Intro To LaTeX

OSDG X Theory Group

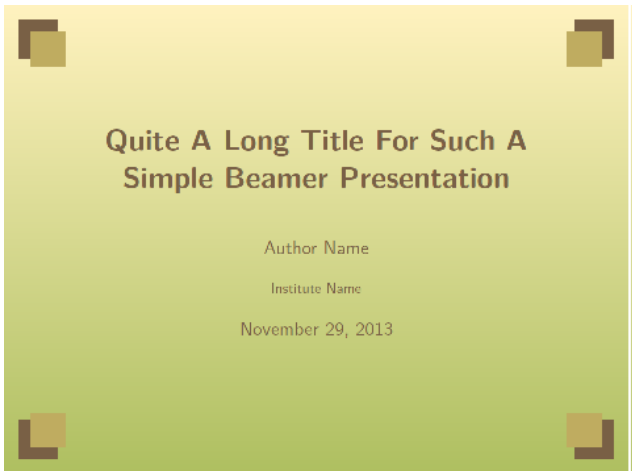
April 7, 2024

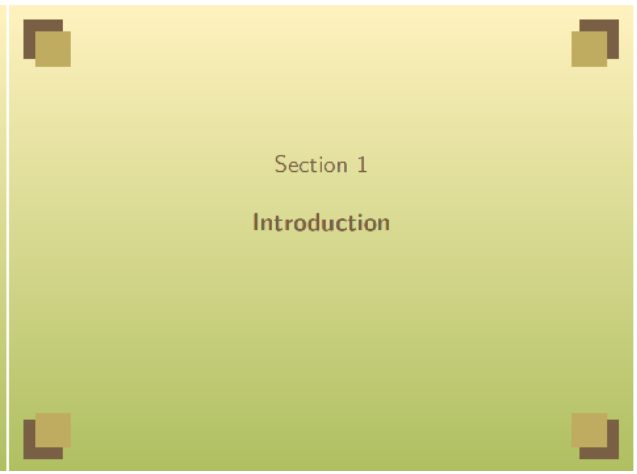
Topics Covered

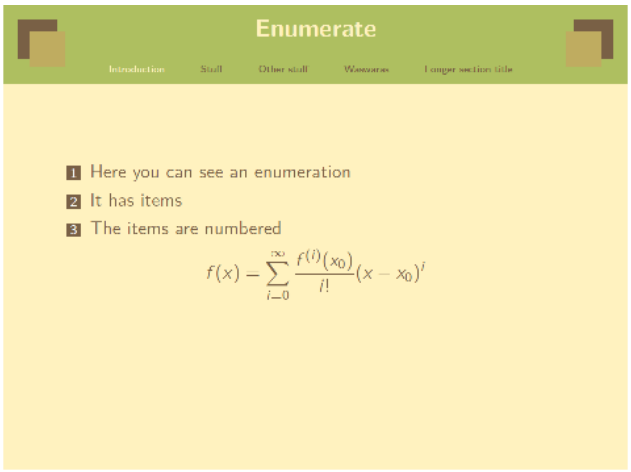
- Beamer
- Mathmode
- Cross References and Bibliographies
- Tables
- Graphics and Figures
- TikZ and plotting
- Templates
- Some useful Tricks

Beamer

- A beamer is one of the 10 LaTeXdocument classes.
- Beamer is used heavily for making great looking and standardized presentations.
- LaTeXhas built-in themes (not templates) Eg: CambridgeUS theme
- They can be simple like this one, but are also highly customizable like the one shown below
- The best part is, they are in PDF format.







Beamer

Make a basic Beamer

A "frame" in a beamer is what can be refered to as a slide in presentation.

You can break a single frame into multiple pages by using the pause command. For example below itemization will load in multiple slides:

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1. this is first

Beamer

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1. this is first
2. this is second

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1. this is first
2. this is second
3. this is third

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1. this is first
2. this is second
3. this is third

Note:

- "Slide" in beamer unintuitively means, a page of a PDF file.
- Most themes also come with Navbar, at the bottom.
- Some usefull documentation can be found in latex-beamer.com

Beamer

Overlays

Like pause, there are various different overlays to fit the needs. You can use the `onslide<n-m>` command to explicitly state the slide number in which an item appears in.

Here's a demonstration of commands like `onslide<n-m>`, `only<n>` and `alt<n>`.

We are not on slide 6 btw

Beamer

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1. this is second slide

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3. this is third slide

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We are not on slide 6 btw

1. this is second slide
2. this is fourth slide
3. this is third slide

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We are not on slide 6 btw

1. this is second slide
2. this is fourth slide
3. this is third slide
4. this only appears in 5th slide

Beamer

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Here's a demonstration of commands like `onslide<n-m>`, `only<n>` and `alt<n>`.

We are on slide 6

1. this is second slide
2. this is fourth slide
3. this is third slide

Beamer

Blocks in Beamer

Sometimes we need to display some information that convey some special messages. As an example, an information box with a title and some background color can deliver an important scientific fact.

