Better typesetting with LETEX

A user's guide

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October 29, 2018

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Introduction

Who's who?

Who am 1?

- 3rd year PhD student, MSP
- 4 years of LATEX experience

Who are you? (hopefully)

- Familiar with basics of LATEX already
- Interested in learning more thoroughly

Resources

- First point of call: stack exchange
- ullet The not so short introduction to LATEX 2arepsilon
- More Math into LATEX 4th edition (hard copies available at library)
- CTAN: comprehensive T_EX Archive Network

Packages: a few favourites

ackslashusepackage $\{$ booktabs $\}$

What does it do?

Enhances default table.

Typical LATEX table:

ltem		
Animal	Sold	Price (\$)
Gnat	per gram	13.65
	each	0.01
Gnu	stuffed	92.50
Emu	stuffed	33.33

Table 1: Default LATEX table.

\setminus usepackage $\{$ booktabs $\}$

```
\operatorname{begin}\{\operatorname{tabular}\}\{|1|1|r|\}
 \ hline
 \mbox{multicolumn} \{2\}\{|c|\}\{|tem\} \& \\\\cline\{1-2\}
               & Sold & Price (\$) \\hline
 Animal
               & per gram & 13.65
 Gnat
               & each & 0.01
               & stuffed & 92.50
 Gnu
               & stuffed & 33.33 \\\hline
 Emu
\end{tabular}
\caption{Default \LaTeX\ table.}
```

\setminus usepackage $\{$ booktabs $\}$

Booktabs table:

ltem		
Animal	Sold	Price (\$)
Gnat	per gram	13.65
	each	0.01
Gnu	stuffed	92.50
Emu	stuffed	33.33

Table 2: Booktabs improves table spacing.

ackslashusepackage $\{$ booktabs $\}$

```
\begin{tabular}{||Ir}
\toprule
& Sold & Price (\$) \\midrule
Animal
       & per gram & 13.65
Gnat
          & each & 0.01
         & stuffed & 92.50
Gnu
          & stuffed & 33.33
Emu
\bottomrule
\end{tabular}
\caption{Booktabs improves table spacing.}
```

What does it do?

Reads data from input (e.g. a .csv file) and generates code for tabular. Can round numbers to desired precision and print in different formatting styles.

Element,	Number,	Mass
Н,	1,	1.00794
He,	2,	4.00260
Li,	3,	6.94100
Be,	4,	9.01218

pgfplotstable:

	Atomic		
Element	Number	Mass	
Н	1	1.00794	
Не	2	4.00260	
Li	3	6.94100	
Be	4	9.01218	

Table 3: pgfplotstable can read input files.

```
\pgfplotstabletypeset [col sep=comma,
 string type,
 every head row / . style ={
  before row={\toprule
             & \multicolumn{2}{c}{Atomic}
              after row={\midrule}},
 every last row / . style = { after row = \bottomrule }
]{ elements.csv }
\caption{pgfplotstable can read input files.}
```

pgfplotstable can format numbers as desired:

	Atomic	
Element	Number	Mass
Н	1	1.008
He	2	4.003
Li	3	6.941
Ве	4	9.012

Table 4: pgfplotstable understands precision and rounding.

\setminus usepackage $\{$ pgfplotstable $\}$

```
\pgfplotstabletypeset [col sep=comma,
columns/Number/.style={string type},
columns/Element/.style={string type},
columns/Mass/.style={fixed zerofill,
                       precision = 3.
  (As in earlier example)
\caption{pgfplotstable understands precision
          and rounding.}
```

$\usepackage{cleveref}$

What does it do?

Formats cross-references automatically

See Figure 1.



Figure 1: TEX the Lion.

