

*algo*logic

Algologic Research and Solutions

Technical Report

Grace meets beauty, again
Algologic Research and Solutions

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Preamble : This article is a sequel to my article [1]. We explore here, some tricky aspects of \LaTeX .¹

1 A pot-pourri of pictures, tables and text paras

Creating a document with plain text is easy. Trying to put text, figures, tables, and maths, in the same document, requires some expertise in using \LaTeX . Here is a sample of how you can do this yourself. Feel free to hack the \LaTeX source of this document.

This part uses the picinpar package by Friedhelm Sowa.²

Parthasarathy, is an experienced and an internationally respected scientist from India. When he is not teaching discrete mathematics to undergrad students of computer science, he loves to explore and discover \LaTeX mysteries, on his Linux machine. This is an example of the things \LaTeX can do for you. This para begins with an extra large letter. The rest of the text behaves like normal text, and is placed all around the first letter.

¹This \LaTeX document was made using Kile in a Suse Linux environment. You can get softcopies of the \LaTeX source, and the rendered version (pdf file), by sending an email request to the author. Feel free to hack the source and create your own magic.

²Some portions of this material have been hacked shamelessly from the picinpar.tex document of Friedhelm Sowa, Heinrich–Heine–Universität Düsseldorf, Universitätsrechenzentrum

You can do more tricks with tables ! You can do the same thing with tables

1	HSV	12:0
2	MSV	11:1
3	VfB	10:2
4	SVW	9:3
5	King-queen	8:4

Table 2: Table trick#2

The table which you see here is plunk in the middle of the text paragraph. Mary had a little lamb, which knew nothing about \LaTeX ... blah blah blah

blih blih blih Mary which knew noth- blah blah blah blih a little lamb, which \LaTeX ... blah blah

1	HSV	12:0	14:1	blue
2	MSV	11:1	10:4	pink
3	VfB	10:2	12:9	red
4	SVW	9:3	11:9	green
5	HYG	8:4	10:10	gray

The table is plunk text paragraph. blah blih The table is plunk

Table 3: Table trick#3

text paragraph. blah blah blah blih blih blih The table is plunk in the middle of the text paragraph. blah blah blah blih blih blih This table will be visible only if the text around it is bigger than the table. If there is not enough text, you will not see the table at all.

had a little lamb, ing about \LaTeX ... blih blih Mary had knew nothing about blah blih blih blih in the middle of the blah blah blih blih in the middle of the

2 Maths and \LaTeX , made for each other

As explained by Parthasarathy in [1] , the mathematically gifted writer will be able express his ideas in the most beautiful fashion. All the sizes and positioning is done automatically by \LaTeX .

$\sqrt[3]{x * y}$ looks different from

$$\sqrt[3]{\frac{x*y}{p+q+r-f}}$$

which is different from

$$\sqrt[7]{\frac{\sqrt[5]{\frac{a+b+c}{d-e-f}}}{\sqrt[3]{\frac{x*y}{p+q+r-f}}}} * (x+y)^{(w+z)}$$

Notice that the size of the individual variables x,y,z etc. gets automatically adjusted. The size of the root symbol gets adjusted automatically. The length of the separator used in fractions (the horizontal line) varies automatically, according to the size of the fraction. The superscript size is smaller than the normal size.

2.1 Math related fonts

Now, for some math related font styles (in Large size):

$\mathfrak{G}\mathfrak{O}\mathfrak{D}$ *mathfrac* + $\mathfrak{G}\mathfrak{O}\mathfrak{D}$ *mathcal* + $\mathfrak{G}\mathfrak{O}\mathfrak{D}$ *mathfs* +
 $\mathfrak{G}\mathfrak{O}\mathfrak{D}$ *mathbb*

2.2 Permutations and combinations

Permutation of r objects out of n objects is the same as selecting r objects out of n (in any order), and then arranging these r objects (out of r objects) in all possible sequences.