Here are some useful blocks:

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Here are some useful blocks:

Custom block message

some content

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Here are some useful blocks:

Custom block message

some content

Custom alert message

some alert

Beamer

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Sometimes we need to display some information that convey some special messages. As an example, an information box with a title and some background color can deliver an important scientific fact.

Here are some useful blocks:

Custom block message

some content

Custom alert message

some alert

Custom example: 1.1

some example

Beamer

Blocks in Beamer

Sometimes we need to display some information that convey some special messages. As an example, an information box with a title and some background color can deliver an important scientific fact.

Here are some useful blocks:

Custom block message

some content

Custom alert message

some alert

Custom example: 1.1

some example

Making a some standard blocks, such as `proof`, `example` can be as easy as making environments. Using above custom block messages, it is also really easy to make your own environments.

Beamer

Task-1

Try solving the task-1.

Math

Types of math in latex

LaTeXhas a monopoly in typesetting math expressions in any context. So much that other frameworks like `MathJax` have integrated LaTeX's code and implementation to render math.

Inline math

This is used to write smaller math expressions within the text. Can be activated using.

- `\(...\)`
- `$...$`
- `\begin{math}...\end{math}`

Math-Mode

Used to write larger equation which render on a seperate line. Can be activated using.

- `\[...\]`
- `$$...$$`
- `\begin{equation}...\end{equation}`

Math

Symbols

Practically every Math symbol or equation that you have ever seen printed on a text book can be written in LaTeX. But you may need some extra packages to render different symbols.

Here is a website containing a list of widely used symbols in latex.

This is some inline math $S = \sum_{x=0}^{n} x$

$$S = \sum_{x=0}^{n} x \qquad \text{(This is mathmode)}$$

```
\documentclass{article}
\usepackage{amsmath}
\begin{document}
This is some inline math $S = \sum_{x=0}^{n} x$
$$ S = \sum_{x=0}^{n} x \hspace{4em}\text{(This is mathmode)} $$
\end{document}
```

Math can get complicated really fast, try to format your code.

$$\mathcal{L} = \begin{cases} 1 & \text{if } i = j \text{ and } deg_j \neq 0, \\ -\left(\frac{1}{\sqrt{deg_i deg_j}}\right) & \text{if } (i, j) \in \mathbb{E}, \\ 0 & \text{otherwise} \end{cases}$$

$$x = y \quad \text{(make a new equation environment for nextline)}$$

```
$$
  \mathcal{L} = \begin{cases}
    1 & \text{if $i = j$ and $deg_j \neq 0$}, \\
    - \left(\frac{1}{\sqrt{deg_i deg_j}}\right)
        & \text{if $(i, j) \in \mathbb{E}$}, \\
    0 & \text{otherwise}
  \end{cases}
$$
$$ x = y \hspace{1em}\text{(make a new equation environment for nextline)} $$
```

Math

Task-2

Its impossible to go through plethora of features in Math, you learn as you come accross stuff. Try solving the task-2.

$$\int_1^x \sum_{p \leq u} \left\lceil \frac{\log u}{\log p} \right\rceil \log p . du = \frac{\hbar}{2\pi\iota} \int_{c-\iota\infty}^{c+\iota\infty} \frac{x^{s+1}}{s(s+1)} \left(-\frac{\partial \zeta'(s)}{\partial \zeta(s)} \right) . ds$$

Citations and Bibliographies

Introduction

Bibliography - a list of the books referred to in a scholarly work, typically printed as an appendix.

When it comes to bibliography-management packages, there are three main options in LaTeX: bibtex, natbib and biblatex. BibTex LaTeX has its own bibliography format `.bib`, that you can find almost everywhere and is mostly compatible with above listed packages.
It is possible to write citations manually, but when they are large in number, it is faster to automate it.

References

[1] Donald E. Knuth (1986) *The TEX Book*, Addison-Wesley Professional.

[2] Leslie Lamport (1994) *LATEX: a document preparation system*, Addison Wesley, Massachusetts, 2nd ed.

```
\begin{thebibliography}{9}
    \bibitem{texbook}
    Donald E. Knuth (1986) \emph{The \TeX{} Book},
    Addison-Wesley Professional.

    \bibitem{lamport94}
    Leslie Lamport (1994) \emph{\LaTeX: a document preparation system},
    Addison Wesley, Massachusetts, 2nd ed.
\end{thebibliography}
```

Citations and Bibliographies

BibTex

BibTex is built into LaTeXand there is no need to use any other package.

Blablabla said Nobody [1].

