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The road to insanity

A complete guide to the laws of the universe

Master's Thesis

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Contents

1 LaTeX/Markdown Template

1.1 From Markdown to LaTeX via pandoc

For simple texts it is much more convenient writing in Markdown than in LaTeX. However the latter produces more good-looking results. The idea is to use pandoc to get the best of both worlds.

Pandoc can convert Markdown directly to pdf by using LaTeX as intermediate format. But I prefer to let pandoc translate .md files to .tex and then use LuaLaTeX to compile the pdf in a second step.

By using simplified a simplified LaTeX template, the code looks quite OK and I can hack in additional stuff which would be not possible in Markdown alone. However, if things get fancy it makes sense to forget about Markdown and write the LaTeX directly.

1.2 BibTeX Integration via zotero

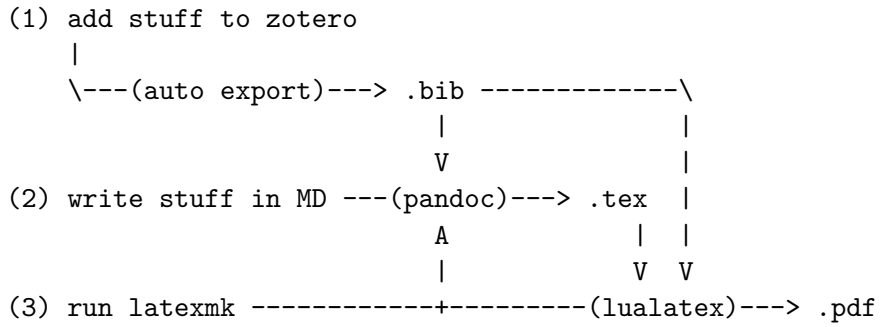
It is pretty cool that pandoc can handle BibTeX which makes citation handling very easy. I use zotero to manage bibliographies and with a suitable plugin it exports to BibTeX quite nicely.

For a time a used zettlr as a Markdown editor which has also some integration for pandoc and plays (to some extent) nicely with zotero. However recently I fell back to plain vim (nvim to be precise).

1.3 Building with latexmk

It is still a painful to build LaTeX with its circular .aux dependencies. That is where latexmk comes into the mix. It provides a simple build system which handles most stuff automagically.

So my workflow looks something like this:



All this is put in a git repository to have some version control at hand.

2 How to use

2.1 Copy the example folder

A complete example project is in the `example` folder. It is a good starting point. It contains already several folders. I use `main` for the Markdown content and `notes`, well, for my notes. I prefer to have a file named `notes/@key` for notes regarding the source with citation key `key`. This way I can keep my notes separated and organized.

There is a `latex` folder containing the LaTeX source and auxiliary files. After adjusting the template there is little to do in this folder.

Here is a complete overview:

```
.\
 .latexmkrc             # latexmk configuration
 + latex
   + aux                # all the latex helper files
   + src                # actual latex source
     template.tex       # LaTeX template used by pandoc
     titlepage.tex      # custom title page
     bibliography.bib   # bibTeX file maintained by zotero
   + extra              # graphics and additional latex stuff
 + notes                # scratch space
 + main                 # actual content, written in Markdown
   05_intro.md          #   with number prefix to keep the ordering
   15_demo.md           #   simple
 main.pdf               # genrated pdf
```

2.2 Install and configure zotero

This is completely optional. You can maintain `bibliography.bib` in any other way you like. However the name (and path) is hard-coded in `.latexmkrc` and in the custom template, if you change it, you have to adjust it there as well.

- Install zotero
- Install the Better BibTex(BBT) extension for zotero
  - Follow the BBT installation instructions, that is:
    * Download the latest xpi

        * In zotero click: Tools > Add-ons > Install Add-on from file
        * Choose the downloaded xpi
        * Restart zotero

- Configure BBT:
  - Rightclick on a collection, choose "Export collection"
    * Format: Better BibLaTeX
    * Keep updated: yes
    * Background export: yes
  - Navigate to your project folder and save as `latex/src/bibliography.bib`

Now zotero should keep `bibliography.bib` up-to-date as you add more and more references. BBT extension has a lot more settings, most of them seem to be good. I prefer to set the "citation key formula" to `auth.lower + year` to have kind of readable citation keys.

2.3 Running latexmk

`latexmk` will read `.latexmkrc` to figure out what to do. The main purpose of this file is to get all the file locations right, call pandoc (with the correct parameters) and build the final pdf. These are the most common commands:

- `latexmk`: Build the main pdf
- `latexmk -C`: Big cleanup, remove all regeneratable files
- `latexmk -g`: Go mode, force rebuild, even if it looks unnecessary

Add `-silent` to make the output less verbose.

2.4 Custom templates and title pages

Pandoc uses a template to generate main .tex file. The `latex_template` parameter controls which template to use. Either the custom template `latex/src/template.tex` or the default template (i.e. `latex_template=default.latex`).

The custom template is a simplified version of the default template and includes also a custom title page. The title page has it own .tex file. To build/update it, run

```
latexmk latex/src/titlepage_eth.tex
```

2.5 Setup git

Just create a new repository and add a remote if necessary:

- `git init`
- `git remote add origin https://github.com/frukto/md-latex-template.git`

There is already a `.gitignore` containing excluding auxiliary files and the main pdf. You also want to delete/adjust `main/*.md` or unused templates/title pages before the first commit:

- `rm -r main/*.md`

3 Markdown Demo

This section contains basic Markdown examples for faster reference.

3.1 Simple math stuff

Simple math can be encapsulated in `$`:

- `$n = \sum_{d|n}\varphi(d)$` is rendered as $n = \sum_{d|n} \varphi(d)$

3.2 Citations

Pandoc has a citation extension, with `--biblatex` enabled citations are translated using BibTeX's `autocite` command:

- `[@serre1979]` general reference (Serre, 1979)
- `[@serre1979,p.20]` reference with a page (Serre, 1979, p.20)
- `[@serre1979;@lurie2009]` multi-reference (Lurie, 2009; Serre, 1979)

3.3 Footnotes

- `^[just like this]`: inline footnote [1]

3.4 Internal references

Markdown can do inter-document links but only to headings and only within the same file

- Use `[link text](#markdown-demo)` to a link a section: link text.
  - The anchor has to be lower-kebab-case, irrespective of the case of the anchor name. Note that you have to choose a name and not get the section number, so this corresponds to `\nameref`.
  - It is possible to set a custom anchor name with `{#key}` behind a heading. This way it can be referenced with `[link text](#key)`.

3.5 Mixing Markdown and LaTeX

Actually for pandoc it is (mostly) fine to mix markdown and LaTeX. So math stuff can be typeset with `equation` environments etc, for example:[2]

$$e^{i\pi} + 1 = 0 \tag{1}$$

This is not valid markdown, so it will land as it is in the pandoc's target - which is fine as long as we transform to LaTeX anyway. So basically it possible to write a wild mixture of Markdown and LaTeX.

This enables LaTeX labels and references - in particular for figures or equations. Just set the label via `\label{key}` and refer to it with `\ref{key}`, e.g.

- `See equation (\ref{eq:euler})`: See equation (1)

[1] just like this

[2] the equation also contains `\label{eq:euler}` to define an anchor point

References

Lurie, J. (2009). *Higher Topos Theory (AM-170):* Princeton University Press. https://doi.org/10.1515/9781400830558

Serre, J.-P. (1979). *Local Fields* (Vol. 67). Springer New York. https://doi.org/10.1007/978-1-4757-5673-9