

L^AT_EXtutorial

The very basics for typesetting research papers

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What is L^AT_EX?

L^AT_EX (pronounced 'latek') is a typesetting tool

Unlike in Microsoft Word:

- Content is entered as plain text
- Formatting and references are done “automatically”

Powerful and convenient for:

- Creating beautiful, long/complex documents
- Inputting lots of equations
- Easily managing lots of cross-references and bibliographical references

It is widely used in academia, especially in science and engineering fields

Installing L^AT_EX

- Get the **full** version of a L^AT_EX distribution:
 - ▶ MiKTeX (Windows)
 - ▶ TeXLive (Linux)
- Get an editor: TexMaker
- Get a reference manager: JabRef

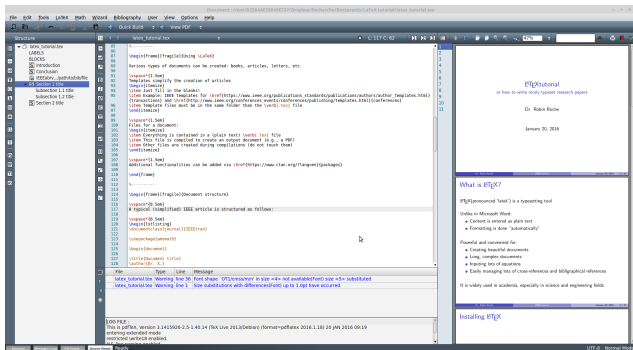


Figure: Screenshot of TeXMaker

Using L^AT_EX

Various types of documents can be created: books, articles, letters, etc.

Templates simplify the creation of articles

- Just fill in the blanks!
- Example: IEEE templates for transactions and conferences
- Template files must be in the same folder than the `.tex` file

Files for a document:

- Everything is contained in a (plain text) `.tex` file
- This file is compiled to create an output document (e.g., a PDF)
- Other files are created during compilations (do not touch them)

Additional functionalities can be added via packages

Document structure

A typical (simplified) IEEE article is structured as follows:

```
\documentclass[journal]{IEEEtran}

\usepackage{amsmath}

\begin{document}

\title{Document title}
\author{Dr. X.}
\maketitle

\begin{abstract}
The abstract goes here.
\end{abstract}

\section{Introduction}
Content goes here.

\section{Conclusion}
The conclusion goes here.

\appendices
\bibliographystyle{IEEEtran}
\bibliography{IEEEabrv,../path/to/bib/file}

\end{document}
```

Sections and lists

Hierarchical sections:

```
\section{Section 1 title}
  \subsection{Subsection 1.1
    title}
  \subsection{Subsection 1.2
    title}
\section{Section 2 title}
```

V. PRIMARY CONTROL STATE-OF-THE-ART

A. Inverter Output Control

Itemized lists:

```
\begin{itemize}
\item Item 1
\item Item 2
\end{itemize}
```

- *Players*: Registered users in set \mathcal{N} .
- *Strategies*: Each user $n \in \mathcal{N}$ selects its energy consumption scheduling vector \mathbf{x}_n to maximize its payoff.
- *Payoffs*: $P_n(\mathbf{x}_n; \mathbf{x}_{-n})$ for each user $n \in \mathcal{N}$, where

Enumerations:

```
\begin{enumerate}
\item Item 1
\item Item 2
\end{enumerate}
```

- 1) The interlinking-converter droop is modified and applied to the coordination of a community microgrid.
- 2) A hierarchical coordination strategy is proposed for the flexible and the optimal coordination of power exchanges while maintaining the normal operation of participating microgrids.

Figures

- Figures (.png, .pdf, .jpg) are numbered automatically
- A caption must be added below the figure
- Add a label to refer to the figure in text
- Size can be changed: scale, height, width
- Location can be changed: here, top, bottom, page

```
\begin{figure}[hbtpt]
\centering
\includegraphics [height=13em]{figure_
    file.png}
\caption{Figure caption}
\label{fig:microgrid}
\end{figure}
```

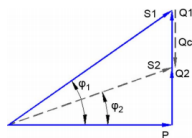


Fig. 5. Control architecture of the real-time HIL testbed at the Xtreme Power facility in Kyle, TX.

Tables

- Tables are numbered automatically
- A caption must be added above the table
- Add a label to refer to the table in text
- Location can be changed: here, top, bottom, page
- Cells spanning multiple rows and columns can be used
- Alignment can be changed (left, center, right)

```
\begin{table}  
\caption{Table caption}  
\begin{tabular}{|c|c|}  
\hline  
Cell 1 & Cell 2 \\  
\hline  
Cell 3 & Cell 4 \\  
\hline  
\end{tabular}  
\label{tab:microgrid_params}  
\end{table}
```

TABLE I
OPERATIONAL FEATURES OF COMMUNITY MICROGRID

	MG_j is grid-connected	MG_j is islanded
	CMC	Optimal regulation of power exchange by communicating with each MC_j
Operation at the community level	MC_j	MC_j regulates the exchange between MG_j and utility grid
	IC_j	Operating in f/V regulating mode to maintain the f/V of MG_j
		Scheduling DER outputs in MG_j
		Hierarchical Coordination of power exchange between MG_j and other microgrids

Equations

- Equations are numbered automatically
- Add a label to refer to the equation in text

```
\begin{equation}
b = 1+2
\end{equation}
```

```
\begin{eqnarray}
a &=& 1 + \frac{1}{2} \\
&=& \frac{3}{2}
\end{eqnarray}
```

$$C^* \triangleq \sum_{h=1}^H C_h \left(\sum_{m \in \mathcal{N}} \sum_{a \in \mathcal{A}_m} x_{m,a}^{h*} \right). \quad (31)$$

References

Cross-references

See Fig.~\ref{fig:label_of_the_figure} for more details.
Equation~(\ref{eq:equation_label}) defines blah blah.
Section~\ref{sec:section_label} describes blah bah.

Bibliographical references

- Add references in a separate .bib file in JabRef
- Store all references in this file
- Use the BibTeX format (see examples on IEEEXplore and ScienceDirect)
- Refer to the paper in the text

The authors in \cite{paper_id} describe blah bla.

Next steps

This document only describes the very basics of \LaTeX

Another, longer tutorial is available [here](#)

Next step: experiment!

- Install and run the required software
- Try to typeset and compile a sample IEEE article

Getting help

- Use Google! Many people probably had the same problem
- Ask me