HELPING FUTURE HIGH SCHOOL TEACHERS
WITH WEB-BASED INTERACTIVE MATHEMATICS

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Abstract

The author has been awarded a grant to implement a technology project from the State System of Higher Education in Pennsylvania. The project aimed to train several mathematics majors at Kutztown University with a computer algebra system (CAS) called *LiveMath Maker* (LMM).

Project Outlines

What sets LMM apart from well-known CAS's such as *Mathematica* and *Maple* is that it can generate fully-interactive web pages without requiring instructors to have any syntax or programming knowledge. These web pages can then be viewed in web browsers with a free plug-in called *LiveMath Plug-In*. By fully-interactive, we mean that end-users can change values of variables or equations, and the corresponding computations and graphs will update in real time within the browsers. Since the free plug-in is the engine that drives the interactive web pages, costs to the end-users are none.

For secondary education mathematics majors, the project trained them to use LMM in their future high school classrooms. What is prepared or presented in LMM for classroom use can immediately be put on the web. Back at home or in a computer lab, high school students can then review web pages with embedded LMM notebooks that are identical to what they saw in the classroom. Furthermore, teachers can provide interactive mathematics web pages as supplements.

For students bound for graduate school, the skills they acquired with LMM are expected to help them not only in their own fields in mathematics but also as they teach courses in the capacity of teaching assistants.

What is *LiveMath Maker*

LiveMath Maker is a medium-strength computer algebra system with a full graphical user interface. A user write expressions and functions in LMM as if they were written by hand on paper. That is, no syntax-based entries are necessary. As such, LMM is suitable for courses from high school algebra to differential equations in college mathematics curricula. Its primary strength lies in the easy of use and portability to the web.

How Interactive Web Pages Are Made

Step 1 **Create a LiveMath Notebook**
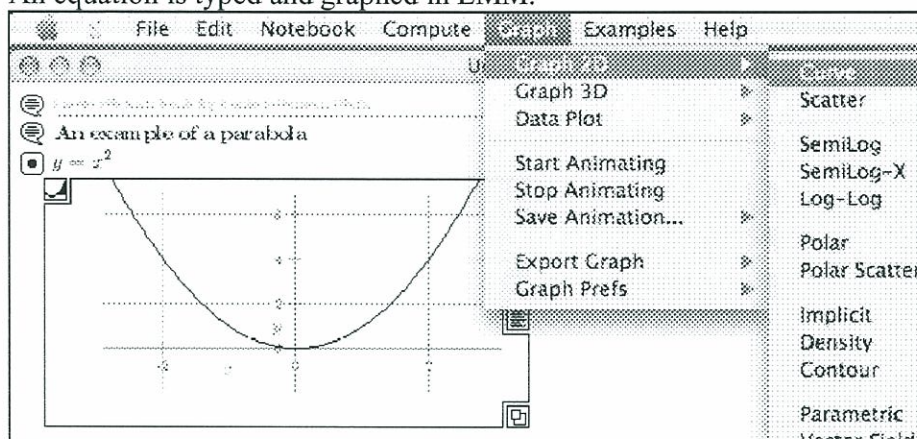An equation is typed and graphed in LMM.

Figure 1 (Graphing)

Step 2 **Export the Notebook to an HTML File**
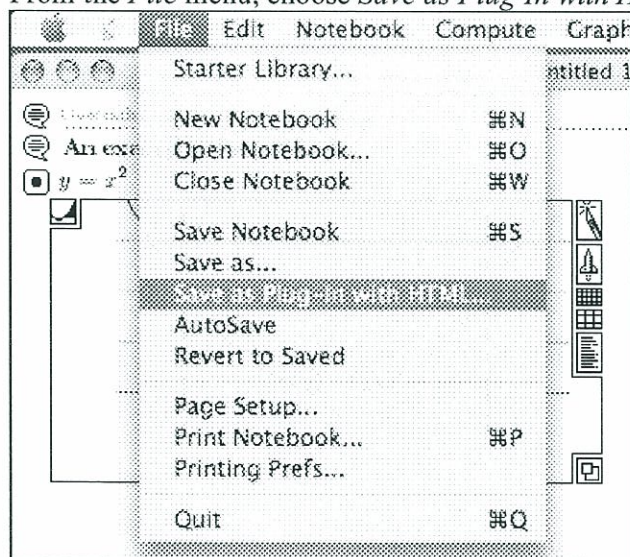From the *File* menu, choose *Save as Plug-In with HTML*.

