

## THE ACROTEX EDUCATION BUNDLE

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### 1. Introduction

This is the age of the computer, electronic communication and ePublishing. In the years to follow, ePublishing, in particular, will play a more and more prominent role in education and in the classroom. Materials that would have been written for paper publications in past years will be authored instead for eBooks, eTextBooks and the WWW.

In education, electronic authoring is more than a simple transcription of material authored for paper, it is more “alive”, more interactive, more innovative. There is a need, therefore, for an authoring system that is both inexpensive and incorporates all the functionality of a professional authoring application, yet provides the author with all the tools to create a quality interactive electronic document.

The **AcroT<sub>E</sub>X eDucation Bundle** is a collection of authoring tools for educators to help facilitate the publication of quality *interactive* electronic documents. The **AcroT<sub>E</sub>X Bundle** attempts to meet the particular needs of the scientific community, especially mathematics. The home page of the **AcroT<sub>E</sub>X Bundle** is

[www.math.uakron.edu/~dpstory/webeq.html](http://www.math.uakron.edu/~dpstory/webeq.html)

On the home page is an interactive manual of usage and an extensive set of demonstration files that illustrate various features of the **AcroT<sub>E</sub>X Bundle**. See also the **AcroT<sub>E</sub>X** web site,

[www.math.uakron.edu/~dpstory/acrotex.html](http://www.math.uakron.edu/~dpstory/acrotex.html)

which contains links to the works of numerous authors who have used the **AcroT<sub>E</sub>X eDucation Bundle** and published on the WWW.

The **AcroT<sub>E</sub>X Bundle** can be used to create educational material for an eBook (eTextBook), for publication on the World Wide Web (WWW), or for distribution on a CD. The documents may be self-contained, or communicate with server-side script; they may be viewed off-line, or within a Web browser. The exact form the document takes is entirely determined by the document author.

The **AcroT<sub>E</sub>X Bundle** is an authoring tool for those who write using **L<sub>A</sub>T<sub>E</sub>X**, the output file format is PDF (Adobe’s Portable Document Format). **L<sub>A</sub>T<sub>E</sub>X** provides all the features of an

expensive authoring application, but at no cost. The **AcroT<sub>E</sub>X Bundle** is an extensive “plug-in” to the  $\text{\LaTeX}$  authoring system. The output (PDF) document, can be viewed in the free Acrobat Reader, the application, or from within a Web browser, using the Reader plug-in. The **AcroT<sub>E</sub>X Bundle** supports three methods of producing the final PDF document: the Acrobat Distiller, pdftex (written by Hàn Thế Thành), or dvi<sub>pdfm</sub> (by Mark Wicks).

The **AcroT<sub>E</sub>X Bundle**, which has been in development since 1999, is based on the work and efforts of many people in the  $\text{\LaTeX}$  community; of particular importance are the works of Sebastian Rahtz and Heiko Oberdiek, authors of the hyperref Bundle. (The hyperref Bundle provides the code necessary to create hypertext links for cross-referencing.) In addition, many features of the **AcroT<sub>E</sub>X Bundle** were the result of suggestions by authors who use the **AcroT<sub>E</sub>X eDucation Bundle**.

## 2. Features

Currently, the **AcroT<sub>E</sub>X Bundle** has four components, or packages: web, exerquiz, insdljs and dljslib. The following sections highlight the functionality of each package.

### 2.1. The Web Package

The **Web Package** is primarily used for *document design*. The author can design the page dimensions of the electronic document; include navigational icons, a navigational panel; include background colors, or background graphics. There is an option (the *forpaper* option) for producing the document suitable for printing (the document defaults to letter size, all color is set to black). Standard display strings have been localized, thanks to the efforts of some international users: **AcroT<sub>E</sub>X** has support for French, German, Norwegian, Dutch, Spanish, Italian, Russian, Danish and Polish.

### 2.2. The Exerquiz Package

The **Exerquiz Package** contains all the necessary  $\text{\LaTeX}$  and JavaScript code for producing online *exercises* and *quizzes*.

**Exercises:** Exercises can be composed using the *exercise environment*. Questions and solutions are written by the document author; the solutions gravitate to the end of the document and appear in the solutions section. A hypertext link from the question to the solution is automatically generated. There is an option for including or excluding the solutions in the final document. This feature, in combination with the *forpaper* option, has been used by some authors to publish exercise sets and pretests, initially without solutions, then later, to provide the solutions to the students.

**Quizzes:** The creation of online quizzes is one of the strengths of the **AcroT<sub>E</sub>X Bundle**. The quizzes can consist of multiple choice questions, text-fill in questions, and math fill-in questions. The quizzes are (optionally) scored and marked; answers and solutions can be included or excluded. Quizzes are graded using JavaScript within the document (not on the

server side). In the case of math fill-in questions, extensive JavaScript was written to parse the user's answer, to check for simple syntax errors, to determine whether the answer is correct by comparing it with the correct answer. The stand-alone, self-contained quizzes are ideal for a self-study courses/eTextBooks/online tutorials; for authors who want to track a students progress, server-side support is needed. (Future plans for **AcroT<sub>E</sub>X** include writing some general script for receiving form data from online quizzes and storing it in a database, see Section 3 below.)

### 2.3. The insdljs and dljslib Packages

The heart of the functionality of the quizzes is the client-side JavaScript that process the user's response. These JavaScripts are stored as "document-level JavaScripts" in the PDF document. The insdljs Package is a stand-alone  $\text{\LaTeX}$  package that inserts any JavaScript code that appears in a special  $\text{\LaTeX}$  environment into the document-level section of the PDF document. The Exerquiz Package using the insdljs Package to insert the JavaScripts for processing the quizzes.

Additionally, document authors can extend the basic functionality of the **AcroT<sub>E</sub>X Bundle** by writing their own JavaScript routines. The insdljs Package is the mechanism for inserting these scripts into the final output PDF document.

The functionality of the quizzes comes from its client-side JavaScript. The basic math fill-in question handles multivariate functions as responses, which is sufficient for many problem types.

**AcroT<sub>E</sub>X** comes with a "JavaScript Library" (The dljslib Package). Authors can "checkout" JavaScript code that extend the basic capabilities of math processing to process questions where an *equation* or a *vector-valued function* is expected. Knowledgeable authors can write their own custom JavaScript functions to process math questions not included in the JavaScript Library, and submit them to the JavaScript Library for acquisition.

## 3. Future Development: Online Assessment

As originally envisioned, the role of the **AcroT<sub>E</sub>X eDucation Bundle** was to enable authors to create *self-contained* (PDF) documents in which exercises and quizzes are used by the author as a teaching aid; however, since the roll-out of the **AcroT<sub>E</sub>X Bundle**, authors have wanted the capability to design quizzes for online assessment. To that end, currently under development is a new  $\text{\LaTeX}$  package called eq2db. The eq2db Package will make it easy for the document author to create quizzes that can be submitted to a web-server for storage in a server-side database.

Additionally, server-side script needs to be written to receive the form data from the PDF document and to store it in a database. Preliminary work has already been done in this regard.

#### **4. Concluding Remarks**

The **AcroT<sub>E</sub>X eDucation Bundle** has proven itself an easy and useful authoring system that many have used to create beautiful and interactive documents for electronic education. It is hoped that educators who try the **AcroT<sub>E</sub>X eDucation Bundle** in the future will find it a valuable tool for authoring quality electronic documents.