Getting Started with LaTeX

And why I don't use Word anymore

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April 2, 2020

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President - MUGS (2019)

What is LaTeX?

A bit of Background

- Widely regarded as the standard typesetting method for academic journals
  - Far easier to present data, equations
  - Much easier to cite references (i.e. automatic footnotes, hyperlinking etc.)
  - Separates content from the formatting of documents

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  - Far easier to present data, equations
  - Much easier to cite references (i.e. automatic footnotes, hyperlinking etc.)
  - Separates content from the formatting of documents
- Far more control over many aspects of the document
  - Backend rather than frontend (e.g. Word)
  - Images won't disappear when moved slightly
    - Everything is where you tell it to be

- Files can be as big as needed, don't need to worry about a 30+ page Word doc crashing
- Multi-file documents are very easy to achieve, no post-processing
- It looks pretty

Something to keep in mind throughout this presentation: *every single slide is done in LaTeX*

What can I do?

In short: anything you can do with Word + much much more!!

Images

Diagrams from scratch:

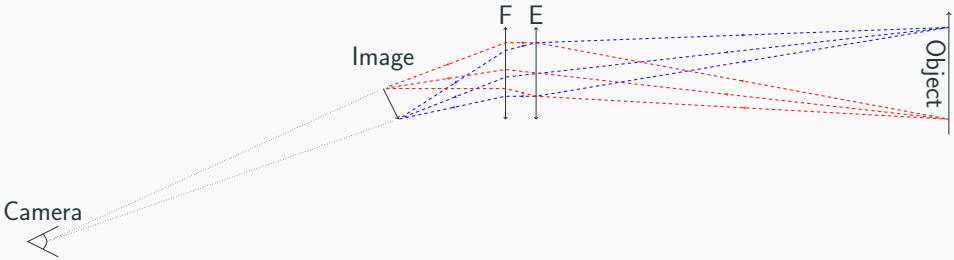


Figure 1: Image formation captured by imaging camera

GIFS:

Maths

- Inline:
  It is known that $y = x^2 + 2x + 4$ is a parabola.
- Block:
  Here is a Fourier transform:
  $$\mathcal{F}(\omega) = \int_{-\infty}^{\infty} f(t) e^{i\omega t} \mathrm{d}t$$
- Numbered:

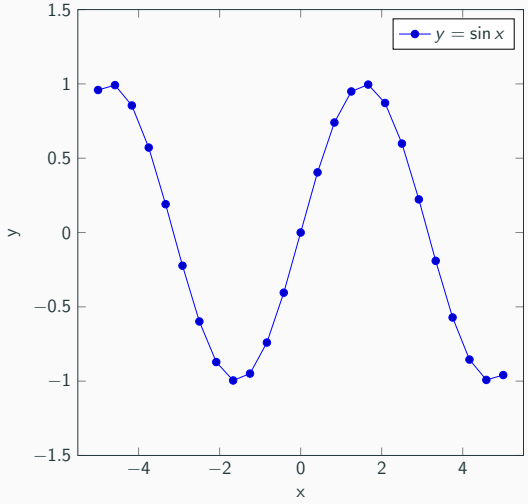
$$|+_x\rangle = \frac{1}{\sqrt{2}} |+\rangle + \frac{1}{\sqrt{2}} |-\rangle \tag{1a}$$

$$|-_x\rangle = -\frac{1}{\sqrt{2}} |+\rangle + \frac{1}{\sqrt{2}} |-\rangle \tag{1b}$$

$$|\langle +|+_x\rangle|^2 = 0.5 \tag{1c}$$

Plots

Using gnuplot:



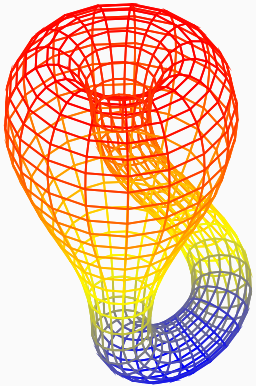
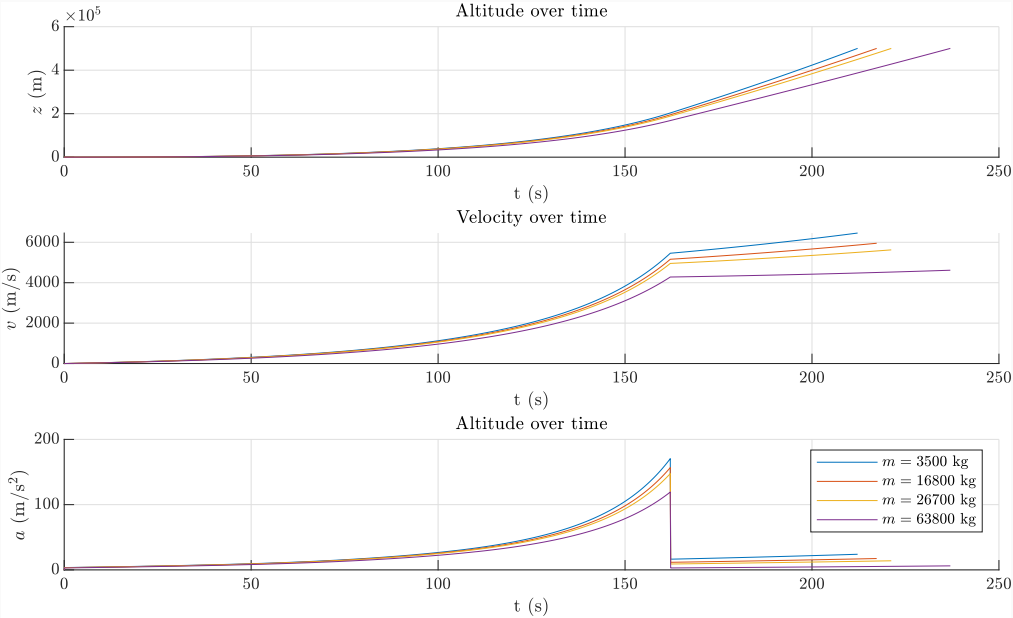