References

[1] Nobody Jr. My article, 2006.

```
% mybib.bib file
@misc{ Nobody06,
    author = "Nobody Jr",
    title = "My Article",
    year = "2006"
}
```

```
% tex file
\documentclass{article}
\begin{document}
Blablabla said Nobody \cite{Nobody06}. % 1. cite wherever required

% at the end of the document
\bibliography{mybib} % 2. include the .bib files (without extension)
\bibliographystyle{plain} % 3. Set the bibliography style (compulsary)
\end{document}
```

Compiling in terminal takes a few extra steps, if a .bib file is used:

```
$ pdflatex myarticle.tex   # unresolved citations written to .aux
$ bibtex myarticle         # generata .bbl file from .aux file
$ pdflatex myarticle.tex   # resolves cross-references and adds citations
$ pdflatex myarticle.tex   # to make sure all entries are resolved and updated
```

Citations and Bibliographies

Task-3

Try solving the task 3.

Citations and Bibliographies

Task-3

Try solving the task 3.
You can find the sources.bib file renamed to ‘h‘ in the ‘test3‘ directory.

Table: F0 Scores of Random Models

Model	F0 Score
Model 1	0.75
Model 2	0.68
Model 3	0.82

Table: Multicolumn Table

Group 1		Group 2		
A	B	C	D	E
1	2	3	4	5
6	7	8	9	10

Table: Multirow Table

Group	Values	
	A	B
1	2	3
2	4	5
	6	7

Tables

Task-4

Try the task-4

Figures and Diagrams

Task-5

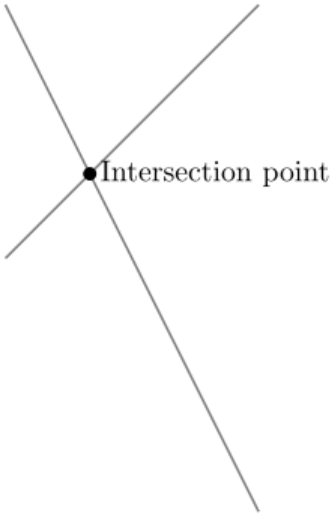
Try to solve the Task-5. The solutions are...

TikZ and Plotting

Introduction

TikZ is probably the most complex and powerful tool to create graphic elements in LaTeX. There are so many options and commands that it is out of the scope of this session. A small jist of this is shown in the following examples.

TikZ uses PGF (Portable Graphics Format) is a macro package for creating graphics within LaTeX.

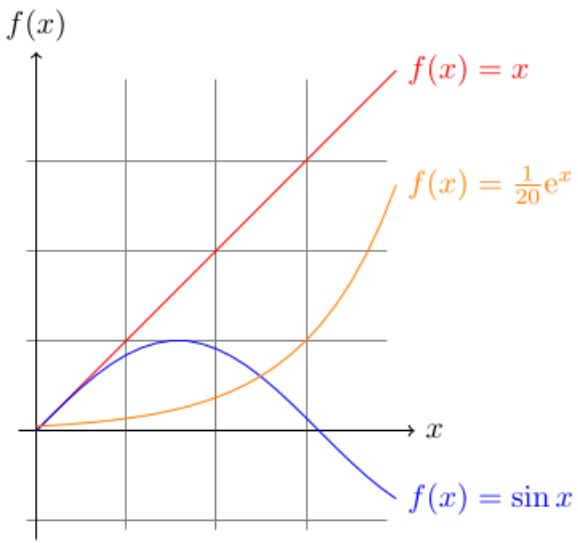



```
\documentclass{article}
\usepackage{tikz}
\begin{document}
\begin{tikzpicture}
\draw[gray, thick] (-1,2) -- (2,-4);
\draw[gray, thick] (-1,-1) -- (2,2);
\filldraw[black] (0,0) circle (2pt) node[anchor=west]{Intersection point};
\end{tikzpicture}
\end{document}
```

TikZ and Plotting

Plotting using TikZ

When you plot a function, the coordinates of the plot data can be computed by evaluating a mathematical expression. Since pgf comes with a mathematical engine, you can specify this expression and then have TikZ produce the desired coordinates for you, automatically.




```
\documentclass{article}
\usepackage{tikz}
\begin{document}

\begin{tikzpicture}[domain=0:4]
  \draw[very thin,color=gray] (-0.1,-1.1) grid (3.9,3.9);

  \draw[→] (-0.2,0) -- (4.2,0) node[right] {$x$};
  \draw[→] (0,-1.2) -- (0,4.2) node[above] {$f(x)$};

  \draw[color=red]    plot (\x,\x)             node[right]
        {$f(x) =x$};
  % \x r means to convert '\x' from degrees to _r_adians:
  \draw[color=blue]   plot (\x,{sin(\x r)})    node[right]
        {$f(x) = \sin x$};
  \draw[color=orange] plot (\x,{0.05*exp(\x)}) node[right]
        {$f(x) = \frac{1}{20} \mathrm e^x$};
\end{tikzpicture}

\end{document}
```

TikZ and Plotting

3-rd Party tools and TikZ

I have used TikZ in my 'Automata Theory' assignment to make a finite state machine. This website, is a simple GUI to create Finite State Machines.

Also used the same tool to make a turing machine: