THE ACROTEX ONLINE ASSESSMENT SYSTEM (TAOAS)

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1. Introduction

The **AcroTeX Online Assessment System (TAOAS)** is a system—still under development—for authoring and delivering quizzes in PDF for online assessment. The purpose of this paper is to describe the current capabilities of the system, comment on student experiences with the system, and indicate directions for future work.

The feature that distinguishes **TAOAS** from the multitude of other online assessment systems is that the assessment/quiz is delivered to the student's browser as a PDF document, rather than an html page. The student enjoys a typeset quality document, including complex mathematics, within the browser. This gives a very clean, visually attractive and professional looking document.

2. Authoring

Quizzes are written using the **AcroTeX eDucation Bundle** [2, 3], a collection of LaTeX packages for authoring online, interactive content. Using the **AcroTeX Bundle**, the author can pose multiple choice questions (with partial credit), text and math fill-in questions.

There is a variety of math fill-in questions, math responses can be an (algebraic) expression, an equation, a set of answers, or a vector of responses, for example. The types of responses the **AcroTeX Bundle** can process can be extended by the author who has some programming experience and is willing to learn about core JavaScript and Acrobat's extensions to JavaScript [1]. Methods of extending **AcroTeX Bundle** are fully documented.

Text and math responses can be grouped together and evaluated as a unit; a matrix of responses is an example of grouping. In the case of grouping, the author can specify the method of evaluating the responses and how points are awarded; this is way of awarding partial credit for math response questions.

There is a "progressive type" question (for text and math fill-in questions), this type of question allows the student to work through a multiple part question, where the answer to one part depends on having obtained correct answers for earlier parts; the student is allowed to see the correct answer to any part, but, of course, is no longer allowed to modify the response to that part.

3. TAOAS

This section contains a brief description of **TAOAS**: quiz preparation, class pages and server-side scripts. Section 4 contains a short talk-through **TAOAS**.

Preparing the Quiz. As explained earlier, an educator uses the **AcroTₑX Bundle** to author quizzes for publication. A quiz for **TAOAS** is published in three forms: (1) questions only (formatted for the screen); (2) questions with solutions for online viewing; (3) questions with solutions for printing. The author can write multiple versions of the same quiz, and these are randomly served up to the student upon request.

Only a single source file is needed for all these versions, by setting some of the compile options appropriately, each version of the quiz can be built. A small application, the **AcroTₑX Build Utility**, was written to automate this whole process: build the PDF document from the source file, rename the file, and move it to a designated folder for deployment to the Web.

The document containing only the quiz questions has security set so that the student cannot print the document. Should the student save the quiz document to a local hard disk to study the questions, the student will discover that the document closes as soon as it is opened outside the "**TAOAS** environment".

Class Assessment Pages. Each instructor manages his/her own class assessment pages. The instructor can specify the quiz publication date[1], the quiz expiration date[2] and the solution publication date[3].

In addition to the quiz documents, two forms of the solutions are normally available, one for screen viewing (with printing disabled), and another for printing. After the solution publication date, a student can see his/her own quiz: the server-side script retrieves the responses the student made, selects the version of the quiz that student took, and repopulates the quiz with the student's data. The quiz is both marked up and scored.

Server-side scripts. The server-side scripts, and there are five of them, are used to communicate between the browser, the server and the database. It is the scripts that provide the security of logging in to the class assessment pages, for serving up the appropriate quiz (in PDF) on demand, for receiving and storing the quiz data on submission, and for serving up the solutions and repopulating the quiz with the student's data.

The server-side scripts are written as a collection of Active Server Pages (ASP) and uses VBScript as the scripting language. **TAOAS**, therefore, requires the web server to be running Microsoft Internet Information Services.

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[1]The date and time the student is first allowed to take the quiz

[2]The date and time the student is no longer allowed access to the quiz.

[3]The date and time after which the student will be allowed to view the solutions to the quiz.

4. Walk-Through

The student begins by logging in to **TAOAS**, Figure 1, if successful, the student arrives at the class assessment page[4], Figure 2, which is Calculus I in this case.
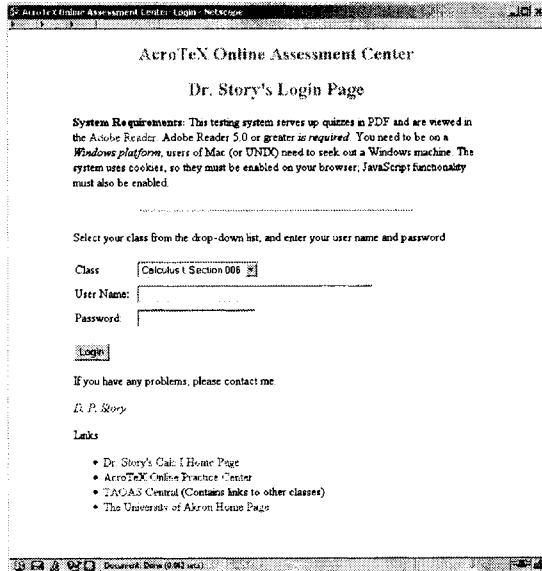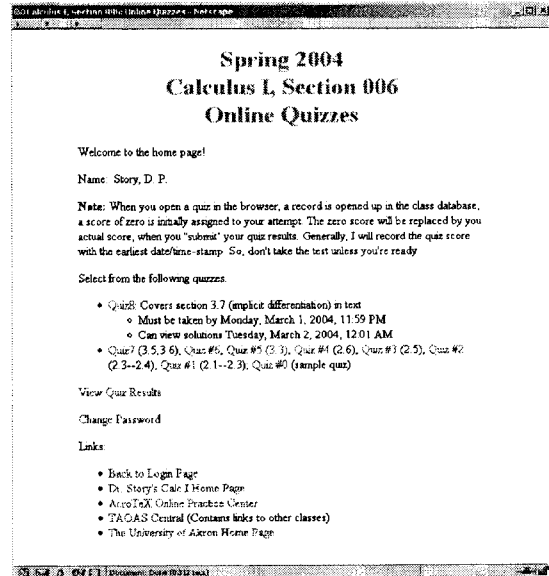

Figure 1: Login to TAOAS

Figure 2: Class assessment page

The student then clicks on one of the available quizzes. If equivalent versions of the same quiz are available, one of the versions is randomly served up. In Figure 3, we see the cover page with name and student ID pre-populated. Figure 4 shows the second page, the first page of the quiz.
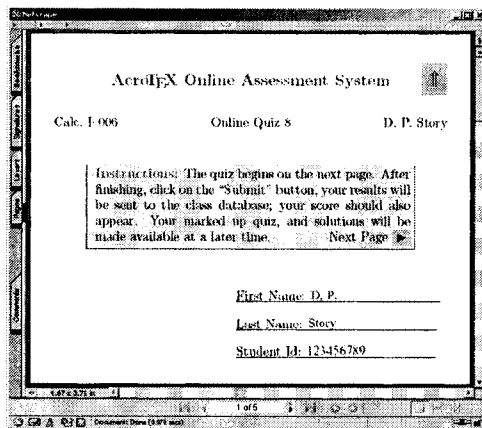

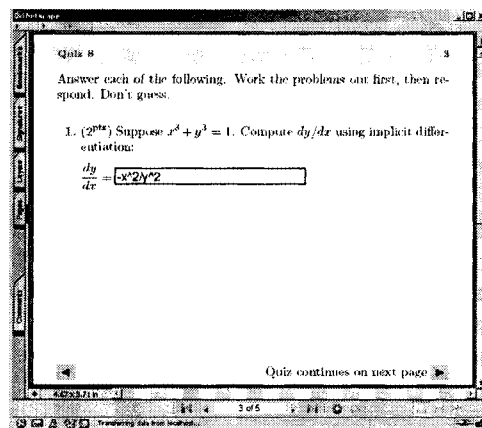**Figure 3:** A cover page of a quiz in PDF

Figure 4: A sample question

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[4]A student who logs in to one class, cannot access the class page of another class.

Once the quiz is submitted, results are saved to a (Microsoft Access) database. At some point in time, the solutions become available for viewing. Figure 5, to the right, shows the page that lists all quizzes taken by the student.

The listing shows each quiz taken, the date the quiz was taken, and the score received. Links are provided to the screen and printable versions of the quiz.

Figure 6 shows the quiz with solutions. The PDF document is repopulated with the student's data, the quiz has been scored and marked up, and solutions are provided, see Figure 7.

Figure 5: Listing of student's quiz results with links to a screen and print version of the quiz.

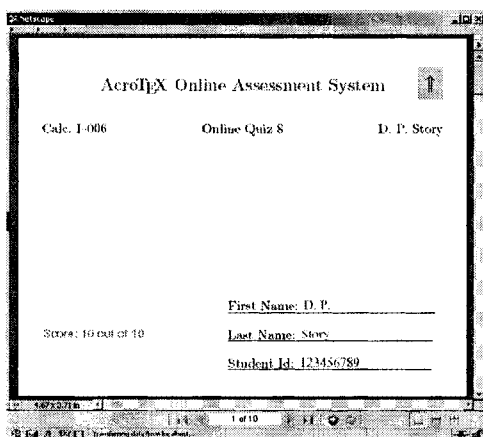A printable version of the student's marked up quiz is also available (not shown).

Figure 6: A cover page of the student's marked quiz. The student's name and other data are pre-populated, score is shown.
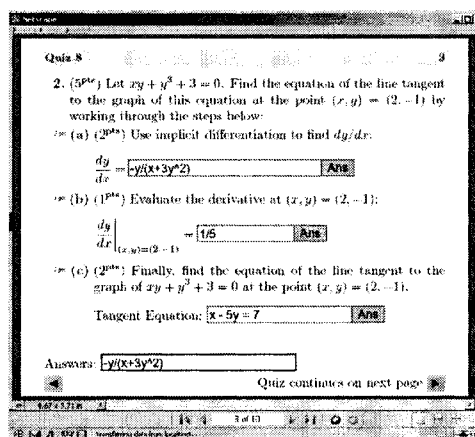

Figure 7: A sample page showing markup. The "Ans" button shows the correct answer, and is also a link to a complete solution.

A login page for **TAOAS** is located at

http://fbsd1.cs.uakron.edu/dpstory/acrologin.asp

Choose the demo class Math 101 from the dropdown menu, and login using the username ictcm17 and password ictcm17.

5. Class Experiences

In the classroom—Calculus I and II—students can take the quizzes anywhere they find convenient; however, because of a limitation on Acrobat technology, quizzes must be taken on a computer running a Microsoft Windows operating system.

The weight of the quizzes is about 10% of the total grade, consequently, I am not too worried about cheating. I've explained to the class that the purpose of the eQuizzes[5] is to check their own knowledge of the material, and to get insight on how they are really doing in the class. pQuizzes[6] are also used to correct the problems with written mathematics students have.

On the instructor side of things, I use eQuizzes as a way of developing a *pace* to the class in hopes that it will help student *retention*. The requirement to take a regular eQuiz encourages the student to keep up with the course, and provides a bit of a reward for doing their assigned homework as well.

TAOAS can be used in an unsupervised climate, as I do now in my classes, or it can be used in a secured environment, such as in a CBT lab, for *serious* testing.

Students have been generally receptive to the online system, and provided many good suggestions for improvement, most of which were implemented. I was able to enhance their enthusiasm for the system by offering extra credit for each quiz taken (beyond the minimum) with a score of 70% or greater.

6. Future Efforts

In addition to continuing to improve overall system performance and ease of use, there are plans to develop a test bank system compatible with the **AcroTeX Bundle** that will enable the instructor to select questions in a very visual way and to build a quiz or (paper) test using these selections.

References

[1] Acrobat JavaScript Scripting Refernce, Technical Note #5431, Version 6.0., Adobe Systems, Inc., 2003, http://partners.adobe.com/asn/acrobat/docs.jsp

[2] "The AcroTeX eDucation Bundle," 15th ICTCM Conference (15th International Conference on Technology in Collegiate Mathematics), Hilton in the Walt Disney World Resort, Orlando, Florida, Nov. 1, 2002.

[3] The **AcroTeX eDucation Bundle**, D. P. Story, The University of Akron, Department of Theoretical and Applied Mathematics, Akron, OH. Home Page URL: http://www.math.uakron.edu/~dpstory/webeq.html

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[5]Electronic Quizzes
[6]Paper or Pulp Quizzes