Authoring Homework Sets in LaTeX

Getting Set-Up

Enabling your desktop LaTeX environment to work with the programming structure of PH Grade Assist (PHGA) is done by interacting with the Brownstone on-line support website. (Brownstone is the company that authored the backbone to PH Grade Assist.) The basic support site is at http://www.brownstone.net/support/edu/authoring/. This link will be used not only for the set-up, but is also the online help site for all things related to authoring in PHGA.

Downloading *latex2edu*

The set of LaTeX macros that are used are unique to PHGA. We need to download the custom style sheet used in compiling our LaTeX document from the Brownstone web site. The following steps will take you through the process of finding and downloading the file *latex2edu*, where the custom style file, *ed.sty*, is contained.

1. Link to the authoring support site, http://www.brownstone.net/support/edu/authoring/.
2. Select "*Using LaTeX*" at the bottom of the page.
3. Under **Requirements** click on the link http://www.brownstone.net/support/edu/latex2edu/. This will take you a download center. Do not change anything in the field in "*Step 1*". In "*Step 2*", the download package **EDU LaTex Macros** should already be selected and highlighted for you. Fill in the fields in "Step 3" and then hit the "*download now*" button and save the zip file – named *latex2edu* - to your computer.

Installing *ed.sty*

Installing the custom style file can be a bit tricky. We need to embed this style file in the same place as the other built-in style files currently in your LaTeX program. The method of doing so differs depending upon whether you are using a unix machine or a pc. The following steps will walk you through the process of installing the *ed.sty* file into your desktop LaTeX program.

1. Unzip the file *latex2edu*. Inside you will find three files *ed.sty*, *ed-xml.sty* and *EDU_LaTeX_doc*. The two .sty files allow us to author in LaTeX rather than the XML source code used by PH Grade Assist. The *EDU_LaTeX_doc* file is a manual on specifically authoring in LaTeX. (We will return to this we get to the authoring section.)
2. **Using Unix** (The following is taken from Dr. Hildebrand's computer tips page, TeX Tips and Resources. Specifically, the page LaTeX Tips: Installing and using custom packages and style files is found at

http://www.math.uiuc.edu/~hildebr/tex/customstyles.html, where a more general discussion and more detail can be found.)

a. **Create a private tex hierarchy.** Under your home directory, create a subdirectory "texmf", underneath that directory create another one called "tex" and under this one create a "latex" directory. Thus, you should have a tree of the form `$HOME/texmf/tex/latex/`. Place the custom style files for PHGA used by LaTeX (*ed.sty* and *ed-xml.sty*) into this directory.

b. **Run the "texhash" program.** Simply type "texhash" at the prompt. This will create a database of files inside your texmf directory. The database file is called, appropriately enough, "ls-R", and is located in the top-level texmf directory, i.e., the file is `$HOME/texmf/ls-R`. The `ls-R` file is an ordinary text file and can be inspected with an editor or a pager like `more` or `less`. If the texhash run was successful, this file should contain a listing of all files under your private texmf directory.
Important. Whenever you add new files to your texmf tree, be sure to run texhash. For efficiency reasons, TeX does not search for files, but only consults the ls-R database; if a (non-standard) file is not listed in this database, TeX will not find it.

3. **Using a P.C. or windows-like environment**. Essentially we follow the same tree form that is used in unix - `$HOME/texmf/tex/latex/` - except we have to open the proper succession of folders and place the .sty files in a folder we create at the end of the tree. Below, you will find the exact steps that were necessary in MiKTeX, the Windows-based LaTeX program I use. I am assuming the same approach will be used in all Windows-styled LaTeX formats. Most LaTeX programs have an online resource guide to help with questions. If the following seems incomplete, go to your program's help page and search for information on installing custom style files. I will refer to *Your LaTeX Program* as an arbitrary program name.

a. **Embedding the style files in the correct folder.**
   i. Find on your hard-drive where the folder texmf is and open it.
   ii. Within this folder you should find the folder tex. Open it.
   iii. Within this folder you should find the folder latex. Open it.
   iv. Create a folder titled ed and place *ed.sty* and *ed-xml.sty* into this folder.

b. **Create a private tex hierarchy.**
   i. In the Start menu at the bottom left-hand corner of the screen, find *Your LaTeX Program*'s name – i.e. MiKTeX – in the Programs option.
   ii. Under *Your LaTeX Program*, there should be a choice for *Your LaTeX Program Options*.
   iii. In the window that pops up, there should be a tab titled "*trees*" or "*roots*". Click on it.
   iv. Click on the tree defined as "C://texmf" and then click on the "add" button. (Here I have assumed that my hard-drive is titled C. Obviously, use what ever your hard-drive is labeled.)

v. A "browse for folder" window should come up. Follow the exact same path that we established in part a. (From the desktop to texmf to tex to latex to ed) Then click the "ok" button.
vi. You should now be back to the "*trees"* or "*roots*" window. Press the "ok" button.
vii. **Important**. You may need to refresh the pathways to ensure that your new path has been embedded into the system of trees. There is probably a button on the same window that enables this. For example, in MiKTeX, there is a button that is labeled "Refresh FNDB", where FNBD is short for file name database. To be on the safe side, you should do so at this time.

