The Future of Engineering

Challenges and opportunities

Miguel Xochicale (@mxochicale @_mxochicale)

October 21, 2020

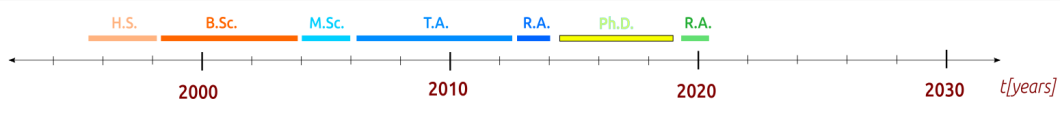
This work is licensed under a Creative Commons “Attribution 4.0 International” license.
Get source of this slides and see further references from `https://github.com/mxochicale/itds2020`.

Contents

Short-bio

My journey in Engineering and Science

- **(1996-1999)** Hight School in Electronics
- **(1999-2004)** BSc in Electronics
- **(2004-2006)** MSc in Signal Processing
- **(2006-2012)** Teaching Associate in Mechatronics
- **(2013-2014)** Research Assistant in Robotics at INAOE
- **(2014-2019)** PhD student in Human-Robot Interaction at Uni of Bham
- **(2019-present)** Research Associate in Ultrasound-Guidance Intervention at KCL



Installation

- Windows/Linux
  - TeXLive `https://www.tug.org/texlive/`
  - Online installer:
    - Windows
      `http://mirror.ctan.org/systems/texlive/tlnet/install-tl-windows.exe`
    - Linux
      `http://mirror.ctan.org/systems/texlive/tlnet/install-tl-unx.tar.gz`
  - Offline ISO file: `http://mirror.ctan.org/systems/texlive/Images/`
- Mac
  - MacTeX `http://www.tug.org/mactex/`
  - Or install through Homebrew (`https://brew.sh`)

```
# Install Homebrew
ruby -e "$(curl -fsSL https://raw.githubusercontent.com/Homebrew/install/master/install)"
# Install MacTeX
brew cask install mactex
```

- TeXLive/MacTeX release major updates around May each year.
  It is recommended to uninstall the old version and install the new version annually.

LaTeX editor

- LaTeX source codes are plaintext. So you can use any editor you like.
- Visual Studio Code [Recommend]
  - `https://code.visualstudio.com`
  - LaTeX Workshop `https://github.com/James-Yu/LaTeX-Workshop`
  - Code Spell Checker `https://github.com/streetsidesoftware/vscode-spell-checker`
- Vim/Neovim
  - `https://www.vim.org` | `https://neovim.io`
  - Vimtex `https://github.com/lervag/vimtex`
- Emacs
  - `https://www.gnu.org/s/emacs`
  - AUCTeX `https://www.gnu.org/software/auctex`
- TeXstudio
  - `https://www.texstudio.org`

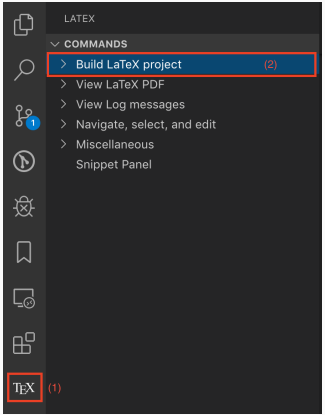
Challenges and Opportunities in Engineering

Hello, LaTeX!

- Create `hello.tex` file with following content.

```
% this is hello.tex
\documentclass{article}
\begin{document}
Hello, \LaTeX!
\end{document}
```

- Compile it
  - Click the build button in your LaTeX editor/IDE
  - OR using command line: `latexmk -pdf hello`
- Open `hello.pdf` to preview the result



Compile LaTeX Project in VSCode

Example of A Complex Document

- Download the source code from
  `https://github.com/xu-cheng/latex-tutorial/archive/master.zip`
- The example document is located in the `example` folder. It contains:
  - `main.tex` The main tex source
  - `preamble.tex` A subfile to store format definitions
  - `tikz-example.tex` A figure drawn using tikz
  - `ref.bib` A database of references
- Use `latexmk -pdf main` to compile the document
- Access the same example in Overleaf:
  `https://www.overleaf.com/read/qsthqbjphhrz`

Comment, Command and Environment

- `%` starts a comment. e.g. `% this is hello.tex`
- `\` starts a command.

```
\command % a command
\command{} % also a command
\command{arg} % a command with an argument
\command{arg1}{arg2} % a command with multiple arguments
\command[opt arg]{arg} % [] is for optional argument
```

- `\begin{} ... \end{}` denotes an environment

```
\begin{envname}
  inside the environment
\end{envname}
% LaTeX environment can take arguments
\begin{envname}{arg} \end{envname}
\begin{envname}[opt arg]{arg} \end{envname}
```

Source File Structure

- A document starts with `\documentclass{...}` command to specify the template
- Common templates include:
  - `article`
  - `book`
  - `report`
  - `letter`
  - `beamer` (slides)
  - `standalone` (graphics)
  - `acmart` (ACM template)
  - `IEEEtrans` (IEEE template)
- Template class can accept options, e.g. `\documentclass[a4paper,10pt]{article}`

Class Options for `article`, `report`, `book`, `letter`

`10pt`, `11pt`, `12pt`	Set font size.
`a4paper`, `letterpaper`, ...	Defines the paper size.
`fleqn`	Typesets displayed formulae left-aligned instead of centred.
`leqno`	Places the numbering of formulae on the left hand side instead of the right.
`titlepage`, `notitlepage`	Specifies whether a new page should be started after the document title or not.
`onecolumn`, `twocolumn`	Typeset the document in one column or two columns.
`twoside, oneside`	Specifies whether double or single sided output should be generated.
`landscape`	Changes the layout of the document to print in landscape mode.
`openright, openany`	Makes chapters begin either only on right hand pages or on the next page available.

Engineering as Multidisciplinary Field

Introduction

- LaTeX is a document preparation system and document markup language.
- It can be used to typeset articles, books, slides, posters, even graphics.
- Pros:
  - It separates presentation/format from contents.
  - Since the source codes are plaintext, it works well with version control system such as git.
  - Highly customizable through various of packages.
- Cons:
  - There is no graphic interface to support WYSIWYG style editing.
  - Not suitable to produce unstructured documents.

Robotics Engineering and open-source projects

Introduction

- LaTeX is a document preparation system and document markup language.
- It can be used to typeset articles, books, slides, posters, even graphics.
- Pros:
  - It separates presentation/format from contents.
  - Since the source codes are plaintext, it works well with version control system such as git.
  - Highly customizable through various of packages.
- Cons:
  - There is no graphic interface to support WYSIWYG style editing.
  - Not suitable to produce unstructured documents.

The Future Engineering

Introduction

- LaTeX is a document preparation system and document markup language.
- It can be used to typeset articles, books, slides, posters, even graphics.
- Pros:
  - It separates presentation/format from contents.
  - Since the source codes are plaintext, it works well with version control system such as git.
  - Highly customizable through various of packages.
- Cons:
  - There is no graphic interface to support WYSIWYG style editing.
  - Not suitable to produce unstructured documents.

Thanks
Questions?