E-LEARNING : ELECTRIC CIRCUIT BY NODAL ANALYSIS

AND MESH ANALYSIS

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MAY 2009

"I hereby declare that i have read through this report entitle "E-Learning : Electric Circuit by Nodal Analysis and Mesh Analysis" and found that it has comply the partial fulfillment for awarding the degree of Bachelor of Electrical Engineering (Power Industry)"

Signature :

Supervisor's Name :

Date :

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A report submitted in partial fulfillment of requirements for the degree of Bachelor of

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DECLARATION

I declare that this report entitle "E-learning: Electric Circuit by Nodal Analysis and Mesh Analysis" is the result of my own research except as cited in the references. This report has not been accepted for any degree and is not currently submitted in candidature for any other degree.

Signature   :

Name   :

Date   :

DEDICATION

Specially dedicated to my beloved family,

For my supervisor,Puan Rahifa bt. Ranom

And Lastly to my beloved friends and who are encouraged,guided and inspired me throughout my journey in education

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In preparing this report, I was in contact with many people, lecturers and individual. They have contributed to my further understanding and thought. In particular, I wish to express my sincere appreciation to my main project supervisor, Puan Rahifa bt.Ranom for encouragement, guidance, critics and friendship. I am also very thankful to my panel En. Md Hairul Nizam for his guidance, advices and motivation. Without their continued support and interest, this project would not have been same as presented here.

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Last but not least, I would like to thank my beloved family who has been giving me support and motivation throughout final year project.

ABSTRACT

E-Learning : Electric Circuit by Nodal Analysis and Mesh Analysis is an educational application for student and lecturer particularly in degree program. The topic selected is to explain the student and lecturer about the nodal analysis and mesh analysis in electric circuit. By using graphics, animation and video, the interest and attention will increase over student who received only traditional learning approaches. It is developed to assist the student and lecturer in particular topic in more interactive ways of learning. In particular, this report explains 5 main chapters which consist of Introduction, Literature Review Methodology, Result and Discussion and Conclusion and Recommendations. The Introduction chapter explains what the application is and what their purposes are. While in Literature Review, it explains the topics cover in the project such as E-Learning, electric circuit, nodal analysis and mesh analysis. In Methodology, it explains the flow of the project and how the project is running from start to finish. In Result and Discussion, it explains the production of E-Learning which consists graphic, animation and video. The platform of learning tool which using the Macromedia Flash Professional 8 is created from the topic that had been selected. The findings of this study are useful for student and lecturer community in order to assist them to learn in more creative way. As the conclusion,the educational prototype which is the E-Learning gives a variety of learning applications for student and lecturer.Different learning technique are applied in this E-Learning in order to help the user have the best way of learning tools.

ABSTRAK

E-Pembelajaran : Litar Elektrik melalui Analisis Nodal dan Analisis Mesh adalah satu aplikasi pembelajaran untuk pelajar dan pensyarah terutamanya di dalam program ijazah. Topik yang dipilih ini menerangkan pelajar dan pensyarah tentang analisis *nodal* dan analisis *mesh* di dalam litar elektrik. Dengan menggunakan grafik, animasi dan video, minat dan perhatian akan meningkat terhadap pelajar yang hanya menerima kaedah pembelajaran tradisional. Ianya dibangunkan untuk membantu pelajar dan pensyarah dalam topik tertentu dalam cara pembelajaran yang lebih interaktif. Secara khususnya, laporan ini menerangkan 5 bab utama yang mengandungi Pengenalan, Ulasan Kesusasteraan, Metodologi, Keputusan dan Perbincangan dan Kesimpulan dan Cadangan. Bab Pengenalan menerangkan apa aplikasi ini dan apa tujuan-tujuannya. Manakala di dalam Ulasan Kesusasteraan, ia menerangkan topik-topik yang dirangkumi dalam projek ini seperti E-Pembelajaran, litar elektrik, analisis *nodal* dan analisis *mesh*. Dalam Metodologi, ia menerangkan tentang aliran projek dan bagaimana projek dijalankan dari awal hingga akhir. Dalam Keputusan dan Perbincangan, ia menerangkan tentang penghasilan E-Pembelajaran yang mengandungi grafik, animasi dan video. Pelantar bagi alatan pembelajaran yang menggunakan Macromedia Flash Professional 8 dicipta dari topik yang telah dipilih. Penemuan-penemuan bagi pembelajaran ini adalah berguna kepada komuniti palajar dan pensyarah dalam membantu mereka untuk belajar dalam cara yang lebih kreatif. Sebagai kesimpulannya, prototaip pembelajaran ini, iaitu E-Pembelajaran memberikan pelbagai aplikasi pembelajaran untuk pelajar dan pensyarah. Teknik penmbelajaran yang berbeza diaplikasikan di dalam E-Pembelajaran ini untuk menolong pengguna mendapatkan khidmat pembelajaran yang terbaik.

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LIST OF SYMBOLS

KVL   -   Kirchoff's Voltage Law

KCL   -   Kirchoff's Current Law

V   -   Voltage

I   -   Current

DC   -   Direct Current

AC   -   Alternating Current

e.m.f.   -   Electromagnetic Field

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1   Project Background

Nowadays, computer learning softwares are increasingly present at the overall stage of education settings. These kind of leanings offer the unique advantages in teaching by improving the learning process. In this project about the electrical circuit analysis, people begin to develop an understanding of electrical current.

However, the learning tool or learning software about electric circuit is rare thing to be created yet. In most of universities in Malaysia, current learning uses taditional classroom teaching treatments, manual textbooks, blackboard and pieces of paper for the teaching and learning activities. Therefore, this research is carried out to establish an educational learning tool which can be basic electronic teaching and learning tools to help student and lecturer understand about the particular topic.

Electricity – we depend on it every minute of every day. And yet, electricity seems a mysterious force. This project focuses on the nodal and mesh analysis in electric circuit. Nodal analysis applies the Kirchhoff's Current Law (KCL) while mesh analysis applies the Kirchhoff's Voltage Law (KVL) as the basis of the analysis. At the end, these analyses will provide us with the value of unknown node voltage (V) and unknown mesh current (I).

By doing these electrical circuit analyses, people will gradually understand one of current and voltage principle from the electric circuit calculation. The way to obtain the answer, understanding the process and think creatively will improve by using this learning tool. Hence, this project can provide them a simple and entertaining ways of learning.

1.2   Problem Statement

Generally, student and lecturer will find it boring to learn and teach in more traditional ways such as taditional classroom teaching treatments, manual textbooks and blackboard. These people still not widely exposed to computer-based technology which may attract them to learn more happily. According to Tina R. Goldsmith and Linda A. LeBlanc (2004), computer-based instruction typically results in benefits such as increased motivation, decrease inappropriate behavior, and increased attention and sometimes results in increased learning compared to traditional methods.

Moreover, it is quite difficult to find the computer-based learning tool in the market about the particular topic such as this topic of the project. If there are, it must be sell with inappropriate price.

In studying the electric circuit, students always confused between nodal analysis and mesh analysis. The nodal analysis applies Kirchhoff's Current Law (KCL) to find the unknown voltages while the mesh analysis applies Kirchhoff's Voltage Law (KVL) to gain the unknown currents. In short, student always confused on which right law should be applied to the respected analysis.

Another problem comes when students can not fully understand what mesh is all about. A mesh is a loop that does not contain any other loop within it while a loop may contain or not the other loop within it.

Students may also meet the difficulties when the voltage sources (dependent or independent) are added to the circuit that already contains the current sources in nodal analysis. The same problem occurred when the current sources (dependent or independent) are added to the circuit that already contains voltage sources in mesh analysis. It may sound complicated to the student perception but the presence of both sources simultaneously reduce the number of mathematical equation.

1.3   Objective

The objectives of the project are:

(a) To study about nodal and mesh analysis in electric circuit in interactive way.

(b) To state the differences between the nodal analysis and mesh analysis.

(c) To guide the student to understand the function and calculation about the electric circuit

(d) To study the Macromedia Flash software.

1.4   Scope

E-Learning: Electric Circuit by Nodal Analysis and Mesh Analysis is an educational tool especially for student and lecturer in universities. The content of this learning tool is integrated with English language component. It is use understandable vocabulary and sentence structure to make learning easier and more effective. This engaging computer application is an ideal way to deliver content to student and lecturer because not all people are comfortable with manual and human interaction**.**

The project topic covers DC electric circuit. Direct current circuit is more easy to analyse compare to alternating current (AC) circuit. The circuit is analyzed using two analyses, nodal analysis and mesh analysis.

Nodal analysis involves Kirchoff's Current Law in the analysis process while mesh analysis involves Kirchoff's Voltage Law in the process of analysis.In some cases,these two analyses can be expanded to supernode and supermesh analysis.

The E-Learning teaching tool covers the notes, example, tutorial and interactive animation. So, in order to do all these things, the software called Macromedia Flash Professional 8 is used. This software is widely used in the world of computer because of its versatility. By using it in this project, it will create something new to student and lecturer to have a new platform of teaching and learning.