Figure 2: A Klein Bottle plotted via pgfplots/gnuplot

MATLAB Plots:



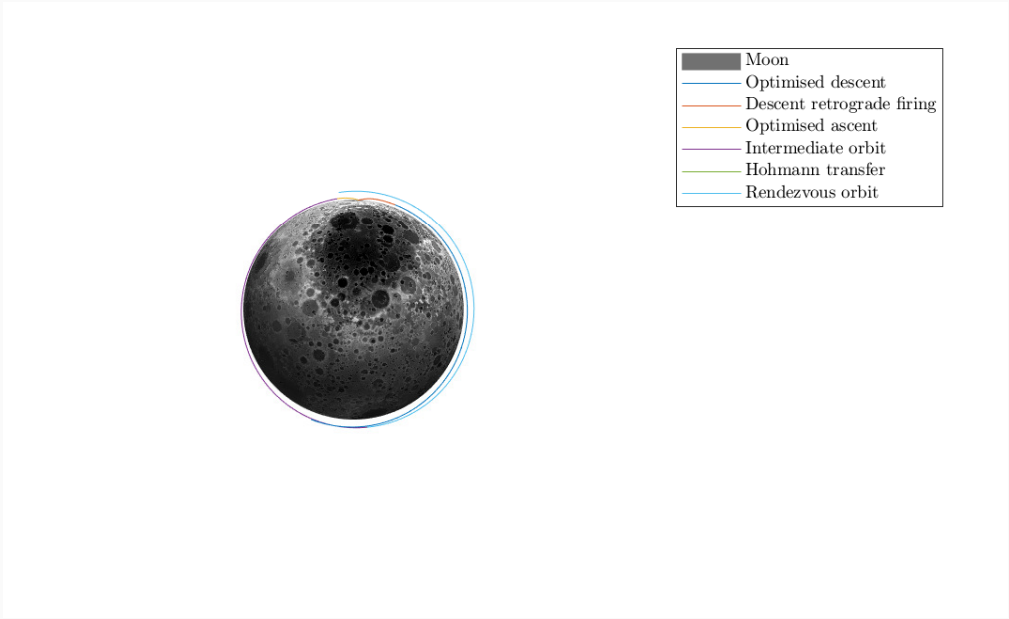


Figure 4: Simulated Apollo 11 Trajectory

Other Cool Stuff

I'm interested! How do I start learning?

Programs/Compilers

MikTex Standalone LaTeXcompiler and editor. Good for local installations on Windows.

- Very easy to use
- Good package support from CTAN (Comprehensive TeX Archive Network)
- Not the prettiest
- THE WHITE - IT BURNS

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Overleaf Web based, cloud storage. The Google Docs of LaTeX.

- Very easy to use
- GitHub integration
- Free Pro+ account by registering as a USYD student/staff member
- Multiple author editing
- Some packages might not be recognisable

We'll be using Overleaf

`overleaf.com`

Starting off a Document

Define document class:

```
\documentclass[12pt]{article}
```

Begin document:

```
\begin{document}

<insert document content here>

\end{document}
```

Well done! You've just told LaTeX to create a new, blank document!
So... is that it?

Not in the slightest!

The Preamble

Everything before `\begin{document}` is known as the preamble. Let's start customising this.

```
\documentclass{article}
\title{My Title}
\author{My Name}
\date{\today}
\begin{document}
\maketitle
...
\end{document}
```

Sections

```
\documentclass{article}
\title{My Title}
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\begin{document}
\maketitle
\section{My Section Name}
...
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Bonus: try adding `\makecontents` after `\maketitle`

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E.g. `\begin{equation}...\end{equation}`

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and `\begin{align*}...\end{align*}`

$$\begin{aligned} F(s) &= \mathcal{L}\{t\} \\ &= \frac{1}{s} \end{aligned}$$

Packages

You'll notice that `align*` doesn't work. The reason is, you haven't added the package necessary yet.
Try including `\usepackage{amsmath}` in your preamble.

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After you've checked that works - load the `graphics` package.

Pictures

```
\begin{figure}[h!]
  \includegraphics{/path/to/figure}
  \caption{}
  \label{}
\end{figure}
```

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The [h!] component tells LaTeX to put the image exactly where you told it to. A big one-up on Word.

Congratulations! You've just learnt LaTeXto the stage where you can do what Word does. But there is so much more!

The best way to keep learning

There is thousands of packages for different things! The only way you can learn them is by going through and using them in documents. Stackexchange is your friend.

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Other things you can have LaTeX do:

- Solve differential equations
- Plot natively in the document
- Presentations (like this one!)

Other programs to help create nice looking documents in LaTeX

TikzEdt Semi-graphical tikz editor - very similar to the semiconductor drawing I showed earlier

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gnuplot Did those very nice plots earlier

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ImageMagick Handy command line image editor

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