USING THE INTERNET WEB SITE AS AN AID TO THE TEACHING AND LEARNING OF ELECTRICAL ENGINEERING SUBJECTS

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Abstract

This paper describes a project which aims to create a web site on the internet to explore the teaching and learning of Electrical Engineering subjects in a tertiary education programme. The web site includes (i) multi-media live coverage on the course material, arranged in a non-sequential form, (ii) assignments and laboratory exercises adopted to individual student's progress, (iii) quick feedback on students' overall progress and test/assignments marks, (iii) open forum discussion on the subject matters, and (iv) channels for the students to seek help and advice from the lecturer. The web does not intend to replace conventional lecturing and tutorial; but rather, it aims to strengthen the students' learning during normal lecturing sessions. It also aims to provide a quick, effective, and powerful media for student-lecturer communications and feedbacks. The paper describes the design, the implementation, the results and the experiences drawn from such an exercise.

1. Introduction

The Internet and the personal computer can be a powerful medium for the teaching and learning of electrical engineering subjects in universities [1, 2, 3]. During the last few years, there has been an accelerated pace in the development of teaching and learning computer packages at the Hong Kong Polytechnic University.

The reasons are:
(i) Nearly all electrical engineering students have a computer or a notebook, or have easy access to a computer.
(ii) The campus of the Polytechnic University has a good infrastructure and support for IT equipment. These include:
  i. Ethernet sockets installed in most classrooms, library, and student common rooms.
  ii. A large population of high power computers which are easily accessible to students.
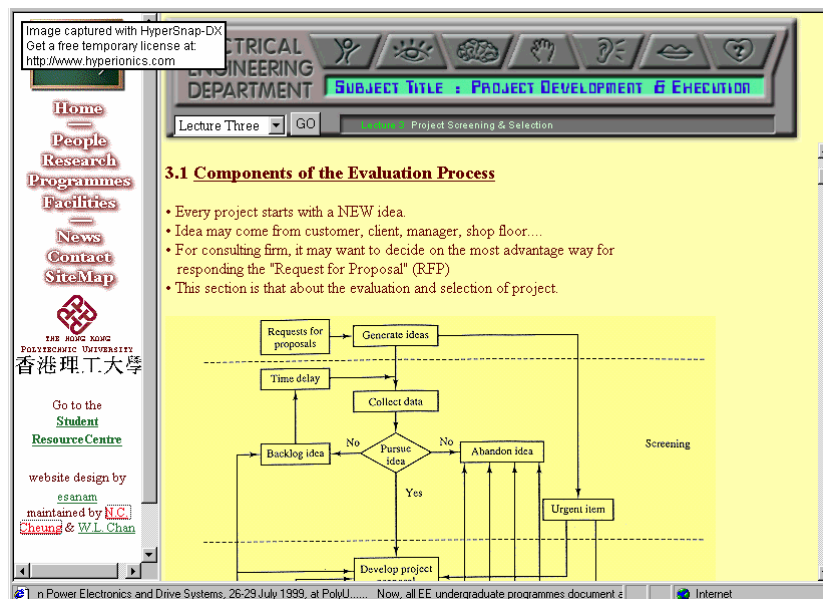

Fig. 1   Appearance of the EE subject Web Page

(iii) The University gives generous support and actively promotes the use of multi-media teaching. All staff are encouraged to participate.

Many Electrical Engineering subjects require visualisation or animation aid for students to understand a particular

subject or concept thoroughly [4]. Using the Internet web site and suitable visualisation tools (e.g. MATLAB) to disseminate this knowledge are therefore very suitable and convenient.

This paper describes the design and development of an electrical engineering web site. The web site is used as an aid for the teaching and learning of electrical engineering subjects.

2. The Design of the Web Site

The home page for the electrical engineering subject web site is shown in Fig. 1. The essential toolbar is conveniently located on the top of the screen, showing the subject title, and various functions of the web site. The top tool bar, shown in Fig. 2, is divided into 6 major categories, and it uses part of the human body to categorize the functions:

Body - The overall 'body' of the course, it includes the syllabus and the schedule of lectures. This is the introduction section. It gives an outline on the importance of this course, and a summary of events associated with this course.

Eye - The place in which students can 'look' for the detail course material. The course material is sub-divided into lecture topics. Usually, a typical electrical engineering subject is sub-divided into 12 lectures/tutorials, and each lecture talks about a different topic.

Brain - The 'deep thinking' section. It includes tutorial questions and answers, is categorised into lecture topics. Each topic is further subdivided into 2 sections: (i) past exam papers and exercises; and (ii) tutorial homework for the class. The tutorial homework is posted onto the web before the assignment distribution day. The solutions will be posted onto the web after the students' hand in their work.

Hand - The 'hands-on' session. It includes all the information on the practical laboratory sessions. It also includes the group assignments and tips on the laboratory exercises.

Ear - The notice board. The listening area. Students can freely put messages on this area, so that other students or the lecturer can listen to him. The 'ear' can be just the lecturer, one student, a group of students, or the whole class.

Mouth - The chat forum. Students and staff can have on line chat on a particular topic. Usually, staff will post a message up on the notice board, stating the topic and time of the chat.

Heart - The frequently asked questions area. All frequently asked questions and matters which concern the students most, will be put in this area.

The web site is designed in a generic manner; most subjects in Electrical Engineering can use the same web design. The only thing it needs to do is to input different subject material into the web site for different subjects.

The web site is written with MS FrontPage, and the total development time takes less than 1½ man-month. The subject material takes a longer time to input. However, in many subjects, the lecturers already have the electronic copy of their lecture notes. In this case the input time is minimal. Any HTML editor (e.g. Netscape composer, FrontPage Express, MS Word, etc.) is quite adequate for the input of the home page.

