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Internet Based Laboratory for Distant-Learning Engineering Education

With the aid of the internet technology, millions of computers are now networked together around the world. Internet is now used in many diverse applications such as information search, advertisement, electronic mail, electronic banking, distant learning, and many more. Distant learning is one of the fastest growing fields where many colleges and universities are now offering courses over the internet. Distant learners are typically adults, often with both family commitments and jobs, who can not easily attend the campus for classes delivered in the traditional way. Distant learning is delivered by a variety of technologies including satellite, TV broadcast, video tape, and currently the internet. Distant learning is not new, for example, the Open University in the U.K has been offering distant learning courses for many years. The method used by the Open University has been to broadcast the courses on the national TV and also send video tapes and written study material to the students. For engineering students a small home kit is also sent which enables them to carry out small experiments in their places of study. Engineering students are also expected to attend the laboratories for some of the experiments. The method of delivering the distant learning courses are changing in the last decade with the speed and the accessibility of the internet. Students can now study the course material which is placed in web pages and they can send their assignments and answer quizzes using the electronic mail.

Teaching non-engineering topics using the distant learning techniques is relatively easy since the students are required to study the course notes, and complete any required assignments in the specified time periods. There are no laboratory experiments to carry out and the need to attend a formal lecture is minimal. One of the problems in teaching engineering topics via distant learning is the lack of laboratories where the students can perform real experiments. During the last decades there has been a definite trend towards the use of simulators in teaching engineering topics. There are several reasons for this. Firstly, physical experiments are costly to purchase and maintain, and secondly, there is a belief that simulators can replace the physical experiments. While simulators can be quite effective tools in teaching, they are actually theoretical and can not replace the practical experiments.

This paper describes the development of an internet based laboratory experiment for teaching logic circuits to distant-learning engineering students. It is shown that, by using a client-server architecture, it is possible to control a laboratory experiment remotely. The client computer is used by the student and the server computer is connected to the experiment kit, situated at the University, remote from the student. A video camera is used to send images of the experiment to the student in real-time.