Figure 2 (Export to an HTML file)

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Step 3   Generate a Web Page
The next window helps the user supply some comments.

Figure 3 (Generate a web page)

Step 4   Generated Files
Three files will be generated. All of them should be uploaded to a web server. Technically, the LMM component (*parabola.thp* file) is embedded into the web page (*parabola.html* file). This interaction is transparent to the user.
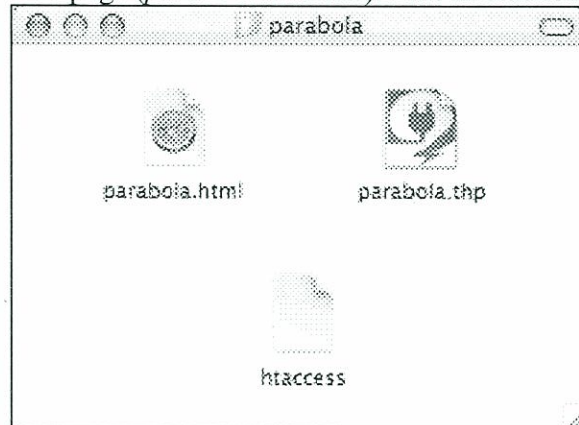

Figure 4 (Generated web-ready files)

Step 5   View the LiveMath Notebook in a Web Browser

When the web page (*parabola.html* file) is viewed in a web browser with the free *LiveMath Plug-In*, it shows the same LMM notebook with the supplied comments. While viewing the page in the browser, students can change the right-hand side of the equation, and the accompanying graph will reflect the change in real time.
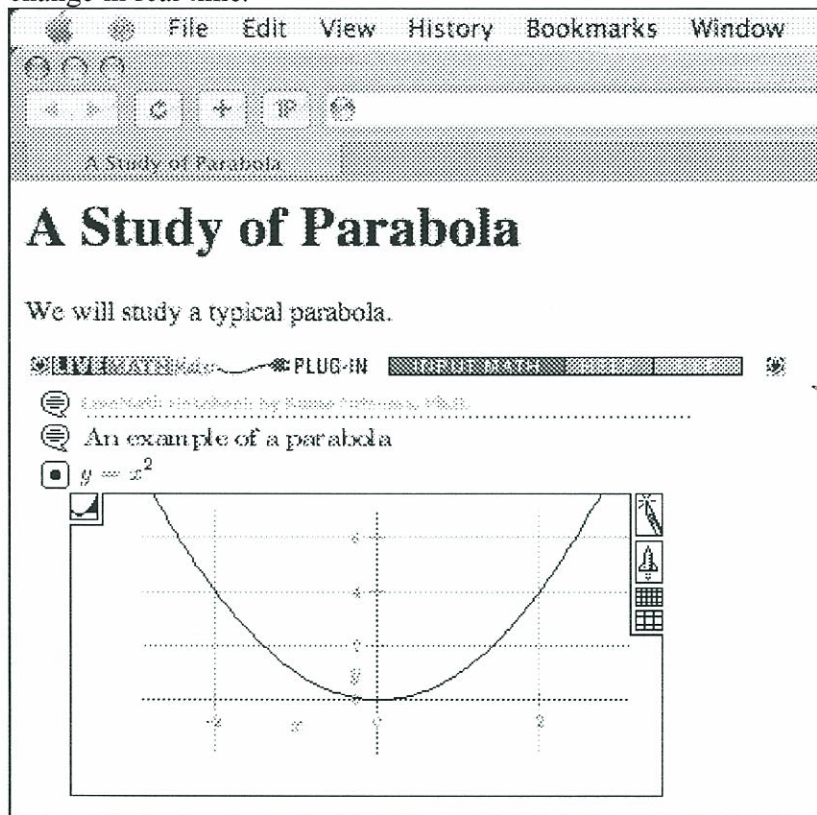

Figure 5 (Viewing in a browser)

Project Outcome

All students who participated in this project expressed their excitement with *LiveMath Maker*. As they remembered how they had been taught mathematics in high school with graphing calculators, they saw a variety of new ways to present mathematics with LMM when it becomes their turn to teach it. The author finds that the current generation of mathematics majors have far better computing skills than their predecessors from just ten years ago. In fact, all of the students in the project extended their LMM-generated web pages by modifying the underlying HTML codes. And, they presented their individual projects at the State System of Higher Education Mathematics Conference at Bloomsburg University of Pennsylvania in March of 2007.