

Kile, Latex and tensor mathematics

Les Hatton, CISM, Kingston University*

March 26, 2010

Abstract

This is a very short introduction to Kile and Latex to allow people easy and free access to professional class typesetting.

1 Latex v. Word

In scientific writing, many people use both Word and Latex. I have used both extensively but for the last seven years have used Latex exclusively after Word damaged some old writing files I had so that they could not be recovered. Kile is simply a graphical user interface to Latex and is available for all Linux distributions either within the distribution itself, using the software installer for a particular distribution¹ or as a download².

The most obvious features of value in scientific writing are as follows with a summary for each.

Feature	Word	Kile / Latex
WYSIWYG	Full	Partial
Free ?	No	Yes
Maths typesetting	equation editor	built-in
Reference handling	Pay extra	built-in
Graphics	Cut and paste	Can insert .eps files
Drawing	Might have to buy	Easy interface to xfig
Tables	Easy	Bit less easy
Ease of use	Easy for unsophisticated use	Easy
Stability	Good	Very good
Ability to output .pdf	No, pay extra	Built-in

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¹Ubuntu# yum install kile

²<http://kile.sourceforge.net/>

2 Examples of tensor maths in Latex

The covariant derivative of $T^{\beta\gamma}_{\delta\epsilon}$ is given by

$$\nabla_{\alpha} T^{\beta\gamma}_{\delta\epsilon} = \frac{\partial T^{\beta\gamma}_{\delta\epsilon}}{\partial x^{\alpha}} + \sum_{\rho} \Gamma^{\beta}_{\rho\alpha} T^{\rho\gamma}_{\delta\epsilon} + \sum_{\rho} \Gamma^{\gamma}_{\rho\alpha} T^{\beta\rho}_{\delta\epsilon} - \sum_{\rho} \Gamma^{\rho}_{\delta\alpha} T^{\beta\gamma}_{\rho\epsilon} - \sum_{\rho} \Gamma^{\rho}_{\epsilon\alpha} T^{\beta\gamma}_{\delta\rho} \quad (1)$$

Any old equation

$$\frac{d\sigma}{d\tau} = -cR_S^{1/2} \frac{1 - R_S/r}{(1 - R_S/r_0)^{1/2}} \left(\frac{r_0 - r}{rr_0}\right)^{1/2} \frac{(1 - R_S/r_0)^{1/2}}{(1 - R_S/r)^{3/2}} \quad (2)$$

and this was equation (2).

3 Another section

3.1 With a sub-section

3.1.1 With a sub-sub-section

and a reference, complex computer models are beset by unquantifiable errors [1]. The reference appears in a simple text file lh.biblio.bib containing the following entry (amongst many others),

```
@Article{HatRob94,  
author = {L. Hatton and A. Roberts},  
title = {How accurate is scientific software ?},  
journal = {IEEE Transactions on Software Engineering},  
year = {1994},  
OPTkey = {},  
volume = {20},  
number = {10},  
OPTpages = {785-797},  
OPTmonth = {October},  
OPTnote = {},  
OPTannote = {}  
}
```

Finally, a postscript figure created using gnuplot³. gnuplot is also free and wonderful for scientific diagrams as shown by Figure 1. xfig can be found at⁴.

4 Conclusions

That was brief introduction. Kile/Latex has been used to produce many scientific textbooks, it is the standard choice for many scientific journals and it is legendarily robust. I hope this gives you an idea of how useful and easy to use it is for this kind of work.

³<http://www.gnuplot.info>

⁴<http://www.xfig.org/>

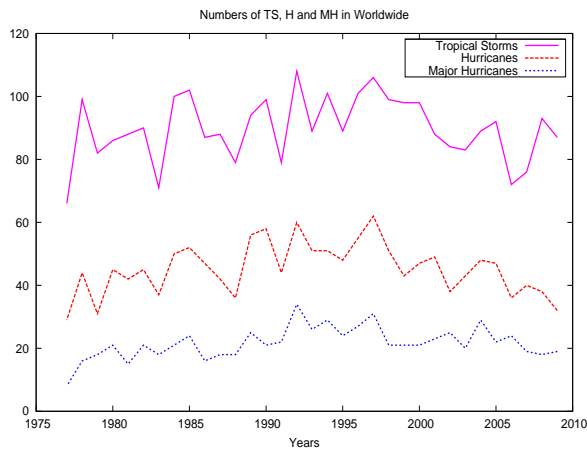


Figure 1: Worldwide tropical storms, hurricanes and major hurricanes in the last 30 years. This currently excludes South Pacific data which is incomplete so this is estimated to represent 90-95% of the total activity.

