

LATEX - Open Source Documentation Software: An Overview

Shubhashree Savant
Assistant Professor,
MCA Department,
MIT (E), Aurangabad

Sonal Sarnaik
Assistant Professor,
CSE Department,
ICEEM, Aurangabad

ABSTRACT

LATEX is a free and open source documentation software (document markup language text processing system) used for preparing impressive and highly structured documents. LATEX is becoming the "standard" text processor for publications in science, engineering, and mathematics. Instead of wasting lot of time in formatting user can focus on contents and logical ideas. To learn LATEX through examples is the easiest way for many people. The objective of this paper is to give overview of LATEX so one can use it without getting into much detail, and can learn to use LATEX quickly and easily.

Keywords

LATEX, \begin, \end, \documentclass

1. INTRODUCTION

LATEX is a very powerful text processing system available to all through the internet, which runs on any PC. It is very popular in scientific and academic communities for publications and report writing and also used in industry. It is more powerful than a word processor or desktop publishing system

LATEX is based on Don Knuth's revolutionary TEX typesetting program. It's been used by millions since launched in 1985, and has been continuously updated to bring accuracy and flexibility. It works on any computer i.e., documents created in one operating system, as Linux, can be reused, without making any changes, in other systems, such as Windows or Mac - and vice-versa.[1]

LATEX has many features:

- Produces outstanding documents
- Automatic numbering of equations, chapters and sections, figures and tables
- Word spacing is uniform throughout the document.
- Documents can be generated easily with lot of mathematical equations
- It is easy to produce bibliographic entries, with changeable formats
- It can easily manage very lengthy documents like books and theses.
- Allows user to focus on content generation and logical sequencing of ideas rather than formatting documents

2. BASIC ELEMENTS OF LATEX FILE

In LATEX source file is created typically using text editor like TEXnicCenter (Win), Kile (Linux), TEXshop (Mac), Emacs (all), even vi and Notepad, and saved with .tex

extension. Then, run the latex program to convert the source file to a document interchange format such as PostScript or PDF. Once the document is converted to PostScript or PDF format, it can be previewed on the screen, sent to others, and printed.

MikTEX was the most popular Open Source user-friendly interface and free distribution of LATEX, but worked with Windows only (download from www.miktex.org).[7]

Blank line in .tex file is used for a new paragraph and a space character used for a new word. Comments start with a % character and till the line ends. Also \$, \, &, #, _ ~ ^ { } are special characters. To print any of these special character, precede it with a \ character (\% to print %).[5]

2.1 Basic document structure

Basic structure of a LATEX document consists of three lines which are compulsory:

```
\documentclass[ ]{ }  
% preamble (extra setups, if any)  
\begin{document}  
% document body  
.....  
\end{document}
```

Document class uses article, report, book, beamer in curly braces {} and options: 10pt, 11pt, twocolumn, a4paper, a5paper etc. in square brackets [].

The Preamble where one can specify any extra packages (LATEX plugins) such as typefaces or special formatting requirements

```
\documentclass[11pt]{Report}  
\usepackage{charter,graphicx}  
\setlength{\parindent}{1em}  
\begin{document}  
\title{document title}  
\author{author name}  
\date{publication date}  
\maketitle  
\tableofcontents  
Document text  
\end{document}
```

In a common document, the title, author, date and table of contents (optional) all are used at the start, followed by text. For spacing and indentation \parskip and \parindent with the \setlength command or with the parskip package is used.[3]

2.2 Sections and sub-sections

`\section{"section title"}` is used for a new section, and `\subsection{"sub-section title"}` is used for a subsection. `\subsubsection{"sub-sub-section title"}` can also be used if required.^[5]

2.3 Mathematics

In normal documentation writing mathematical formula is very tedious and complicated task. In LATEX Mathematical formulas are produced by typing special descriptive text. This means that LATEX must be informed that the following text is to be interpreted as a mathematical formula, and it must also be told when the math text has come to an end and normal text recommences. The processing of math text is carried out by switching to math

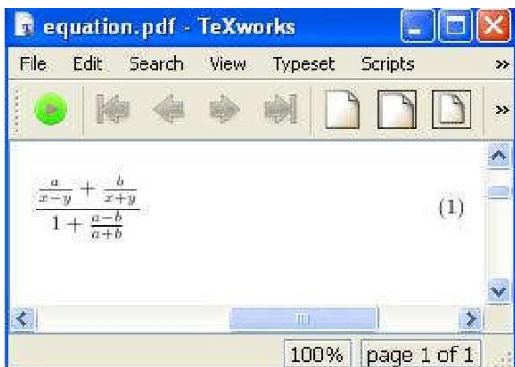
mode ^[3].

