Long lecture

Maplets for Calculus: A Model for Multi-Use Mathematical Software

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Abstract

Maplets for Calculus (M4C: http://m4c.math.sc.edu/) is a collection of more than 200 customized user interfaces for precalculus, calculus and differential equations. Unlike most online homework systems that look only for final answers, each Maplet checks each step in the solution process and gives help as needed.

A unique feature of the M4C is that the same resources are equally useful for instructors and students. They can be used as demonstrations in lecture to demonstrate a new concept, as a group activity in a lab setting, as a drill-and-practice tutor by individual students, and as a graded activity when assessing student mastery of the concept. For example, when introducing the concept of volume as a definite integral of cross-sectional area, the same 3D animations that an instructor would use in lecture are available to students when they are working to complete their homework. In addition, the separate Maplet for the methods of disks, washers, and shells, uses a parallel approach building upon what they have just learned. The interface includes pedagogical features designed to help students develop mastery; these features are disabled when used in a graded setting. Demonstrations of these two Maplets will be included in this presentation.

The use of a CAS is essential. It is used to algorithmically generate an almost endless collection of problems, to determine if responses are mathematically consistent even if they might be entered in a somewhat different form, to produce feedback based on the specific response entered, and to produce appropriate graphics (2D, 3D, animation, and stereo).

In spite of all of the benefits of the M4C, a number of technical obstacles have arisen. For example, Maplets are rendered using Java which limits their accessibility. Some users have difficulties with the syntax for entering mathematical expressions. To address these concerns the authors have worked to re-create the M4C using JavaScript and HTML5; the new resources are called MYMA (Meade-Yasskin Math Apps) Lessons. An early result of these efforts is MathLex, a palette-based mathematical entry system written in JavaScript. The presentation will include demonstrations of MathLex, and prototypical Lessons

(http://mymathapps.com/demos/lessons/).