An Introduction to LaTeX in One Short Talk

Robyn Owens (Edited Mar 2013 Rachel Cardell-Oliver)

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Abstract

This very short talk will not tell you much about LaTeX, but hopefully it will entice you to learn lots more, because it is a beautiful mark-up language and produces the most professional looking documents. It is accepted worldwide and, indeed, insisted upon by some journals.

1 Introduction

In this paper I will tell you how to write a lovely looking paper using LaTeX. It doesn't matter how many spaces you have between letters, LaTeXwill typeset everything beautifully.

However, a line space will indicate the beginning of a new paragraph. As we know, a new paragraph should be used for each new thought.

Typesetting simple text is easy. To mark-up **bold** or *emphases*, you use simple and obvious commands. Sometimes, an *emphasis* requires a bit of extra space if it is followed immediately by another word; if you do not do this, it can look a bit *squashed* up. Moreover, the emphasis command is a toggle command; *if you use it* twice*, you will find the usual result.*

A tied space in LaTeX is provided by using the ~ command. You use it most often when making citations, such as in citing Knuth's [1] work, or with constructs like Chapter 1, Algorithm 2, Theorem 3, Corollary 4 and Lemma 5 so that the number doesn't go over to the next line.

There are four kinds of dashes in LaTeX: the hyphen, such as in user-friendly; the dash between ranges of numbers, such as in 121–123; the dash between phrases, such as in "Which do you prefer—black or white?"; and the mathematical minus sign, such as in −1. They should all be used consistently.

Ellipses are typeset as ..., not as ..., because LaTeX typesets dots as full stops, and puts them up close to the previous symbol.

LaTeX uses various types of logical environments to typeset the different logical structures within your document. If you are familiar with HTML then you will already have a head start of logical mark-up.

The easiest environment is the list environment, and LaTeX provides many. The most common are the `itemize`, `enumerate`, and `description` environments. Here's how they work.

An itemised list uses bullet points for each list item.

- Here is the first item on my list. It can be whatever I like it to be.
- Here's the 2nd.
- And here's the last, which is going to have $x + y = 4$ in it.

An enumerated list uses numbers.

1. Here is the first item on my list. It can be whatever I like it to be.
2. Here's the 2nd.
3. And here's the last, which is going to have $x + y = 4$ in it.

The description list is more commonly used to define terms.

Item 1 Here is the first item on my list. It can be whatever I like it to be.

Item 2 Here's the 2nd.

Item 3 And here's the last, which is going to have $x + y = 4$ in it.

2 Mathematics

Now we really should do some mathematics, where the beauty of LaTeX becomes evident.

Mathematics can be typeset in the `math, displaymath`, and `equation` environments, and in the short forms `$...$` and `\[...\]`.

Here I put in some simple mathematical terms, such as $E = mc^2$, or my favorite equation is

$$e^{i\pi} = -1.$$

Other terms that are simple to handle are fractions, subscripts and superscripts, such as $\frac{1}{n+2} = x_i + y^3$. It is standard practice to typeset in-line fractions, such as the one in this paragraph, as $1/(n + 2) = x_i + y^3$, making it easier to read.

Let's do something more complicated, like

$$\int x^2 e^{x^3} dx = \frac{1}{3} \int e^{x^3} (3x^2) dx \tag{1}$$

Note that in the `equation` environment, each equation is numbered. You can suppress the numbering with the `\nonumber` command. The `displaymath` environment produces unnumbered formulae.

The tabular environment is used for arrays of ordinary text, whereas the array environment is used for mathematical arrays.

Here's a table:

Department	EFTSUs	Budget (in $)
Astronomy	100	1,250,000
Theology	15	250,000
Genetic Engineering	200	5,700,000

The array environment can beautifully typeset matrix equations, such as in the following few lines of text:

The relationship between the two coordinate systems (c, x, y) and (C, X, Y, Z) is given by

$$x = \frac{Xf}{Z} \qquad \text{and} \qquad y = \frac{Yf}{Z}. \tag{2}$$

This can be written linearly in homogeneous coordinates as

$$\begin{bmatrix} sx \\ sy \\ s \end{bmatrix} = \begin{bmatrix} f & 0 & 0 & 0 \\ 0 & f & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix} \cdot \begin{bmatrix} X \\ Y \\ Z \\ 1 \end{bmatrix},$$

where $s \neq 0$ is a scaling factor.

