

AUTOMATED PHYSICS DEMONSTRATIONS
CONTROLLED USING VISUAL BASIC

MUHAMAD FAREED BIN MOHD RAFI
B071110197

UNIVERSITI TEKNIKAL MALAYSIA MELAKA
2015



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**AUTOMATED PHYSICS DEMONSTRATIONS CONTROLLED
USING VISUAL BASIC**

This report submitted in accordance with requirement of the Universiti Teknikal
Malaysia Melaka (UTeM) for the Bachelor Degree of Engineering Technology
(Industrial Power) (Hons.)

by

MUHAMAD FAREED BIN MOHD RAFI

B071110197

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2015

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: Automated Physics Demonstrations Controlled Using Visual Basic

SESI PENGAJIAN: 2014/15 Semester 1

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DECLARATION

I hereby, declared this report entitled “Automated Physics Demonstrations Controlled Using Visual Basic” is the results of my own research except as cited in references.

Signature :

Author's Name : MUHAMAD FAREED BIN MOHD RAFI

Date : 23/12/2014

APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Engineering Technology (Industrial Power) (Hons.). The member of the supervisory is as follow:

.....
(EN. SHAHRUDIN BIN ZAKARIA)

ABSTRAK

Projek ini menyifatkan tentang pembangunan kit demonstrasi yang digunakan untuk menunjukkan eksperimen yang berkaitan dengan prinsip-prinsip fizik secara automatik. Pada masa kini, eksperimen di sekolah masih dijalankan secara manual . Dengan projek ini, eksperimen yang dijalankan secara manual akan mendemonstrasikan eksperimen secara automatik dan ia dikawal menggunakan perisian Visual Basic (VB). Kit demonstrasi ini adalah ringkas, serba boleh dan mempunyai ketahanan lebih lasak daripada melakukan eksperimen secara manual. Kit demonstrasi ini mempunyai 4 bahagian demonstrasi. Bahagian pertama adalah demonstrasi mengenai prinsip Bernoulli yang merupakan eksperimen melantun belon dan bahagian kedua adalah demonstrasi tentang motor elektrik dengan penukar tertib. Di samping itu, bahagian ketiga adalah demonstrasi mengenai induksi elektromagnet dan bahagian terakhir adalah demonstrasi mengenai lenturan cahaya. Kelebihan kit demonstrasi ini ialah ia menggunakan program yang dibuat dengan VB adalah bahawa ia dapat memendekkan masa dan membangunkan komponen latihan interaktif semasa fasa kajian dan penilaian fenomena fizikal.

ABSTRACT

This project described the development of the demonstrations kit that is being used for demonstrate experiments related to physics principles automatically. Currently, experiments at a school still run manually. With this project, the experiment that run manually will be demonstrates the experiments automatically and it controlled using Visual Basic (VB) software. This demonstrations kit is simple, versatile and more rugged durability than do the experiments manually. This demonstrations kit has 4 demonstrations sections. The first section is a demonstration of Bernoulli's principle which is the bouncing balloon experiment and the second section is a demonstrations about electric motor with commutator. Besides that, the third section is a demonstrations about an electromagnet induction and the last section is a demonstrations about bending the light. Advantages of this demonstrations kit is using programs made with VB are that it shortens the time and develops interactive training component during phases of study and assessment of physical phenomena.

DEDICATION

To my beloved parents, family, friends and lecturers

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I would like to than I will like to express my gratitude to Universiti Teknikal Malaysia Melaka (UTeM) for giving me the opportunities and fully sponsored through Jabatan Perkhidmatan Awam (JPA) Scholarship to pursue my Bachelor's Degree in Electrical Engineering Technology.

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TABLE OF CONTENT

Abstrak	i
Abstract	ii
Dedication	iii
Acknowledgement	iv
Table of Content	v
List of Tables	vii
List of Figures	viii
CHAPTER 1: INTRODUCTION	1
1.1 Background	1
1.2 Problem Statement	2
1.3 Project Objectives	2
1.4 Project Scope	2
1.5 Project Outline	3
CHAPTER 2: LITERATURE REVIEW	5
2.1 Previous Project Study	5
2.1.1 Java	5
2.1.2 Visual Basic.Net	6
2.2 Best Choice for Programming Language	7
2.2.1 Java	7
2.2.2 Visual Basic.Net	8
2.3 Software	8
2.3.1 Microsoft Visual Basic 2010 Express Software	9
CHAPTER 3: METHODOLOGY	10
3.1 Project Methodology	10
3.2 Hardware Development	12