\usepackage{cleveref}

```
\% Reference as Figure 1, instead of fig. 1
\usepackage [capitalise, noabbrev] { cleveref }
See \cref{fig:lion}.
\begin{figure}
 \centering
 \left( \text{includegraphics} \right) = 0.4 \left( \text{textwidth} \right) \left\{ \text{Lion.png} \right\}
 \caption{\TeX\ the Lion.}
 \label{fig:lion}
\end{ figure }
```

A few others

- hyperref
- tikz
- standalone
- fancyhdr
- titlesec
- microtype
- biblatex

Activity / break

Here we take a 10 minute activity break

- Look through master's thesis or publication and see what you could improve with these new packages
- Investigate hyperlinked packages
- Ask me questions

Custom commands

Macros

Used to simplify repetitive and/or complex formatting \newcommand{\name}[# of parameters]{ definition}

Simple commands

The set of real numbers are usually represented by a blackboard captital r: \mathbb{R} .

 $\mbox{\ensuremath{\sf newcommand}} \{\R\} \{\mbox{\ensuremath{\sf mathbb}} \{R\} \}$

The set of real numbers are usually represented by a blackboard captital $r: \R\$.

Commands with parameters

Other numerical systems have similar notations. The complex numbers \mathbb{C} , the rational numbers \mathbb{Q} and the integer numbers \mathbb{Z} .

Commands with optional parameters

 $\newcommand{\name}[\# params][default #1]{def.}$

We make a new command to save time writing expressions of the form $(x + y)^2$ and $(a + b)^4$.

 $\label{eq:localization} $$ \operatorname{newcommand} \{ plusbinomial \}[3][2]\{ (\#2 + \#3)^\#1 \} $$ We make a new command to save time writing expressions of the form <math>plusbinomial\{x\}\{y\}\$ and $plusbinomial\{4\}\{a\}\{b\}\$.

Managing a bibliography

Bibtex can be used to manage bibliographies. (Biblatex is a more sophisticated alternative.)

- Bibtex entries stored in a .bib file
- Recommend maintaining a single centralised .bib file for duration of thesis.

A list of entry types which Bibtex understands can be found here.

```
Obook{knuth 84,
  title="The texbook",
  author="{Donald Ervin} Knuth and Duane Bibby",
  volume="3",
  year="1984",
  publisher="Addison-Wesley Reading"
}
```

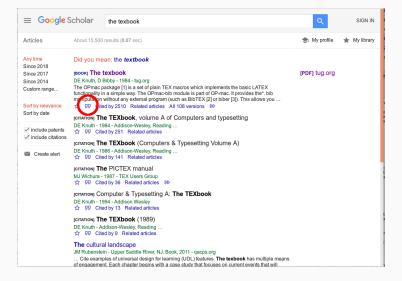
```
Reference as \cite{knuth84}.
Include bibliography with
\bibliography{references}
\bibliographystyle{plain}
```

BibTeX adds extra complexity to the processing of your manuscript. You will have to run LATEX a number of times.

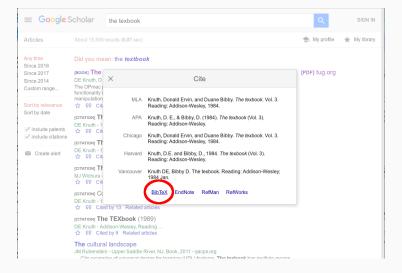
- 1. pdflatex thesis tex
- 2. bibtex thesis aux
- 3. pdflatex thesis tex
- 4. pdflatex thesis tex

(May use a Makefile to simplify)

Google scholar can be used to export citations easily.



Google scholar can be used to export citations easily.



