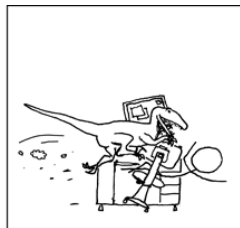
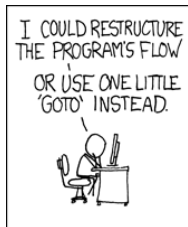


Writing your papers and thesis more effectively

LaTeX, vector graphics, reference management and version control

Krishna Kumar ^{*1}



Schofield Centre, January 2015

¹github.com/kks32

1 Why not to use WYSIWYG

2 Introduction to \LaTeX 2e

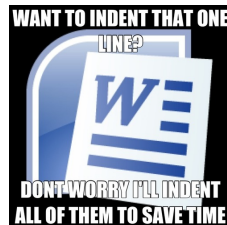
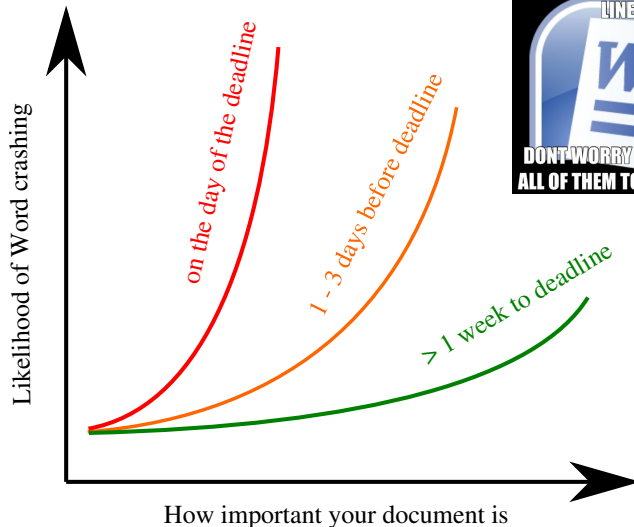
- Title and Abstract
- Sections

3 Structure

4 Good practices

- Equations

Likelihood of Word crashing



Can you see beyond the WYSIWYG bubble?

mouth; whenever it is a damp, drizzly November in my soul; whenever I find myself involuntarily pausing before coffin warehouses, and bringing up the rear of every funeral I meet; and especially whenever my hypos get such an upper hand of me, that it requires a strong moral principle to prevent me from deliberately stepping into the street, and methodically knocking people's hats off – then, I account it high time to get to sea as soon as I can. This is my substitute for pistol and ball. With a philosophical flourish Cato throws himself upon his sword; I quietly take to the ship. There is nothing surprising in this. If they but knew it,

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Word vs InDesign vs LaTeX

grafiet efficiënt fles souffleur fjord
gra**f**iet e**ff**iciënt **f**les sou**ff**leur **fj**ord

Ligatures

AAa BB CC DD
AAa BB CC DD

Smallcaps

Tafel AVA AVA
Tafel AVA AVA

Kerning

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What is L^AT_EX?

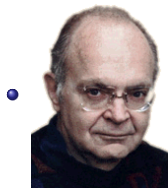
- L^AT_EX is a document preparation system for the T_EX typesetting program.
- Programmable desktop publishing, which automates most of the typesetting.
- L^AT_EX produce beautiful documents, especially mathematics

$$i\hbar \frac{\partial}{\partial t} \Psi(r, t) = \left[\frac{-\hbar^2}{2\mu} \nabla^2 + V(r, t) \right] \Psi(r, t)$$

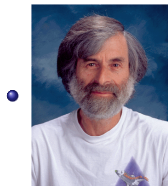
$$E^2 = (pc)^2 + (m_0 c^2)^2$$

- L^AT_EX is WYSIWYM (What You See is What You Mean)

It all started with Donald Knuth and “The Art of Computer Programming”



Donald Knuth, 1977, $\text{T}_{\text{E}}\text{X}$ - a computer language used for typesetting math and other technical material



Leslie Lamport, \LaTeX - a higher-level method of accessing the power of $\text{T}_{\text{E}}\text{X}$

Pros

- It's free and works on Macs, Windows, Unix/Linux.
- LaTeX files are ASCII and are portable.
- The typesetting is better, especially the maths.
- Style changes are neater in LaTeX.

Cons

- Special/Modern Font selection is difficult, but one can use XeTeX.
- LaTeX encourages (almost insists on) structured writing and the separation of style from content. This is not the way that many people (especially non-programmers) are used to working.
- Without a WYSIWYG front end, it's not always easy to find out how to do things.

Gerring started with L^AT_EX

- **Typesetting**

- T_EXLive - full version
- MiK_TE_X- Windows (Basic installer)

- **Off-line editors**

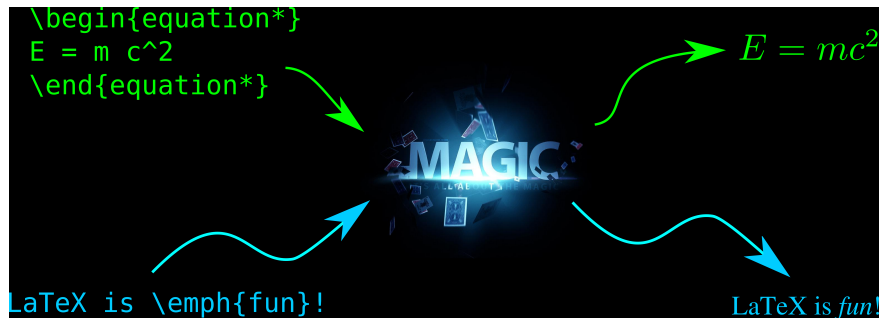
- T_EXStudio
- T_EXMakerX

- **Online editors**

- Overleaf (formerly WriteL^AT_EX)
- ShareL^AT_EX

How L^AT_EX works? - The Magic

- You write your document in plain text with **commands** that describe its structure and meaning.
- The L^AT_EX program processes your text and commands to produce a beautifully formatted document.



More examples of commands and their output...

```
\begin{itemize}
\item Despicable Me
\item Wall-E
\item Tangled
\end{itemize}
```

- Despicable Me
- Wall-E
- Tangled

```
\begin{figure}
\includegraphics{figs/minion}
\end{figure}
```



```
\begin{equation}
\alpha = \beta + 1
\end{equation}
```

$$\alpha = \beta + 1 \quad (1)$$

Getting Started

- A minimal \LaTeX document:
- Commands start with a *backslash* `\`
- Every document starts with a `\documentclass` command.
- The *argument* in curly braces `{ }` tells \LaTeX what kind of document we are creating: an *article*.
- A percent sign `%` starts a *comment* — \LaTeX will ignore the rest of the line.

Declarations and Environments

Declaration and commands...

- Are stated once
- Take effect until further notice
- Can optionally be constrained

Eg., `\documentclass` or `\includegraphics`

Environments...

- Have matching begin and end declarations
- Must be constrained

Eg., `\begin{document}` ... `\end{document}`

Arguments

Required arguments...

- Are contained in curly braces
- Must be provided

Eg., `\documentclass{article}`

Optional arguments...

- Are contained in square bracket
- Can be left out, in which case default value is assumed
- Give you more control over the commands

Eg., `\documentclass[12pt]{article}`

Title and Abstract

- Tell \LaTeX the `\title` and `\author` names in the preamble.
- Then use `\maketitle` in the document to actually create the title.
- Use the abstract environment to make an abstract.

```
\documentclass{article}

\title{The Title}

\author{A. Author}

\date{\today}

\begin{document}
\maketitle

\begin{abstract}
Abstract goes here...
\end{abstract}

\end{document}
```

The Title

A. Author

November 11, 2014

Abstract

Abstract goes here...


```
\documentclass{article}  
\begin{document}
```

```
\section{Introduction}
```

The problem of \ldots

```
\section{Method}
```

We investigate \ldots

```
\subsection{Sample Preparation}
```

```
\subsection{Data Collection}
```

```
\section{Results}
```

```
\section{Conclusion}
```

```
\end{document}
```

1 Introduction

The problem of ...

2 Method

We investigate ...

2.1 Sample Preparation

2.2 Data Collection

3 Results

4 Conclusion

Let's try that ...

- write \LaTeX is a website for writing documents in \LaTeX .
- It 'compiles' your \LaTeX automatically to show you the results.

Click here to open the example document in **write \LaTeX**

Or go to this URL: <https://www.overleaf.com/docs/1778557gcvcyt/clone>
For best results, please use Google Chrome or a recent FireFox.

- If you would like to try out the exercise on your machine. Go to **Exercise / paper.tex**

Outline

1 Why not to use WYSIWYG

2 Introduction to \LaTeX 2e

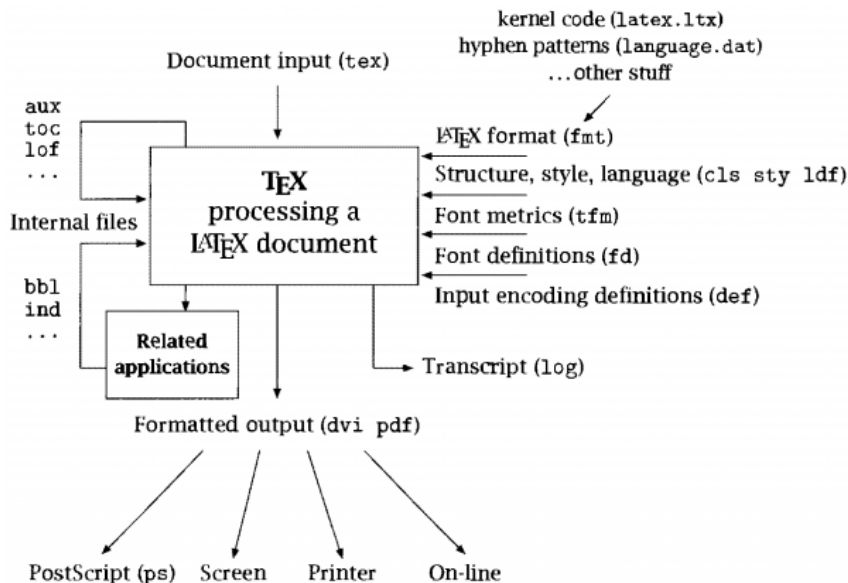
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LaTeX Structure - The Magic



