COMPUTER AIDED LEARNING IN DIGITAL SYSTEMS

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Introduction

As we move into the next millennium, Teaching and Learning can no longer be the same as it use to be. With the advancement in computer hardware and software capabilities, more powerful and sophisticated authoring and graphical tools are being developed to deliver a richer context in text, graphics, animations, video and audio, which are excellent aids to convey information.

Using Macromedia Authorware 4, we are able to integrate information in Digital Systems and package it as aiding tool in teaching. The CAL package would allow students to go through the essential materials with various simulations followed by a session of tutorials. CAL does not replace the teacher in teaching (there is still no computer with the flexibility of the human brain) but rather it aids teaching. It as an essential tool as students can used them to comprehend the materials in a different and more interesting learning environment, and progress accordingly to their very own pace.

1. Aim

The aim of this thesis is to design an interactive CAL package in “Digital System” and its tutorials. This project is design to aid all first year Electrical Engineering & Telecommunications students in UNSW to have a fundamental concept in Digital Systems. Main outlines of the thesis are:

1. To design an interactive tutorial session
2. To design a user friendly navigation panel
3. To design more interactive simulation or examples

2. Topic Layout

The 5 topics chosen and presented in the thesis are:

- Number System and Codes
- Logic Gates
- Boolean Algebra and Switching Functions
- DeMorgan’s Theorems
- Karnaugh Maps

3. Design Layout

The screen display of the program is split into two main areas. The core materials are presented on the left of the display screen whereas complementary information like help and glossary are presented on the right. The navigational panel is fixed at the right bottom of the display screen.

4. Numerical and graphical simulation

Numerical simulation were written for simple number conversions between various bases from Decimal to Binary, Octal and Hexadecimal and vice versa. Another numerical simulation was written for Logic Gates where by students can configure the type of circuits based on assertion and level shifter. They can then view the expression, physical and logical truth table of the circuit. Simple Graphical simulation for generating pulse train for AND, OR, NOT, NOR and NAND gates were written to give the students a better picture of how these basic gates function.

4. Tutorials

Four tutorials were written for the program. Using the scripting tools of Authorware 4 (Functions, Variables and Array), the program is written as such that it could generate random tutorial questions and answers at the same time base on a logical pre-calculated formula. For instance, the tutorial for Logic Gates can have a possible of combination of 128 2-input 1 gate circuit based on the random selection of gates, assertion levels and bubbles (level shifter). Similarly, a total of 512 possible combinations for a 3-input 1 gate circuit and 4096 possible combinations for a 3-input 2 gate circuit. Students are required to solve for the output Expression, Physical and Logical Truth Table. From this tutorial, students are able to attempt different sets of question each time.

The rest of the tutorials include Number System Conversion, Karnaugh Map and Multiple Choice Questions.