We have now completed enabling your LaTeX environment and are ready to start authoring problem sets.

Authoring Homework Sets

Authoring homework sets in LaTeX is not difficult once you know the EDU macros necessary. This is where the third file, *EDU_LaTeX_doc*, becomes useful. It is recommend that you use Word to open *EDU_LaTeX_doc*. Here you will find a 37-page document giving brief descriptions of all the basic question authoring macros and some basics on structure. Note that all of the information contained in the text document can also be found at http://www.brownstone.net/support/edu/authoring/ under "*LaTex_Authoring*" in the table of contents found on the left-hand side of the screen.

Basic Document Structure

Below is a template of a basic assignment. Following each new command unique to the ed style package, there is a brief description

```
\documentclass[12pt]{article}

\usepackage{ed}
%This command instructs the complier to use the style package that we installed.

\begin{document}

\begin{topic}{…}
% The \begin{topic}{…}-\end{topic} pair must be used for each assignment. Replacing
% the ellipsis with text titles the problems set. For example, most of the problems in the
% pre-established problem bank are of the form \begin{topic}{Section 1.2,\#1-10}.
% However the title can be any meaningful label that you want such as
% \begin{topic}{Logarithmic Differentiation}. All problems must be contained in the
% topic environment.

\begin{question}{…}
```

```
% In the question environment, PHGA allows a wide variety of types of questions to be
% asked.  The ellipsis needs to be replaced with the name of one of these types. An
% example would be \begin{question}{Blanks} for fill-in-the-blank type questions.
% These will be discussed later in greater detail
…
% Here is where you will author the body of the question.  Beware that the body is very
% type specific and changes from problem type to problem type.
\end{question}

\begin{question}{…}
…
\end{question}

%…as many questions as you need…

\end{topic}

\end{document}
```

Questions

There are many different types of problems such as multiple choice, multiple selection, true-false, matching, blanks, clickable image, sketch, key words, essay, etc. available to PHGA. Each are explained with numerous LaTeX encoded examples at http://www.brownstone.net/support/edu/authoring/ under "*LaTex_Authoring*" in the table of contents found on the left-hand side of the screen. The exact same material is available in the *EDU_LaTeX_doc* but not all of the examples are as math specific as the web site.

One of the advanced features available to PHGA is an algorithmic-type question. Here you may assign a specific type of problem but have a few of the coefficients and powers randomized. An example of this would be find the derivative of $f(x) = x(3 - ax)^b$ where a and b are random integers selected between 4 and 10. At either the help site or *EDU_LaTeX_doc* the last example given in each problem type is an algorithmic problem. It is suggested that one use the example code as a template for one's own work.

Compiling

After you have finished coding your assignment, compile as you normally would. As normal, the dvi file that is created can be used to check your output. However, it is important to note that this in NOT what the assignment will look like in the PHGA web space. The file will be converted into XML and will be in the exact same format as the book problems that are currently in your courses homepage. The dvi file is simply created to aid in editing and error checking.

Installing your problem bank into your PH Grade Assist course space

Now that we have authored an assignment in LaTeX, we first need to convert the LaTeX into the XML format used by PHGA's EDU Space environment. (EDU Space is the Brownstone name for the backbone that PHGA is built on.) After converting the file, we need to save the converted file to our desktop. Lastly, you will upload the converted file into your PHGA course.

1. Go to http://www.brownstone.net/support/edu/authoring/ and click on "*Using LaTeX*" at the bottom of the screen.
2. Under **Authoring Process** click on the link to the web based conversion service, http://qa.brownstone.net/latex2edu/.
3. Fill in the first field by selecting your tex file off your system. The second field does not need to be entered since we are already using the ed.sty required by EDU Space. Leave it blank. Then click on the "*Send File*" button.
4. Brownstone will convert the file and send back a status report. Click on the "*Click to Download File*" button.
5. A File Download field will open on your screen. Select the "*Save*" option. (Note that selecting the "*Open*" option will open the XML code file. If you want to see the source code used by PHGA, this is where you will find it.) A Save As field will now open. Our converted file needs to be saved as a .edu file onto our desktop. **Important**. Notice that Brownstone names the converted file something completely different that the name of the tex file that your sent to be converted. Be sure to rename it so that you can find the file. It is also important that the name of the assignment not be the same as any of the problem banks currently on the system. For example, if you are authoring an extra set of problems for Section 2.2, do not name it the exact same as the book problems already in PHGA or you will overwrite them.
6. Log into your class homepage as the instructor.
7. Go into the **Question Bank Editor**.
8. Select the option "*Upload and edit a testbank from your computer*" and press the "*OK*" button.
9. Select the .edu file off your computer and press the "*Load*" button.
10. Then press the "*Install Bank*" button.

You have now uploaded your authored problems into your course space. The problems are now available for assignments. To assign the problems, you need to go back to the **Main Menu** and go into the **Assignment Editor.** From here you would create an assignment as normal.