You can view this post in the following formats, thanks to Pandoc!

| Format | Link |
|---|---|
| IEEE-PDF | LINK |
| IEEE-DOCX | LINK |
| IEEE-HTML | LINK |
| PDF | LINK |
| DOCX | LINK |
| HTML | LINK |
| SLIDES-PDF | LINK |

Academic writing involves:

- writing down ideas as they come along and documenting results (notetaking),
- experimenting with these ideas (simulations and data analysis),
- and finally presenting them effectively (scientific paper).

- Word is slow, and consumes sometimes up to a gig of virtual memory. For what is basically a word processor, that is unnecessary.
- there is no clean way to permanently save comments or notes, that persist in the final version without affecting how final document looks.
- collaborating with other people requires foresight and planning.
- the equation editor is painful to use.
- Word does not work in the workflow for **scientific research papers or reports**.

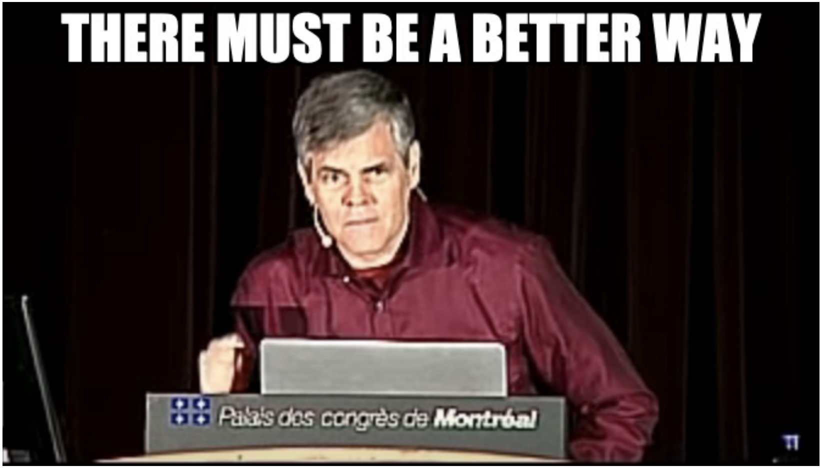


Figure 1: Raymond Hettinger

Enter \LaTeX.

> *\LaTeX is to a book what a set of blueprints is to a building. [1]*

Essentially, \LaTeX is a markup language. Content is written in plain text and can be annotated with commands that describe how certain elements should be displayed.

For example, take a look at the following commands.

```
\textbf{bold}
\textit{italic}
```

This markup will format the words passed into these “functions” as **bold** and *italic* respectively.

```
\section{Section Name}
This is text in the section
\subsection{Sub Section Name}
The following is a list in this subsection
\begin{enumerate}
  \item The first \textbf{bold} item
  \begin{enumerate}
    \item Nested item 1
    \item Nested item 2
  \end{enumerate}
  \item The second \textit{italicized} item
  \item The third etc \ldots
\end{enumerate}
```

Markdown is a very lightweight easy-to-read easy-to-write plain text markup language. The same example as before looks like this in Markdown.

```
# Section Name

This is text in the section

## Sub Section Name

The following is a list in this subsection

* The first **bold** item
    - Nested item 1
    - Nested item 2
* The second *italicized* item
* The third etc ...
```

- Easy: the syntax is simple
- Fast: the simple formatting saves time and speeds up workflows of writers
- Portable: documents are cross-platform by nature
- Flexible: HTML, PDF, DOCX, TEX are all supported output formats

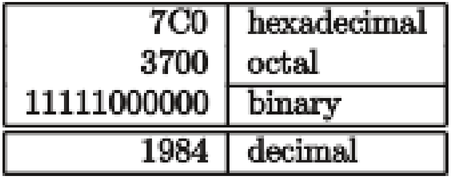
```
  Right     Left     Center     Default
-------     ------ ----------   -------
     12     12        12            12
    123     123       123          123
      1     1          1             1

Table:  Demonstration of simple table syntax.
```

This is what the same table looks like in \LaTeX.

```
\begin{longtable}[c]{@{}rlcl@{}}
\caption{Demonstration of simple table syntax.}
\tabularnewline
\toprule
Right & Left & Center & Default\tabularnewline
\midrule
\endfirsthead
\toprule
Right & Left & Center & Default\tabularnewline
\midrule
\endhead
12 & 12 & 12 & 12\tabularnewline
123 & 123 & 123 & 123\tabularnewline
1 & 1 & 1 & 1\tabularnewline
\bottomrule
\end{longtable}
```

However, Markdown does not allow for the level of detailed customization that you can achieve using \LaTeX. Even a moderately complex table such as the one below is not supported (currently) by any form of Markdown.



| | |
|---:|:---|
| 7C0 | hexadecimal |
| 3700 | octal |
| 11111000000 | binary |
| 1984 | decimal |

Figure 2: Tabular \LaTeX example [2]

Markdown may not be as powerful as \LaTeX, but its easy to write easy to read syntax, open standard format and a strong backing from the community make it a ideal candidate for writing. It has the advantages of Word (ease of use) and \LaTeX (excellent typesetting) for output formats. Also there is the added advantage of only having to write in Markdown once, and have documents generated in a multitude of formats later - PDF, DOCX, slides, HTML etc.

## Pandoc - A “swiss army knife”

Pandoc is a software tool by John Macfarlane written in Haskell that can convert a document from just about any format to just about any other format. And works really well.

To generate a PDF file:

```
pandoc document.md -o document.pdf
```

It is as simple as that! To generate a HTML file:

```
pandoc document.md -o document.html
```

With PDF files, you can specify the following additional arguments:

- `--latex-engine=pdflatex`: latex engine
- `--latex-template=latex.template`: latex template file

With html files, you can specify the following arguments:

- `--template=html.template`: html template file
- `--css=cssfile.css`: css file

With docx files unfortunately, you cannot specify a template (at least not at the time of writing this post) [3]. You can however, specify a reference-docx:

- `--reference-docx=reference.docx`: docx for reference styles

These following arguments allow you to use citations when writing academic papers.

- `--filter pandoc-citeproc`: filter to parse citations
- `--csl=CSLFILE`: define a citation style sheet e.g. ieee.csl
- `--bibliography=BIBFILE`: look for citations from a bibliography

Also, I've found the following filters useful.

- `--filter pandoc-eqnos`: equation numbers
- `--filter pandoc-fignos`: figure numbers
- `--filter pandoc-tablenos`: table numbers

## Downside to using Markdown?

The good news is that anything you do in \LaTeX, you can do in Markdown and render as a PDF. This includes equations, tables, citations, references, images, lists, tikz diagrams etc. The bad news is that if you do decide to use \LaTeX syntax, you are still writing \LaTeX (although a lot less of it), and you have lost complete HTML and DOCX conversion capability.

## Bending Markdown to your will

Fortunately, some of the problems I mentioned in the previous section can be solved using an excellent feature of Pandoc - filters!

There is a python package called `pandocfilters` that allows you to walk the AST and parse specific formats or keys. It is very powerful, and can offer unique ways to expand on pandoc's functionality. I wrote a pandocfilter [4] to embed a jupyter notebook using a liquid tag style syntax, which I currently use for this post.

## TLDR

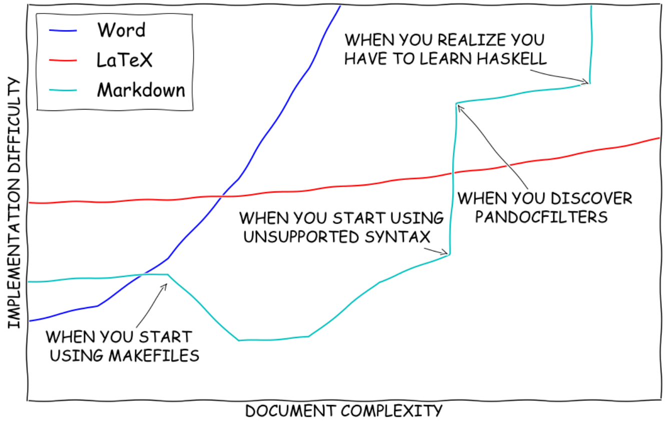


Figure 3: Comparing Word, \LaTeX and Markdown

[1] “StackOverflow Quote.” Accessed: Jan. 08, 2016. [Online]. Available: http://tex.stackexchange.com/a/95078