

A Simple Example Using L^AT_EX

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Abstract

This short paper illustrates basic techniques in the use of the L^AT_EX text formatting language, which is useful in typesetting scientific and mathematical papers. This paper can serve as a short tutorial and as a useful template for a beginning L^AT_EX programmer.

1 Introduction

This paper illustrates how various typesetting is accomplished in L^AT_EX. First, notice that components of your paper such as *sections*, *subsections*, and *equations* are numbered automatically.

1.1 Lists

Making an itemized list is easy:

- If the L^AT_EX file is called `sample.tex` then output is created by executing
`pdflatex sample`
- To force a line to end, use double backslash as in the previous item as seen in `sample.tex`.
- Anything after a `%` is a comment that won't appear in the output.
- This shows the effect of typesetting. Some of the **greatest** discoveries in science were made by *accident*

2 Mathematical formulas

For more information on math formulas, see a L^AT_EX manual such as [2].

This paper supplies only a taste of how mathematical formulas are created in L^AT_EX. As a short introduction, a few pointers are contained in this section.

Dollar signs places L^AT_EX into its math mode, which is where mathematical formulas and equations are created. To include an equation in

a current line of text, place one dollar sign (\$) before and after the equation, for example we might define $f(x) = 3e^x$. If an equation should be displayed in another line. See below.

$$\sum_{j=1}^N j = \frac{N(N+1)}{2}.$$

If the equation should be numbered, use the following notation:

$$e^{i\pi} = \cos(\pi) = -1. \tag{1}$$

This equation was given a label (which is optional). Hence, the equation can be referred to later as (1) rather than hardcoding such numbers into the \LaTeX file. Therefore, adding new equations does not facilitate a need for the programmer to manually renumber the equations.

(Note that you will have to run \LaTeX twice on your `.tex` file for numbering to appear properly. The first run stores the labels in the file `sample.aux` and the second time run reads these labels at the beginning of processing.)

More complex math is as under:

Subscripts in math mode are written as a_b and superscripts are written as a^b . These can be combined and nested to write expressions such as

$$T_{j_1 j_2 \dots j_q}^{i_1 i_2 \dots i_p} = T(x^{i_1}, \dots, x^{i_p}, e_{j_1}, \dots, e_{j_q})$$

We write integrals using \int and fractions using $\frac{a}{b}$. Limits are placed on integrals using superscripts and subscripts:

$$\int_0^1 \frac{dx}{e^x} = \frac{e-1}{e}$$

Lower case Greek letters are written as ω δ etc. while upper case Greek letters are written as Ω Δ .

Mathematical operators are prefixed with a backslash as $\sin(\beta)$, $\cos(\alpha)$, $\log(x)$ etc.

3 Figures and Tables

3.1 Figures

To include figures, you can use the `includegraphics` package as listed below. It supports different extensions (pdf, jog, png etc). The first figure has a pdf extension and latter a png.

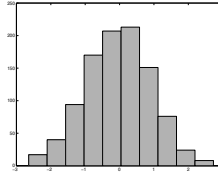


Figure 1: Histogram of 1000 normally distributed random numbers.



Figure 2: Another Figure with a png extension

Note that the `caption` command gives the figure a number that can be referred to later as Figure 1 and 2.

The file `fig.pdf` was created in matlab with the commands:

```
>> r = randn(1000,1);
>> hist(r)
>> colormap([.7 .7 .7])    % to change the color and make it print better
>> print fig.pdf
```

3.2 Tables

Tables use below format. Note `c` refers to the columns, there are 3 columns in the first and second table, while the third table has 4 columns. Center means center the table in the page. Following begin tabular, rows start, there are 3 rows here in 1, and each cell in a row is seperated by a `&` and the row ends by using double backslash to move to next line.

cell1	cell2	cell3
cell4	cell5	cell6
cell7	cell8	cell9

Table 1: Table-1 without border

Another table. A `|` seperating the `c`'s in the second Table 2, essentially draws a border. A `hline` draws a horizontal line.

cell1	cell2	cell3
hello	world	!
cell7	cell8	cell9

Table 2: Table-2 with border

A more complex table with double lines in some places. Here, we applied the float placement specifier *h* to place the table "here", encouraging LaTeX to locate it below the line of text. The [0.5ex] at the end of the headings row is used to add extra vertical spacing between the heading and the first row of the table. Similarly at the end.

Col1	Col2	Col2	Col3
1	6	87837	787
2	7	78	5415
3	545	778	7507
4	545	18744	7560
5	88	788	6344

Table 3: Your caption.

4 Bibliography and citations

See a L^AT_EX manual such as [2] for complete information on the use of a bibliography and citations. The main idea is the use of a bibliographic database such as the one in `samplebib.bib`, which lists a large set of papers and books, each with a distinct label. Then the `cite` command references one of the entries in the database by its label. Hence, the citation is included in the paper; the corresponding reference is automatically included in the bibliography of the paper. To do this, you must:

1. First run `pdflatex sample`
2. Then run `bibtex sample`
3. Then run `pdflatex sample`
4. Then run `pdflatex sample`

The first run of L^AT_EX creates a file `sample.aux` that contains information on the literature references. Running `bibtex` [1] then creates another file `sample.bbl`, which is read into the next L^AT_EX run producing the list of literature references. Running L^AT_EX twice more is needed to read in the citations with proper numbering.

References

- [1] D. P. Dykstra. *Mathematical Programming for Natural Resource Management*. McGraw-Hill, 1984.
- [2] M. Goossens, F. Mittelbach, and A. Samarin. *The LATEX Companion*. Addison-Wesley, 1994.