1.5   Project Significance

The E-Learning teaching and learning platform will benefit the student as well as lecturer. The aim is to motivate student and lecturer to learn in different style and increase their understanding. With its interesting and engaging presentation, this teaching and learning tool will help them to acquire better understanding of electric circuit concept.

It has said that e-learning will help the instructor in many ways. As example it permits instructors to develop materials using the world-wide resources of the web. So, more people can get involve in teaching and learning method.

Other than that, it allows instructors to communicate the information in a more engaging fashion than in text-based distance education programs. E-Learning offers a wide-range of text, diagrams and images with video and sound, including virtual reality technology. And of course it is so convenient for instructors to access any time and any place.

Lastly it can reduce travel and accommodation costs associated with training programs.

CHAPTER 2

LITERATURE REVIEW

2.1   Introduction

This chapter will discuss in detail about the literature review of the project. Several concept of cases will be explained. This is because the understandings of all concepts are necessarily to conduct this research. This work is part of ongoing project that focus for student and lecturer in universities.

2.2   Introduction to E-Learning

Electronic learning (or e-Learning or eLearning) is a type of education where the medium instruction is computer technology. No in-person interaction may take place in some instances. It is defined as a planned teaching learning experience that uses a wide spectrum of technologies, mainly Internet or computer-based, to reach learners at a distance.

E-Learning services have evolved since computers were first used in education. There is a trend to move toward blended learning services, where computer-based activities are integrated with practical or classroom-based situations. Lately in most universities, E-Learning is used to define a specific mode to attend a course or program of study. This show the significance of E-Learning that should be highlighted in the teaching and learning in universities.

2.3   Level of E-learning

E-Learning might differs based on its purpose. Different types of E-Learning serve different kind of usage. There are many different types of E-learning. In the Table 2.1, it shows the types of E-Learning that can be recognized. The types are knowledge databases, online support, asynchronous training and synchronous training.

Table 2.1 : Types of E-Learning

E-learning	Description
Knowledge databases	These databases are the most basic form of E-Learning like software sites offering indexed explanations and guidance for software questions with step-by-step instructions for performing specific tasks. These are interactive, meaning that you can either type in a key word to search the database or make a selection from list.
Online support	Online support comes in the form of forums, chat rooms, online bulletin boards, e-mail, or live instant-messaging support. It more interactive than knowledge databases and offers the opportunity for more specific questions and answers
Asynchronous training	More traditional. It involves self-paced learning like CD-ROM-based, Network-based, Intranet-based or Internet-based. It may include access to instructors through online bulletin boards, online discussion groups and e-mail.
Synchronous training	Synchronous training is done in real-time with a live instructor facilitating the training. Everyone logs in at a set time and can communicate directly with the instructor and with each other. It lasts for a set amount of time – from a single session to several weeks, months or years. This type of training usually takes place via Internet Web sites

2.4 Benefits of E-Learning

E-Learning can provide a lot of advantages for the user. According to W.D. Graziadei (1997) on his book entitled "Building Asynchronous and Synchronous Teaching-Learning Environments: Exploring a Course/Classroom Management System Solution" explained that this type of learning is easy to use and maintain, portable, replicable, scalable, and immediately affordable, and they had to have a high probability of success with long-term cost-effectiveness.

One of the benefits is reducing environmental impact: E-Learning allows people to avoid travel, thus reducing the overall carbon output. With virtual notes instead of paper notes and online assessments instead of paper assessments, E-Learning is a more environmentally friendly solution.

Moreover, it can provide quality education, made affordable. So,the instructors of the highest calibre can share their knowledge across borders allows students to attend courses across physical, political, and economic boundaries. This can drastically reduce the costs of higher education, making it much more affordable and accessible to the masses. An internet connection, a computer, and a projector would allow an entire classroom in a third world university to benefit from the knowledge of an opinion leader.

Other than that, it also convenience and flexibility to learners in many contexts, E-Learning is self-paced and the learning sessions are available 24/7. Learners are not bound to a specific day and time to physically attend classes. They can also pause learning sessions at their convenience.

2.5 Previous E-Learning

There are some examples of simple E-Learning about this project that can be found in the internet. It focused on how the electric circuit works and how to build the electric circuit by yourself. Taking those examples of E-Learning, an idea on how to create an E-Learning with more elaborations and analyses had been built.

From the existed model of E-Learning from the internet website, a lot of references can be a guidance to create our very own E-Learning application based on the electric circuit analysis.