

Using Free Software for the Construction of Complex Course Documents

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Don't Take Too Many Notes

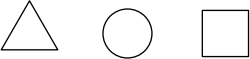
This talk is available from my web-site:

`http://frodo.elon.edu`

under the link **Presentations**.

The Nature of Compound Documents

Addition is commutative.



```
String s1 = "0123456789";  
String s2 = "abc";  
String s3 = s1 + s2;
```

Complicated mathematical documents can contain

- Text
- Diagrams and pictures
- Computer programs

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- Documents for publication go through many revisions before completion.
- Anticipating revisions, it is important when constructing compound documents to be able to automatically generate them, to eliminate the possibility of portions getting out of synchronization.



L^AT_EX is a mathematical typesetting system for creating production-quality mathematical documents. The skills needed for constructing documents for publication also apply to producing high-quality course documents.

This talk will focus on issues related to using L^AT_EX with compound documents.

Output Formats for L^AT_EX

There are two main output forms for L^AT_EX:

- **Postscript** and programs that build on **Postscript** such as **L^AT_EX2HTML**.
- **PDF**

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- This presents both an opportunity (on-going access) and a problem (display of complicated mathematics on a computer screen takes some work).
- When documents are published without considerations of formatting, students usually have to print them out to read them.
- HTML is easier to read on a computer terminal; PDF looks much better when printed out. I use both L^AT_EX²HTML and pdfL^AT_EX for my course documents.

Print

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- Images can be displayed with fine resolution, but the document can't include links to other documents.

Graphics Formats

There is no problem producing both forms of output from L^AT_EX if there are no graphics included; if there are graphics included in the document, they must be of a format that **Postscript** or **PDF** can handle. Unfortunately, these formats are nearly exclusive.

Producing Both Postscript and PDF

There are two ways of having L^AT_EX graphics work with both **Postscript** and **PDF**:

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- Produce a restricted form of encapsulated postscript, known as **meta-postscript**, that is usable both in **Postscript** and **PDF**. **meta-postscript** files are produced by the program **MetaPost**, which is a graphics program bundled with most L^AT_EX systems.

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- Produce a restricted form of encapsulated postscript, known as **meta-postscript**, that is usable both in **Postscript** and **PDF**. **meta-postscript** files are produced by the program **MetaPost**, which is a graphics program bundled with most L^AT_EX systems.
- If I am working with pre-existing graphics files, I use **ImageMagick** to convert between formats automatically. If I am creating new graphics files, I try to use **MetaPost**.

Plotting Curves

There are many programs for producing quality graphs. I am most comfortable using **gnuplot**, probably because it has been around for a while, is robust, with many graphing options. One of its options is to produce **MetaPost** output.

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- With frequent revision, it is near impossible to keep different versions of a document up-to-date. It is far more common to revise only the version that you are currently using.
- It is also easier to make errors in archiving or distributing a document when you have multiple versions of it.

Managing Document Dependencies

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- If your **L^AT_EX** document contains an image that itself needs to be generated by another program such as **MetaPost**, you can record these dependencies in a **Makefile** and use **make** to handle the dependency.

Example Using make

I have a L^AT_EX file `hwso101.tex` that contains a graph generated by `gnuplot`. In order for the image file to be in a format acceptable both to Postscript and PDF outputs, I have `gnuplot` generate `MetaPost` output, which I then run through `MetaPost` to produce the image file in encapsulated postscript.

Example Using: Continued

I will want to convert `hwsol01.tex` both to DVI format and PDF format, so I record the dependencies and commands in a **Makefile**. I also want to convert the DVI file to postscript.

```
hwsol01.dvi: hwsol01.tex
    latex hwsol01.tex
```

```
hwsol01.pdf: hwsol01.tex
    pdflatex hwsol01.tex
```

```
hwsol01.ps: hwsol01.dvi
    dvips -t letter -o hwsol01.ps hwsol01.dvi
```

Example Using make: Continued

Here is an excerpt from `hwsol01.tex`:

```
\item[page~692, \#1--2:] ~
```

Sketch the curve by using the parametric equations to plot points. Indicate with an arrow the direction in which the curve is traced as t increases.

```
\item[page~692, \#1:] ~
```

```
 $x = 1 + \sqrt{t}$ ,  $y = t^2 - 4t$ ,  $0 \leq t \leq 5$ 
```

```
\begin{center}
\includegraphics[width=\linewidth, height=2in,
keepaspectratio]{hwsol01a.mps}
\end{center}
```

Example Using make: Continued

Since `hwsol01.tex` depends on `hwsol01a.mps`, we record this in the **Makefile** in this directory.

```
hwsol01.tex: hwsol01a.mps
```

Now whenever we try to make `hwsol01.tex`, **make** will first make sure that `hwsol01a.mps` has been made.

Example Using make: Continued

`hwsol01a.mps` is created by running **MetaPost** on `hwsol01.mp`, and we record that dependency. (Unfortunately, the output of **MetaPost** always has a numerical file extension, requiring that the file be renamed.)

```
hwsol01a.mps: hwsol01a.mp
               mpost hwsol01a.mp
               mv hwsol01a.0 hwsol01a.mps
```

Finally, `hwsol01a.mp` itself is produced by running **gnuplot** on the file `hwsol01a.gp`.

```
hwsol01a.mp: hwsol01a.gp
              gnuplot hwsol01a.gp
```

Technology for Including Text Files

If you are including a text file that has another role, such as a program, you will not want to just insert the text. If the program is revised, your document will be incorrect. There are a couple of ways to proceed in L^AT_EX.

- Use the **verbatim** package and its **verbatiminput** command.

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- Use the **verbatim** package and its **verbatiminput** command.
- Use a templating system such as Perl's **Template Toolkit** or Python's **EmPy** embedded Python package.

References

gnuplot Program for graphing curves, surfaces, and data.
www.gnuplot.info

ImageMagick Collection of programs for manipulating and converting graphics files.
www.imagemagick.org

L^AT_EX A program for typesetting mathematics.
www.latex-project.org

L^AT_EX2HTML A program for converting L^AT_EX files to HTML for posting on the web.
www.latex2html.org

make A program for managing dependencies between files.
www.gnu.org/software/make/

References (Continued)

MetaPost A program for creating graphics files.

cm.bell-labs.com/who/hobby/MetaPost.html

pdfL^AT_EX A version of L^AT_EX that produces PDF output. It is usually included with most L^AT_EX distributions.

Perl A programming language that is particularly good for manipulating text.

www.perl.org

Template Toolkit is a templating system for use with Perl.

www.template-toolkit.org

python A programming language.

www.python.org

EmPy is a templating system for use with Python.

www.alcyone.com/software/empy/index.html