3.3	Software Development	12
3.4	Hardware Design	13
	3.4.1 Visual Basic Program	13
3.5	The Making of a VB.NET Application	13
	3.5.1 Short Description	14
	3.5.2 Creating a Window Application	14
	3.5.2.1 Begin a project	14
	3.5.3 Forms	18
	3.5.4 Sprucing up the Form	19
	3.5.4.1 Change the display name and icon of the form	19
	3.5.4.2 Change the background colour of the form	21
	3.5.4.3 Add a button to the form	21
3.6	Adding Function to the Button	23
3.7	Application Creation Summary	25
3.8	Physics Principle/Experiment	25
	3.8.1 Bernoulli's Principle (Bouncing Balloon)	26
	3.8.2 Electric motor with commutator	27
	3.8.3 Electromagnetic Induction	28
	3.8.4 Laser bending experiment	29
CHAPTER 4: RESULT & DISCUSSION		30
4.1	VB.NET Application	30
4.2	Result	31
4.2	Expected Result	38
CHAPTER 5: CONCLUSION & FUTURE WORK		39
5.1	Summary of Research	39
5.2	Problems Faced During Research	39
5.3	Suggestions for Future Work	40
5.4	Overall Conclusion	40
REFERENCES		41

LIST OF TABLES

2.1	Advantages and disadvantages of Java	8
2.2	Advantages and disadvantages of Visual Basic.Net	8

LIST OF FIGURES

2.1	Microsoft Visual Basic 2010 Express software	9
3.1	Project flow chart	11
3.2	Start screen of Visual Studio 2010	15
3.3	Creating a new project	16
3.4	New Project Selection screen	16
3.5	Start of New Project	18
3.6	Default application	19
3.7	Properties panel for Form1	20
3.8	VS10 Toolbox for forms	22
3.9	New Modified Form	23
3.10	Code for Form1	24
3.11	Message Code	24
3.12	Message Box on Button Click	25
3.13	Ball before air blow	26
3.14	Ball after air blow	26
3.15	A simplified diagram of the parts in an electric motor	27
3.16	Electromagnetic Induction	28
3.17	Laser bending experiment	29
4.1	First Interface Design	32
4.2	First Interface Code	32
4.3	Second Interface Design	33
4.4	Second Interface Code	33
4.5	Third Interface Design	34
4.6	Third Interface Code	34
4.7	Fourth Interface Design	35
4.8	Fourth Interface Code	35
4.9	Fifth Interface Design	36

4.10	Fifth Interface Code	36
4.11	Sixth Interface Design	37
4.12	Sixth Interface Code	37

CHAPTER 1

INTRODUCTION

The “Automated Physics Demonstrations Controlled Using Visual Basic ” is designed and built to accommodate the needs of educational process due to progressing towards teaching and learning process environments. This project using the physics principles as a main concept which is to demonstrate the experiments and also using a Visual Basic to run or controlled the demonstrations automatically by users. This project used to run 4 kinds of demonstrations related to physics principles. This chapter will briefly discuss the general background of this project, its concept, objectives, scope and the problem statement.

1.1 Background

Automated P hysics Demonstrations Controlled Using Visual Basic using the physics principles as a main concept which is to demonstrate the experiments and also using a Visual Basic to run or controlled the demonstrations automatically by users. This project used to run 4 kinds of demonstrations related to physics principles. The main objective for this project is used to provide a simple, versatile and study training kit. With this trainer kit, the process of learning physics principles can be achieved more quickly and easily. This trainer kit provided 4 sections physics demonstrations. The most interesting for this project is this trainer kit can be demonstrating the experiments automatically and the user just control the start and stop the demonstrations. Simple and easy for the objectives to achieve.

1.2 Problem Statement

Nowadays, the physics subject is the most common subject that taught in most school. Students have trouble to understanding the physics principles that they have learned in class, so they have to do experiments to understand and proves the principles. . However, looking back at our country's school physics teaching process, the main teaching method is still that a teacher writes the formula using a piece of chalk. such a chalk, a blackboard teaching model makes the course which does strong efforts to improve students' ability to analyse problems and problem-solving ability become less practical, more abstract (Huang & Zhang, 2010).