Since the student is using the computer for internet access, the web site also includes the download of student version programs (e.g. PSPICE, MATLAB). Students can work on the exercises from the web site with these applications programs.
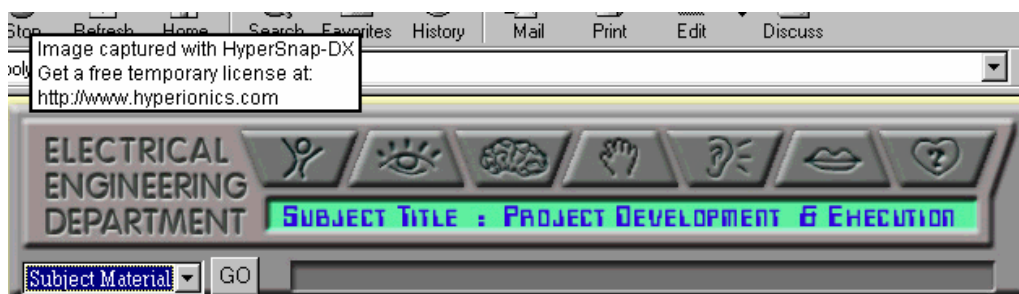

Fig.2   The top tool bar, with the 6 web functions: body, eye, brain, hand, ear, mouth, and heart

5. Implementing the teaching web

The electrical engineering subjects web site has been implemented on a trial base on two electrical engineering subjects:

(i) "Instrumentation and control", Higher Diploma year 1. (80 students)

(ii) "Project Development and Execution", MEng final year. (25 students)

In both subjects, the lecturer uses the web site as an addition to the normal lecture. The lecturer posts the subject material before the commence of each lecture; the students ask questions and participate in chats and virtual tutorials regarding the subject contents. After each tests or tutorial works, the solutions and the most common mistakes are posted on the web site; students use the Internet to submit their homework and presentations, and receive grades and personal comments from the lecturer. Towards the end of the teaching semester, each student is given a questionnaire to comment on the usefulness of the electrical engineering subjects web site.

6. Student questionnaire and feedback

Below are the questions and the feedback results from the Higher Diploma students. 75 students have returned the questionnaire.

(i) The web site is helpful to the learning of the subject.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
29.3%	40%	25.3%	2.7%	2.7%

(ii) The web site can replace conventional classroom teaching.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
6.7%	13.3%	22.7%	46.7%	10.7%

(iii) The web site has shortened my learning time on a particular topic.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
13.3%	25.3%	37.3%	14.7%	9.3%

(iv) I tend to spend more time on this course.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
18.7%	24%	30.7%	13.3%	13.3%

(v) Advantages and disadvantages of the EE Subjects web, please list. _____

From the student questionnaire results, the overall picture is very clear. The students do not want to abandon conventional classroom teaching, but rather, they want the electrical engineering subjects web site to be their learning aid. The other interesting thing is that, while the students admit that the web site can shorten their learning time, they tend to spend more time on the web site.

From the teacher's perspective, the observations are: (i) the students tend to develop more interest in the learning of the subject, (ii) they are willing to spend more time doing in-depth learning, and (iii) they can understand difficult concepts better with the web site.

From question (v) of the questionnaire, most students think that the advantages of the web site are (i) more interesting and lively description of learning topics, (ii) better interactive chatting, Q & As, and teacher-to-learner communication, and (iii) more accessible database on the solutions and tutorials. The disadvantages are mainly on the technical matters (very difficult to start a particular plug-in, etc.), and the inadequacy of the web. Overall most students think that the web site is a useful aid for learning their electrical engineering subjects, but they want more improvements on the web site.

5. Difficulties in promoting web teaching

In spite of the encouraging result, there are still a lot of difficulties to overcome before web aided learning is a common practice at Polytechnic University.

The difficulties include:

(i) Developing effective web based teaching material is a time consuming task. Most lecturers cannot afford so much time in doing this preparation work.

(ii) Many lecturers do not possess much knowledge on web authoring, Internet teaching and learning, and multi-media programming.

(iii) The Internet services in domestic homes are still hopelessly slow. To run an effective multi-media software through the Internet is very time consuming. Wide band Internet should be made more common to domestic users.

(iv) The personal computer and the Internet should be made readily accessible to students. The ultimate solution is to provide notebook computers to each student, and to use wideband wireless network in the campus and the student's halls of residence.

6. Conclusion

This paper described the design, development and implementation of an Internet web site for the teaching and learning of electrical engineering subjects for higher degree students. The implementation result shows that most students welcome the Internet learning initiative and they think that the web is helpful to their learning. Furthermore, they would like to expand and improve the web service. The lecturer observes that the student has developed more learning interest through the use of the Internet web site, and they tend to do more in depth learning. In spite of a lot of difficulties and hurdles, Internet learning should be promoted much further.

7. Acknowledgement

8. References

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9. Biography

Dr Norbert C. Cheung obtained his BSc, MSc, and PhD from the University of London, University of Hong Kong, and University of New South Wales in 1981, 1987 and 1996 respectively. He is a Chartered Engineer, and a member of IEE and IEEE. His research interests are intelligent motion systems and industrial electronics. He is the holder of 2 industrial patents and has published more than 30 papers in his research areas. He is the recipient of the 1995 IEEE award for the second best paper in the Industrial Applications Society. He is presently working as a Lecturer in the Department of Electrical Engineering at the Hong Kong Polytechnic University.