`$ formula $`

`\begin{equation} formula \end{equation}`

These equivalent forms produce an in-text formula by typesetting formula in math mode using text style. Also Equations are numbered automatically by LATEX_[1].

```
\begin{equation}
\frac{\frac{a}{x-y} + \frac{b}{x+y}}{1 + \frac{a-b}{a+b}}
\end{equation}
```



```
\usepackage{amsmath}
\begin{Bmatrix}
a & b & \cdots & z \\
a^2 & b^2 & \cdots & z^2 \\
\vdots & \ddots & \ddots & \vdots \\
a^n & b^n & \cdots & z^n
\end{Bmatrix}
\end{Bmatrix}
```

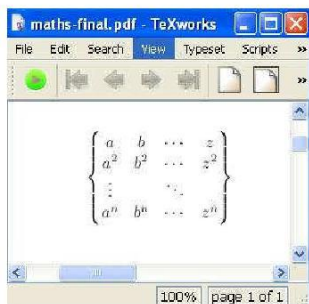


Fig 1. Output of mathematics

2.4 Tables and Figures

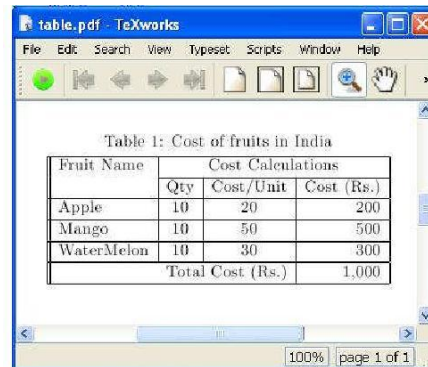
Tables and figures are floating bodies in LATEX (change position to fit available space). `\caption` and `\label` command is used to caption and label tables and figures. LATEX commonly places a table or figure either above the text at the top of a page, below the text at the bottom of a page, or on a separate page containing nothing but figures and tables.^[6]

A table starts with the command `\begin{table}` and `\begin{tabular}` and ends with `\end{tabular}` and `\end{table}` Items

in a table are separated by the ampersand character `&`. For new line `\\` characters are used at the end of each line followed by `\hline` to draw horizontal line and `A |` in the tabular environment's argument is to draw a vertical line.^[2]

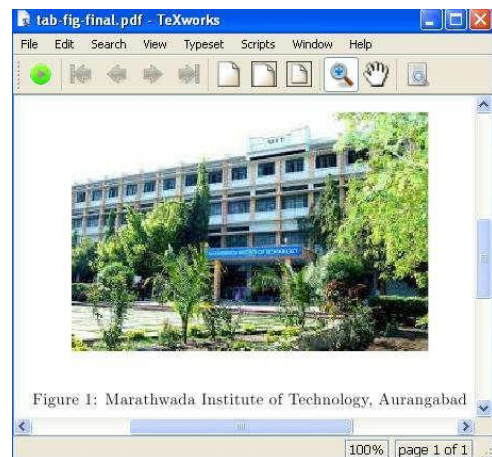
```
\begin{table}
\centering
\caption{Cost of fruits in India}
\vspace{1ex}
\begin{tabular}{|||c|c|r|} \hline
{Fruit Name} & & & \\
\multicolumn{3}{c}{Cost Calculations} \\ \cline{2-4} & & & \\
Qty & Cost/Unit & Cost (Rs.) \\ \hline
Apple & 10 & 20 & 200 \\ \hline
Mango & 10 & 50 & 500 \\ \hline
WaterMelon & 10 & 30 & 300 \\ \hline
\multicolumn{3}{r}{Total Cost (Rs.)} & \\
\multicolumn{1}{r}{1,000} \\
\end{tabular}
\end{table}
```

Fig 2. Output of tables



```
\usepackage{graphicx}
-----
\begin{figure}
\centering
\includegraphics[width=0.5\linewidth,angle=90]{mit}
\caption{Marathwada Institute of Technology,
Aurangabad}
\end{figure}
```

Fig 3. Output of figures



2.5 List

Lists of items can be enumerated (numbered or lettered), itemized (bulleted)^[4] and descriptive (topic and explanation)

```
\begin{enumerate}  
\item \LaTeX \item  
Scilab  
\begin{itemize} \item  
SIVP  
\item IPD  
\end{itemize}  
\end{enumerate}  
\begin{description}  
\item [SIVP] Scilab Image and Video Processing Toolbox  
\item [IPD] Image Processing Design Toolbox  
\end{description}
```

Fig 4. Output of lists



3. CONCLUSION

Thus this paper has given overview of LATEX which will help to learn and use LATEX quickly and easily. LATEX requires sparing time to explore other advanced features. Also documentation prepared in LATEX is a value addition for preparing theses and publications to researchers. In future LATEX can be used mainly for documentation, presentation, writing technical papers etc. in education but also in the field of medical and others

4. REFERENCES

- [1] Lamport, Leslie, LATEX: A Document preparation system: user's guide and reference manual, (New York: Addison-Wesley Publishing company., 1994).
- [2] Spoken-tutorial on LATEX by Kannan Moudgalya IIT Bombay
- [3] Kopka, Helmut, "A Guide to LATEX: Document preparation for beginners and advanced users,(New York: Addison-Wesley Pub. Co., 1993).
- [4] Sivagaminathan Ganesan "Powerful Research Documentation Software 'LATEX'", International Journal of Computer Science and Information Technologies (IJCSIT), Vol. 3 (3) , 2012,4182-4184
- [5] Henri P. Gavin, A brief LATEX tutorial, Department of Civil and Environmental Engineering Duke University Durham, NC, September 30, 2002
- [6] Diller, Antoni, LATEX line by line: tips and techniques for document processing, (New York: J. Wiley, 1993).
- [7] Alexandre Gaudeul, The LATEX project: A case study of open source software TUGboat, Volume 24 (2003), No. 1—Proceedings of the 2003