1.3 Project Objectives

There are several objectives in this development of trainer kit such as:

- To design the program of Automated P hysics Demonstrations Controlled Using Visual Basic
- To develop the hardware of Automated P hysics Demonstrations Controlled Using Visual Basic
- To examine the compatibility of visual program and hardware

1.4 Project Scope

This project involves with study of the physics principles based training kit. The first section is a demonstration of Bernoulli's principle which is the bouncing balloon experiment and the second section is a demonstrations about electric motor with commutator. Besides that, the third section is a demonstration about an electromagnet induction and the last section is a demonstration about bending the

light. The main function of microcontroller is to save and run the program. This project is divided into two parts which is the software development using Microsoft Visual Basic and the hardware part, the trainer kit. The scope of this project is to use personal computer (PC) or notebook computer as an interface.

1.5 Project Outline

Chapter 1:

The general information of this project is provided in this part such as background project, problem statement, and objective of project and scope of project.

Chapter 2:

Journal and some references are explained in this part. There are might be in comparison explanation or some information that's used in this project. There are too many comparison had done in this part. Furthermore, some discussion also made in this part after do the comparison.

Chapter 3:

In order to achieve the objective, several methodologies have been proposed. Literature review is done by gathering information about this project from journal, article, books and papers in order to get knowledge. In the beginning, literature review including understanding about the project. Next is design the system interface by using Microsoft Visual Basic 2010 Express software then the development of hardware. Follow by implementation and integration phase where is to test the project and analyse the results. Finally, the report has been prepared.

Chapter 4:

The main concept which is to demonstrate the experiments and also using a Visual Basic to run or controlled the demonstrations automatically by users. Thus, some knowledge should be included in this report for reference.

Chapter 5:

In this last chapter, conclusion and future work be explained in more depth and detail. Summary of research and problem faced during research will also be discussed in this chapter. The objective of this project will be reviewed either achieved or not.

CHAPTER 2

LITERATURE REVIEW

This chapter will discuss mainly on the theory and current development in Automated Physics Demonstrations Controlled using Visual Basic. This chapter is divided into two parts, one for Vision System and the other is for Industrial Robot Application. Literature review is done by gathering information about this project from journal, article, and books. Literature review is necessary before initiate the project and literature researches regarding the project are important in understanding the concept of the overall project. This chapter discusses about Microsoft Visual Basic 2010 Express software.

2.1 Previous Project Study

Some case study and review of previous researches is performed to gain more information and understanding on programming language. Previous study shown there are some journals about demonstration of physics using various languages.

2.1.1 Java

Java is a cross-platform language with simple grammar which can achieve quantitative calculations (Huang & Zhang, 2010). The Java language was developed at Sun Microsystems in December 1990 as part of the Green project, a small research effort into consumer electronics (Gilbert-rainer, Eftimie, & Re, 2004). It is generally embedded in a web page when used (Huang & Zhang, 2010). First used to create

simple programs on World Wide Web pages, Java can be found today in a lot of, yesterday unusual, places (Gilbert-rainer, Eftimie, & Re, 2004). In addition, it supports a series of interactive Windows controls such as buttons, text boxes. Java is an object oriented programming language. He creates two kinds of programs: applications and applets (Gilbert-rainer, Eftimie, & Re, 2004). In my experience in teaching Machine dynamics I use to work with applets. Located in html files in a browser like Internet explorer it has the advantage to combine the possibilities of both. This are: the capability to present hypertext with the theoretical presentation, the possibility to link the student to appropriate or similar pages, the interactivity and visualization (Gilbert-rainer, Eftimie, & Re, 2004).

2.1.2 Visual Basic

Derived from basic language, VB (Visual Basic) is a programming language focused on the video interface component (Chitu & Inpuscatu, 2011). With graphics and functional components implemented, the programmer is able to bring and use their components to achieve in a relatively short time, the desired application. Language V.B. is a useful tool Physics Teaching by creating educational programs with him (Chitu & Inpuscatu, 2011). Advantages of using programs made with Visual Basic are that it shortens the time and develop interactive training component during phases of study and assessment of physical phenomena (Chitu & Inpuscatu, 2011). The right software evaluation matrix is created in the programming language Visual Basic (VB) and corresponding interface is easy to use by the teacher (Chitu & Inpuscatu, 2011). Using the computer in classic laboratory experiment improve the quality of training physical discipline (Chitu & Inpuscatu, 2011). Visual Basic (VB) is a programming language produced by Microsoft, derived from BASIC. It is widely popular because this program has the graphical interface that is available to the user. This interface is relatively simple to done. Visual Basic can be used to make simple educational software but and to achieve more complex applications such as computer games (Chitu & Inpuscatu, 2011). Use graphical interfaces (GUI) on the laboratory scientific experiment offers students information

on values and that the order of magnitude of physical parameters measured (Chitu & Inpuscatu, 2011).