Activity / break

Here we take a 10 minute activity break

- Look through master's thesis or publication and see if marcros could make your life easier
- Set up a central .bib file which you will use for your entire PhD
- Ask me questions

Working with large documents

Structure

A modular structure makes it easier to work with and organise large documents.

```
thesis/
   thesis.tex
   chapters
    \_ chapter_1.tex
    _chapter_2.tex
    _{--} chapter_3.tex
   inputs
    \_ preamble.sty
   __bibtex_style.bst
   references.bib
```

thesis.tex

```
\documentclass[12 pt]{ report}
\usepackage{inputs/preamble}
\begin{document}
\include \{ chapters / chapter 1 \}
\include { chapters / chapter 2}
\include { chapters / chapter 3 }
\bibliography{references}
\bibliographystyle { inputs / bibtex style }
\end{ document}
```

Other files

```
chapter 1.tex
\chapter{Literature review}
\label{cha: lit review}
There is a large body of literature \ldots
inputs/preamble.sty
% Preamble, packages, commands etc.
\usepackage{amsfonts}
\usepackage{amssymb}
\usepackage{amsthm}
```

Compile a single chapter

\includeonly allows the compilation of a single chapter, without messing up references.

```
\documentclass[12 pt]{ report}
\usepackage{inputs/preamble}
\includeonly{chapters/chapter 2}
\begin{document}
\include \{ chapters / chapter 1 \}
\include { chapters / chapter 2}
\include { chapters / chapter 3 }
```

masthesis.sty

- A thesis template (masthesis) for the school can be found on the wiki
- The template is modular and has a structure similar to that highlighted earlier
- Includes extra goodies such as spell check and makefile

Version control

- Version control allows you to track and manage changes in code, and collaborate with others
- Consider using version control to manage thesis
- Sophie Harbrisher (3rd year MSP) and I will be teaching a faculty workshop on version control with git and github

Common mistakes

Hyphen, en-dash and em-dash (-, -, -)

- The hyphen (-) is used to join words in a compound construction. "A long-term solution"
- An en-dash (--) appears in page ranges. "See pages 1-3"
- An em-dash (---) is typically used as a stand-in for a comma or parenthesis to separate out phrases. "Against all odds, Pete — the unluckiest man alive — won the lottery."

Quotes

LATEX requires you to use separate markup for opening and closing quotes.

Opening quotes are "

Closing quotes are ''

Quotes should look "like this" not "like this".

Capitalisation in BibTeX

```
Your BibTeX style will handle most captitalisation. For some
words (names, places, ...) capitalisation must be ensured
@book{springer57,
  title="Introduction to {R}iemann surfaces",
  author="Springer, George",
  volume = "473"
  year = "1957"
  publisher="Addison-Wesley Reading"
```

Typing maths

Brackets should be large enough to completely enclose all they contain.

$$\left(\sum_{i=1}^{n-1} i\right) + n \qquad \left(\sum_{i=1}^{n-1} i\right) + n$$

$$\left(\sum_{i=1}^{n-1} i\right) + n \qquad \left(\sum_{i=1}^{n-1} i\right) + n$$

$$\left(\sum_{i=1}^{n-1} i\right) + n \qquad \left(\sum_{i=1}^{n-1} i\right) + n$$

Typing maths

$$a, b, c, d, e$$
 and f

$$a, b, c, d, e \text{text} and f$$

$$a, b, c, d, e$$
 and f

$$i = 1, ..., 10$$

$$i = 1, ..., 10$$

$$i = 1, ..., 10$$

$$i=1,\ldots,10$$

$$\sin(x)^2 + \cos(x)^2 = 1$$

$$\sin(x)^2 + \cos(x)^2 = 1$$

$$\sin(x)^2 + \cos(x)^2 = 1$$

$$\sin(x)^2 + \cos(x)^2=1$$

Activity / break

Here we take our final 10 minute activity break

- Look through previous documents you've wrote for common mistakes
- MSP students: download and play around with thesis template (masthesis) on the wiki
- Ask me questions

Conclusion

Perspective

Leslise Lamport, initial developer of LATEX, was asked what three LATEX mistakes people should stop making:

- 1. Worrying too much about formatting and not enough about content.
- 2. Worrying too much about formatting and not enough about content.
- 3. Worrying too much about formatting and not enough about content.

Source

Feedback and the future

- Please (please) complete workshop evaluation
- First year running workshops aimed more at MSP students, any feedback would be very informative
- Look out for teaching opportunities if you would like to run a workshop for MSP students

References