5 Appendix

In this section, the whole of the raw Latex used to produce this pdf file is shown below (apart from a couple of slight modifications noted in the text to allow it to appear).

```

\documentclass[a4paper,10pt]{article}
\usepackage[latin1]{inputenc}
\usepackage{amsmath}
\usepackage{amsfonts}
\usepackage{amssymb}
\usepackage{graphicx}
\usepackage{longtable}

%opening
\title{Kile, Latex and tensor mathematics}
\author{Les Hatton, CISM, Kingston University\footnote{l.hatton@kingston.ac.uk}}

\begin{document}

\maketitle
\bibliographystyle{plain}

\begin{abstract}
This is a very short introduction to Kile and Latex to allow people easy
and free access to professional class typesetting.
\end{abstract}

\section{Latex v. Word}

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In scientific writing, many people use both Word and Latex. I have used both extensively but for the last seven years have used Latex exclusively after Word damaged some old writing files I had so that they could not be recovered. Kile is simply a graphical user interface to Latex and is available for all Linux distributions either within the distribution itself, using the software installer for a particular distribution\footnote{Ubuntu\# yum install kile} or as a download\footnote{http://kile.sourceforge.net/}.

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\section{Examples of tensor maths in Latex}

The covariant derivative of $T^{\beta\gamma}_{\delta\epsilon}$ is given by

$$\begin{aligned} \nabla_{\alpha} T^{\beta\gamma}_{\delta\epsilon} = & \\ \frac{\partial}{\partial x^{\alpha}} T^{\beta\gamma}_{\delta\epsilon} & + \sum_{\rho} \Gamma^{\beta}_{\rho\alpha} T^{\rho\gamma}_{\delta\epsilon} - \sum_{\rho} \Gamma^{\gamma}_{\rho\alpha} T^{\beta\rho}_{\delta\epsilon} \\ & - \sum_{\rho} \Gamma^{\delta}_{\rho\alpha} T^{\beta\gamma}_{\rho\epsilon} + \sum_{\rho} \Gamma^{\epsilon}_{\rho\alpha} T^{\beta\gamma}_{\delta\rho} \end{aligned}$$

Any old equation

$$\begin{aligned} \frac{d\sigma}{d\tau} = & -c R_S^{1/2} \\ & \frac{1-R_S/r}{(1-R_S/r_0)^{1/2}} \left(\frac{r_0-r}{r_0} \right)^{1/2} \\ & \frac{(1-R_S/r_0)^{1/2}}{(1-R_S/r)^{3/2}} \end{aligned} \quad \text{\label{eq:dsigdtau3}}$$

and this was equation (\ref{eq:dsigdtau3}).

\section{Another section}

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/begin{verbatim} (Need to change / to \)
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@Article{HatRob94,  
author = {L. Hatton and A. Roberts},  
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/end{verbatim} (Need to change / to \)
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Finally, a postscript figure created using gnuplot\footnote{<http://www.gnuplot.info>}. gnuplot is also free and wonderful for scientific diagrams as shown by Figure \ref{fig:worldwide}. xfig can be found at\footnote{<http://www.xfig.org/>}.

```
\begin{figure}
```

```
\includegraphics[width=8cm,height=6cm]{worldwide.eps}
```

```
\caption{Worldwide tropical storms, hurricanes and major hurricanes in  
the last 30 years. This currently excludes South Pacific data which  
is incomplete so this is estimated to represent 90-95% of the total activity.}
```

```
\label{fig:worldwide}
```

```
\end{figure}
```

```
\section{Conclusions}
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That was brief introduction. Kile/Latex has been used to produce many scientific textbooks, it is the standard choice for many scientific journals and it is legendarily robust. I hope this gives you an idea of how useful and easy to use it is for this kind of work.

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```
\bibliography{lh_biblio}
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```
\end{document}
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References

- [1] L. Hatton and A. Roberts. How accurate is scientific software ? *IEEE Transactions on Software Engineering*, 20(10), 1994.