

## Incorporating L<sup>A</sup>T<sub>E</sub>X in your Postscript files

Programs which generate Postscript (ps) or Encapsulated Postscript (eps) output, such as MATLAB or xfig, are somewhat limited in their ability to produce mathematical expressions. For example, the current version of MATLAB has no easy provision for combining regular text and Greek symbols, equations, subscripts, etc., for axes labels or for plot legends. Although xfig allows you to create these marvels by hand, it is more efficient to incorporate L<sup>A</sup>T<sub>E</sub>X typesetting commands into your figure. The *psfrag* macro allows any string in a *ps* or *eps* figure to be replaced with L<sup>A</sup>T<sub>E</sub>X generated text. This handout shows you how to do it. An example using a MATLAB plot is given, but you can use the same tricks with any eps file.

### Generating the MATLAB plot

You probably know how to generate a MATLAB plot and store it using the `print` command. To get axes labels on the plot using L<sup>A</sup>T<sub>E</sub>X, you have to label the axes slightly differently. For example, if you want the X-axis label as “Fancy X-label:  $\int_{-\infty}^{\infty} f(t) dt$ ”, type the following (in MATLAB):

```
>> xlabel('x1')
```

Now we have to replace `x1` with “Fancy X-label:  $\int_{-\infty}^{\infty} f(t) dt$ ”. This is done using the `\psfrag` command. This command is to be used in the L<sup>A</sup>T<sub>E</sub>X source file. Its syntax is:

```
\psfrag{name}[position][psposition][scale][rot]{LaTeX text}
```

As an example, consider `\psfrag{x1}[c]{Fancy X--label:  $\int_{-\infty}^{\infty} f(t)\,dt$ }`, which will be a line in your L<sup>A</sup>T<sub>E</sub>X source file. This will replace every occurrence of `x1` that appears in the MATLAB plot with “Fancy X-label:  $\int_{-\infty}^{\infty} f(t) dt$ ”. In a similar vein, if you want to label a graph  $A_2(n)$ , then place a string `p1` in a suitable location inside the plot (using either MATLAB’s `text` or `gtext` command). Once the sequence of commands given below are executed, the final PostScript file should contain the plot with the legend  $A_2(n)$ . In the L<sup>A</sup>T<sub>E</sub>X command `\psfrag{p1}[c]{ $A_2(n)$ }`, the option `[c]` will center the replaced string around `p1`. If you want the replacement string to be right-justified, then the option should be `[r]`. (No prizes for guessing what the option is for left-justifying the text.)

Figure 1 shows the MATLAB plot as it would appear before replacing the strings. (These strings will later be replaced with L<sup>A</sup>T<sub>E</sub>X text.) The first thing to do is to save the figure as an `eps` file. This is done using the MATLAB

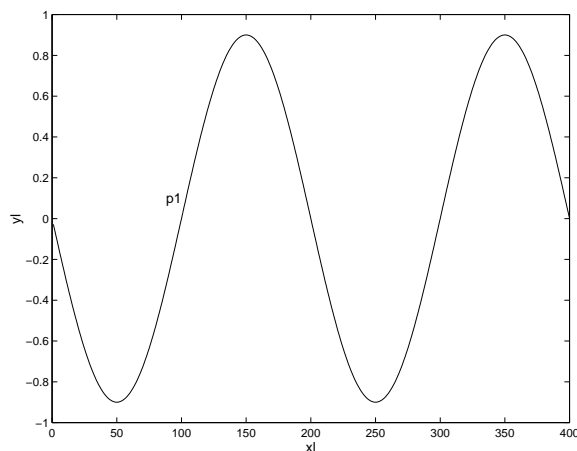


Figure 1: MATLAB plot as it appears on your screen.

command

```
>> print -deps2 figure.eps
```

This will generate the file `figure.eps`. Next, use the command (outside MATLAB, of course) `ps2frag` on the file just created:

```
ps2frag figure.eps
```

## Additions needed in the L<sup>A</sup>T<sub>E</sub>X source file

The L<sup>A</sup>T<sub>E</sub>X source file has to be modified slightly before you can accomplish string replacement on .eps files. The package `psfrag` has to be included using the `\usepackage{psfrag}` command.

The following is a portion of a L<sup>A</sup>T<sub>E</sub>X file `example.tex`. The `\psfrag` commands between the `\begin{figure}` and `\end{figure}` are the ones that take care of string replacement. The `\includegraphics` is needed for including the EPS file `figure.eps` into the L<sup>A</sup>T<sub>E</sub>X document.

```
\documentclass[11pt]{article}
\usepackage{rotating,graphics,psfrag,epsfig}
.....
\begin{figure}[h!t]
  \centering
  \psfrag{x1}[c]{\footnotesize Fancy X--label:  $\int_{-\infty}^{\infty} f(t)\,dt$ }
  \psfrag{y1}[c]{\footnotesize Fancy Y--label:  $\sum_{n=-\infty}^{\infty} f[n]$ }
  \psfrag{p1}[c]{\begin{turn}{75} \footnotesize Dangerously Leaning Tower of
     $\pi\iota\sigma\alpha$  \end{turn}}
  \resizebox{3.0in}{!}{\includegraphics{figure.eps}}
\caption{An example of string replacement using \texttt{psfrag}.}
\end{figure}
```

The following commands are needed to obtain the final output: (1) `latex example.tex` (2) `dvips example.dvi`. The PostScript file `example.ps` will contain the L<sup>A</sup>T<sub>E</sub>X output and figures in the final form.

To summarize the steps required to use `psfrag`:

1. Store the MATLAB plot using the `print -deps2 filename.eps` command.
2. Use the `ps2frag` command on the EPS file.
3. L<sup>A</sup>T<sub>E</sub>X your source file; the source file should contain string replacements using the `\begin{psfrag}` commands.
4. Run `dvips` to get the postscript file.
5. Preview the file with `ghostview` to see if the string replacements have been done properly, before printing the document.

Figure 2 is a sample output in which the strings have been replaced with the desired L<sup>A</sup>T<sub>E</sub>X text.

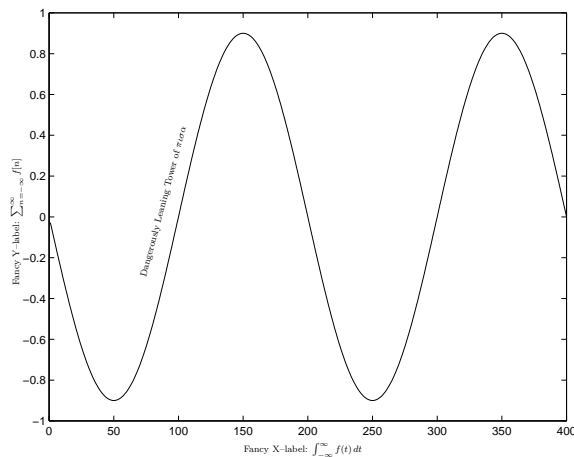


Figure 2: An example of string replacement using `psfrag`.