PDA: An Empowering Tool for Engineering Learning with Applications in Structural Dynamics

Rupa Purasinghe, Javed Alam, Ronald Lin

Computers have become pervasive. The pervasive computing primarily deals with the computing devices of small form factor or mobile devices that exchange data between each other through wireless networks. These have become tools to apply information communication technology in appropriate ways that will lead to the enhancement of the learning experience of students. Now it is possible to provide contents of such devices in digital forms that are very useful for student learning. Already there have been attempts to move towards the concept of paperless classroom. These tools act as motivational tools in engineering education.

Personal Digital Assistants (PDA) are capable to perform the functions of a digital organizers, digital input devices, electronic notebooks, and a powerful scientific calculator. PDA's can be employed for word processing, spreadsheet use, accessing web, e-mailing, personal information organizers, data storage and mobile computing. All classroom handouts can be transferred in the form of word processing documents to the student's PDA through the use of wireless networks. Examples are teacher notes in the form of web pages, tests and quizzes. Similarly, student assignment solutions can be solved on a PDA and sent to the instructor via Internet. PDA's are particularly suitable in colleges in urban setting with commuting student body. Students have a luxury to carry a powerful computer with networking capability in their pockets that can be used anywhere providing a flexible learning environment.

PDA's are today capable of performing symbolic mathematical calculations, where few years ago only large computers could perform it. One such example is a large computer program called "Maxima" for manipulation of algebraic expressions in symbolic form. It can differentiate, integrate, take limits, solve differential equations in symbolic form, and perform many other mathematical operations used in Engineering. This program has been successfully ported to a Linux based PDA allowing added capabilities beyond a simple calculator.

This paper provides examples in using PDA's to solve several engineering problems including a solution to a structural dynamic problem. A frequency computation of a tapered beam is performed step-by-step using the symbolic mathematics capability of Maxima on a PDA. The paper will also describe plans to adapt portion of freshman design course to be taught in a paperless classroom delivery mode through PDAs facilitation m-learning.