$${}^n P_r = \frac{n!}{(n-r)!} \tag{1}$$

$${}^n P_r = {}^n C_r \cdot r P_r \tag{2}$$

$$= {}^n C_r \cdot r! \tag{3}$$

$${}^n C_r = \frac{n!}{r! \cdot (n-r)!} \tag{4}$$

$$\therefore {}^n P_r = \frac{n!}{(n-r)!} \tag{5}$$

Now, let us see what ${}^nC_{(n-r)}$ is :

$${}^nC_{(n-r)} = \frac{n!}{(n-r)!(n-(n-r))!} \quad (6)$$

$$= \frac{n!}{(n-r)!(n-n+r)!} \quad (7)$$

$$= \frac{n!}{(n-r)!r!} \quad (8)$$

$$= {}^nC_r \quad (9)$$

$$\therefore {}^nC_{(n-r)} = {}^nC_r \quad (10)$$

2.3 therefore, because, degree, and dots

Notice that you have to add a $\$.\$$ delimiter if you are not in align environment (math mode). You can also use a `displaymath` environment as a global delimiter.

$\therefore x = y$

$\because z + j + g \neq (x + y)/k$

In an equilateral triangle, all angles are equal to 60°

In a right angled triangle there is one angle which is exactly 90°

The `textdegree` command works only if you have “`usepackage[latin1]{inputenc}`” in the Preamble of your document.

On the dot...like this

`xyz ... dots pqr` (dots is on the lower edge of the line)

`zxzxzx ... ldots cvcvcv` (low dots, same as dots)

abc \cdots *cdots* def (dots on the v-center of the line)

qwer
:
vbnm (vertical dots)

zxcv \ddots *ddots* vbnm (slanted line dots)

asdf *dotfill* hjkl (fillup with dots)

Use dots, to divide a line into one, two, three, four, or n equal parts.

```
|.....|  
|.....|.....| | |
|.....|.....|.....|.....|  
|.....|.....|.....|.....|
```

2.4 Pythagoras & Louis Fermat

This is the celebrated theorem ascribed to the great **Pythagoras** by his followers: *The square of the length of the hypotenuse (c) of a right angled triangle equals the sum of the squares of the lengths of the other two sides (a,b).* In other words,:

$$c^2 = a^2 + b^2 \tag{11}$$

Poor **Louis Fermat** was not so lucky. He could'nt go beyond three in the famous equation. Thus spake Louis Fermat : *There are no integral solutions for the equation :*

$$x^n + y^n = z^n \text{ for } n \geq 3 \tag{12}$$

Pythagoras made a positive statement about something. There are a hundred ways to prove Pythagoras right. Fermat had a negative statement to make.

Fermat had to wait 200 years to prove his theorem. Is this proof of the power of positive thinking ?

3 Je parle français, et vous ?

It is easy to introduce diacritical marks (accent marks) in your text, like this: *Le café français est très bon à cause de son goût. A Noël, tout le monde boit du café.*

4 Tables

Coming soon: demonstrations of “table” and “tabular” environments in \LaTeX . Watch this space.

5 Cross referencing – \LaTeX style

The power of cross referencing : You can make cross references to any part of the document. The corresponding numbers (page number, section number, equation number, figure number) are **automatically** computed and inserted for you. these numbers are also automatically re-computed whenever their location in the document changes.

- **Cross-referencing a Section :** In section 2.4 we see a famous theorem which took 200 years to prove correct.
- **Cross-referencing a page :** The author’s bio is in page 2. You can also refer to the page where an equation occurs - like this. In page 7 we have the enigmatic theorem attributed to Louis de Fermat (aka Fermat’s last theorem).
- **Cross-referencing an equation :** Equation 12 shows what Fermat wanted to say (but did not prove).

- **Cross-reference to a figure/picture** : In Figure 1 we see the man who made this document. In Figure 3 we see a GNU. In Figure 2 we see a bird which everyone loves.

6 Closing remarks

The examples given above, show you how, unconventional and complex text can be created using \LaTeX . Using traditional word-processors for such text, can prove to be painful or futile. There are lots of things things like this which \LaTeX can do for you. It usually needs a few hours of patient study and experimentation, to produce such typographically complex material.

Feel free to hack this article itself. You can get the \LaTeX source of this article, as well as that of [1] and [2], from the author (email: drpartha@gmail.com). Hacking and experimenting, is the best way to learn \LaTeX . You too can write mathematically-rich documents like this. Have fun !

References

- [1] Parthasarathy S, *When grace meets beauty, \LaTeX meets mathematics*, Algologic Technical Report, March 2008.
- [2] Parthasarathy S, *Who says \LaTeX is only for serious stuff ?* Algologic Technical Report, March 2008.

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