2.2 Best Choice for Programming Language

The objective of this research is to determine which programming language among Java and VB .NET is the ideal choice for the Object-Oriented Programming (OOP) course in the Information Technology major. After discussing the fundamentals of OOP, this study compare OOP languages, Java and VB .NET, with other procedural languages. It formulates six criteria, such as:

- (a) The ease of development
- (b) Increased performance
- (c) Application development
- (d) Runtime possibilities
- (e) Application integration
- (f) Cost-efficiency

Both Java and VB.Net possess strengths and weaknesses. Java's strength lies in its increased performance, runtime environments, application integration within the same enterprise and between enterprises, and in cost-efficiency. VB.Net is advantageous in the ease of program development, rapid application development thereby culminating in a reduction in time to- market. The students prefer VB.Net due to its easy program development ability with GUI in Windows application. This author favours Java due to its component capabilities of running large scale projects on multi- tier client/server systems on any platform, and application integration within and between enterprises. Presently, both Java and VB.Net are full- fledged languages and both are excellent choices for learning OO Programming. The specific choice of either for the Object-Oriented Programming course depends upon a particular university's Information Technology Environment (Pudichery, 2005).

2.2.1 Java

Table 2.1: Advantages and disadvantages of Java

Advantages	Disadvantages
<ul style="list-style-type: none"> • Automatic memory allocation and garbage collection 	<ul style="list-style-type: none"> • Slower than C, C++, and many other languages
<ul style="list-style-type: none"> • Fully object-oriented language facilitating modular design 	<ul style="list-style-type: none"> • Strictly typed
<ul style="list-style-type: none"> • Platform-independent 	<ul style="list-style-type: none"> • Not suitable for scripting
<ul style="list-style-type: none"> • Secure 	
<ul style="list-style-type: none"> • Facilitates distributed programming 	
<ul style="list-style-type: none"> • Strong multithreading support 	
<ul style="list-style-type: none"> • Strictly type language promoting • robust code development 	

2.2.2 Visual Basic.Net

Table 2.2: Advantages and disadvantages of Visual Basic.Net

Advantages	Disadvantages
<ul style="list-style-type: none"> • User friendly and interactive 	<ul style="list-style-type: none"> • DLL issue
<ul style="list-style-type: none"> • Simple and easy 	<ul style="list-style-type: none"> • Memory leakage
<ul style="list-style-type: none"> • Rapid Development 	<ul style="list-style-type: none"> • Inheritance undeveloped
<ul style="list-style-type: none"> • Powerful front-end tool 	<ul style="list-style-type: none"> • Inefficient web development
<ul style="list-style-type: none"> • Multiple vendor support 	<ul style="list-style-type: none"> • Passing value by reference
<ul style="list-style-type: none"> • Standalone and distributed applications 	<ul style="list-style-type: none"> • Only for windows
<ul style="list-style-type: none"> • Scripting language 	<ul style="list-style-type: none"> • Sluggish performance
<ul style="list-style-type: none"> • Act as VBA (Visual Basic for Microsoft) 	

- | | |
|-----------------|--|
| • Applications) | |
|-----------------|--|

2.3 Software

The following software is used to develop the visual basic program interfacing. The combination between hardware and software already became necessity in engineering project. In fact, the suitable software selection is important to make sure the project successful. The software part involve in this project are the Microsoft Visual Basic 2010 Express software.

2.3.1 Microsoft Visual Basic 2010 Express Software

Microsoft Visual Basic 2010 Express has been chosen in this project to design user interface. Derived from basic language, VB (Visual Basic) is a programming language focused on the video interface component. With graphics and functional components implemented, the programmer is able to bring and use their components to achieve the desired application in a relatively short time. Language VB is a useful tool in physics teaching by creating educational programs with it. Advantages of using programs made with VB are that it shortens the time and develops interactive training component during phases of study and assessment of physical phenomena (Chitu & Inpuscatu, 2011).