minimal	Is as small as it can get. For debugging purposes.
letter	For writing letters.
article	articles in journals, documentation, invitations, ...
proc	A class for proceedings based on the article class.
report	For longer reports containing several chapters ...
book	For real books.
memoir	For advanced book style.
beamer	For writing presentations

Typesetting Caveats

- Quotation marks are a bit tricky: use a backtick ``` on the left and an apostrophe `'` on the right.

Single quotes: `'text'`.

Double quotes: `"text"`.

Single quotes: `'text'`.

Double quotes: `"text"`.

- Some common characters have special meanings in \LaTeX :

<code>%</code>	percent sign (comment)
<code>#</code>	hash sign (macro parameter #1)
<code>&</code>	ampersand (align)
<code>\$</code>	dollar sign (in-line math)

- If you just type these, you'll get an error. If you want one to appear in the output, you have to *escape* it by preceding it with a backslash.

`\$ \% \& \#`

`$\%&\#`

Packages

Packages allow you to further customize L^AT_EX

The command:

```
\usepackage{amsmath}
```

Common packages

Environment	Packages
Maths	amsmath, amsfonts, amssymb
Maths Times Font	mathptx
Figures	graphicx, epsfig
Table	tabularx, booktabs
Pagelayout	geometry
Hyperlinks	hyperref
Algorithms and code	algpseudocode, algorithm, listings
Color	color, xcolor

Outline

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Equations, equations everywhere

- Use `\mathit` instead of `\textit` inside math environments.
- Why are dollar signs `$` special? We use them to mark mathematics in text.

% not so good:

Let `a` and `b` be distinct positive integers, and let `c = a - b + 1`.

% much better:

Let `a` and `b` be distinct positive integers, and let `$c = a - b + 1$`.

Let `a` and `b` be distinct positive integers, and let `c = a - b + 1`.

Let *a* and *b* be distinct positive integers, and let *c = a - b + 1*.

- Use caret `^` for superscripts and underscore `_` for subscripts.

`$y = c_2 x^2 + c_1 x + c_0$`

$y = c_2x^2 + c_1x + c_0$

- Use curly braces `{` and `}` to group superscripts and subscripts.

`$F_n = F_{n-1} + F_{n-2}$` *% oops!*

$F_n = F_{n-1} + F_{n-2}$

`$F_n = F_{\{n-1\}} + F_{\{n-2\}}$` *% ok!*

$F_n = F_{n-1} + F_{n-2}$

- Detexify <http://detexify.kirelabs.org/classify.html>

`$\Omega = \sum_{k=1}^n \omega_k \times \mu$`

$\Omega = \sum_{k=1}^n \omega_k \times \mu$

Never use equation arrays

```
\begin{eqnarray}
```

```
E = m_0 c^2 \,,\,
```

```
E^2 = (m_0 c^2)^2 + (pc)^2 \,,.
```

```
\end{eqnarray}
```

$$E = m_0 c^2, \quad (2)$$

$$E^2 = (m_0 c^2)^2 + (pc)^2 \quad (3)$$

```
\begin{equation}
```

```
E = m_0 c^2 \,,,
```

```
\end{equation}
```

```
\begin{equation}
```

```
E^2 = (m_0 c^2)^2 + (pc)^2 \,,.
```

```
\end{equation}
```

$$E = m_0 c^2, \quad (4)$$

$$E^2 = (m_0 c^2)^2 + (pc)^2. \quad (5)$$

```
\begin{align}
```

```
E = m_0 c^2 \,,\,
```

```
E^2 = (m_0 c^2)^2 + (pc)^2 \,,.
```

```
\end{align}
```

$$E = m_0 c^2, \quad (6)$$

$$E^2 = (m_0 c^2)^2 + (pc)^2. \quad (7)$$

Acknowledgements

This \LaTeX for Beginners course is loosely based on and examples from:

- John Miller's An interactive introduction to \LaTeX :
<https://www.writelatex.com/blog/7>
- WikiBook on \LaTeX : <https://en.wikibooks.org/wiki/LaTeX>
- Share \LaTeX Learn: <https://www.sharelatex.com/learn>
- CUED Textprocessing: <http://www.eng.cam.ac.uk/help/tpl/textprocessing/>
- UCS Course on \LaTeX 2 ϵ :
<http://www.ucs.cam.ac.uk/docs/course-notes/unix-courses/earlier/latex>