There are lots of other beautiful things you can do in mathematics, but let's move on to including diagrams and images.

3 Figures

To include diagrams and images into your document, you can use a LaTeX macro called `graphicx`. This usage is declared in the header of your LaTeX source as follows:

```
\documentclass{article}
\usepackage{graphicx}
```

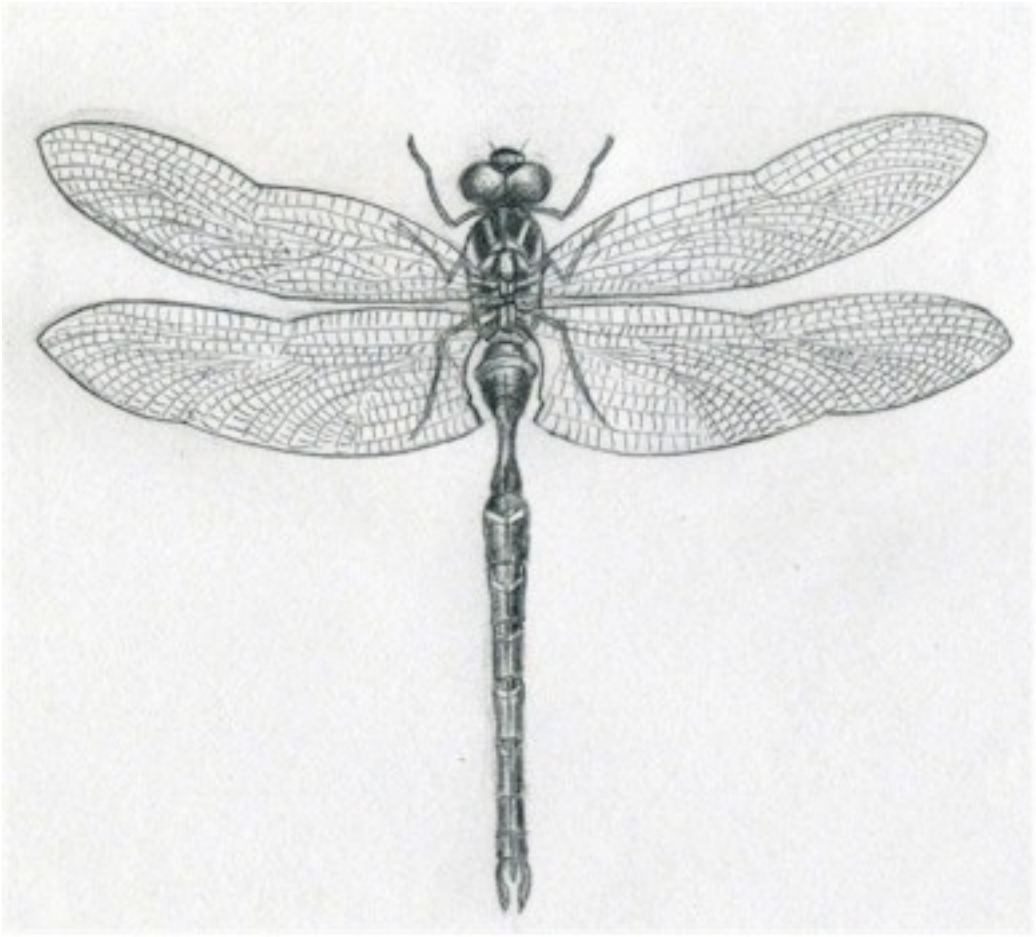

Figure 1: Here is a nice picture of a dragon fly

and then to include a pdf file you simply use the command

```
\includegraphics[width=0.5\textwidth]{image}
```

The size of the figure can be controlled by setting width or height options. This is illustrated with the inclusion of a nice image somewhere in this document but probably not exactly *here*!

I can fiddle around with commands in `graphicx` to change the size and orientation of the pdf figure fairly easily and get something like the image shown in Figure 2.

Figure 2: Here is a small picture of a dragonfly.

4 Getting some output

Once your source is beautifully typeset, you might want to print it out. Tools, such as `pdflatex` will create `.pdf` output, which can be read by an Adobe Acrobat reader.

Don't forget to use a spelling checker, such as `ispell`, which will check all your spelling and ignore most LaTeX commands.

References

[1] D. E. Knuth. *The TeX Book.* Addison-Wesley, Reading, Massachusetts, 1984.