must used extra cost when added to a self-contained oscilloscope. Otherwise, the procedure to export the data to standard PC software such as spreadsheets and word processors are difficult. The CRT oscilloscope is not ability to control the instrument by running a custom program on the PC. Finally, the weakness of the recent oscilloscope is not portability. The size of the recent oscilloscope is big and heavy. Digital PC oscilloscope is design to solve or decrease the weakness and problem above. Digital PC Oscilloscope is a new type of oscilloscope is emerging that consists of an external analog-to-digital converter connected to a PC that provides the display, control interface, disc storage, networking and often the electrical power.

1.5   SCOPE OF PROJECT

This project is attempts to achieve the same functionality as a traditional oscilloscope, using a data acquisition card (DAQ) which transfers the data to the PC

(possibly via USB). The Visual Basic program application will then display the waveform as it would appear on a traditional CRT oscilloscope. Actually, the purpose of this project is to apply what student had learned in the previous semesters and also to get new useful knowledge.

For hardware part, this project is more about how to inter-relate computer technology with external hardware design. DAQ Card is use as an interface between input and output. For software part, the design of the interface part on PC's monitor (GUI) is develop by using Visual Basic and then programmed by programming language. Besides that, the writing of the Visual Basic programming language must follow to the specification of the hardware part. Finally, the integration of the hardware and software part will be implementing so that it will produce a complete model of Digital PC Oscilloscope. The data will be directed to the monitor of the PC and will reproduce a wave form that represents the signal.

1.6   METHODOLOGY

Methodology for this project is divided into three parts as listed below;

i)   Hardware part
ii)   Software part
iii)   Integrate the hardware and software part

For hardware part, first method is making some researches to find suitable hardware. The researches about the information and data of hardware will be used and make sure that hardware is suitable based on specification of project, available on market and also low cost. After choose the right hardware or equipment, scope more detail about the chosen hardware and understanding hardware specification. Finally is to design and assemble that hardware.

For software part, firstly concentrate on literature review which study of the journals, application notes, data and books that related to this project will be done. Besides, learning more detail about Visual Basic programming will make the implementation of this project become easy. Finally, the design of the interface part is develop by using Visual Basic and programmed by programming language.

In final stages, the software and hardware part will be integrated to become a complete model of Digital Personal Computer Oscilloscope. Then, the debugging process will be implemented to check either it function properly or not.

1.7   THESIS ORGANIZATION

This thesis report provides all explanations and detail information about this project. The material is divided into six chapters as follows.

Chapter 1 provides an overview or introduction of this project. All the simple description of my project is shown under this chapter. This chapter also expound about project's objectives, problem statement, scope of work and methodology.

Chapter 2 is literature review which the discussion about the background study that relevance to the project. There are many others project, journal and thesis that have been taken as a comparison and reference. From this process, the weakness from other project can be reduced and the other project mistake can been avoided. This chapter will discuss the study and all information that are related to this project.

Chapter 3 will explain the specifically about the methods or procedures that have done to make this project success. The success of this project can be determined when the project objectives archived.

Chapter 4 will show the results obtained on this project including the finding and the analysis of the data. On this chapter, the discussion of all the result will be explained.

Finally, all the chapter will be conclude in chapter 5. Then, suggestions are given to improve this project in future.