

*algo*logic

Algologic Research and Solutions

Technical Report

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Technical Report Template 201001  
Algologic Research and Solutions

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# Algologic Template for Technical Reports

## Ver. 201001

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### Executive summary<sup>1</sup>

This is a L<sup>A</sup>T<sub>E</sub>X document.

*This is a template document, for the proposed standard style which **Algologic** will use for all its technical reports. It shows a demo of how to write maths and also how to do many tricks which L<sup>A</sup>T<sub>E</sub>X lets you do. The summary of the document comes here.*

This is followed by the Table of Contents.

This document also demonstrates many of the facilities and features which LaTeX offers you.

You can hack this document, to produce your own demonstration document.

The author welcomes your comments, suggestions and remarks. You may also ask for other tutorial material/papers on L<sup>A</sup>T<sub>E</sub>X , written by the author [1] [6] [7].

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<sup>1</sup>This is file : techreport.tex. You can get the L<sup>A</sup>T<sub>E</sub>X source, and the rendered version, from : <http://algolog.teamfree.info/techreport.zip>. This file was prepared using Kile, on a Suse Linux system.

The best part of  $\LaTeX$  – you get the TOC automatically made, like this :

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The main matter will start in a new page, after this line of text.

# 1 Preamble

Welcome to *algo<sup>logic</sup>*, the right place to learn L<sup>A</sup>T<sub>E</sub>X and many other things.

You think L<sup>A</sup>T<sub>E</sub>X is too cumbersome ? You think you can never master this great tool ? Are you looking for help ? Then, look no further.

There are many ways to learn L<sup>A</sup>T<sub>E</sub>X :

1. Just buy the two basic books : [4], and [5], and read.
2. Take a good L<sup>A</sup>T<sub>E</sub>X file, and hack it. Start with this very same Tex file. Hacking is easy, fast and less frustrating, if you are the adventurous type, and have enough courage [1]. Or,
3. Invite Prof. Partha to hold your hand, while you take the first steps. There is nothing more effective than a live presentation by a guru, and some help when you begin to walk “the L<sup>A</sup>T<sub>E</sub>X path”. To get a list of training programs by Prof. Partha, send an e-mail to:  
`drpartha@gmail.com`
4. Ask Dr. Partha for his tutorial CDROM. This CDROM gives you everything you need, to get started on the L<sup>A</sup>T<sub>E</sub>X adventure.

The best way would be to try out ALL the methods listed above ! But, first read the fine print given below.

The inevitable fine print : All tutorials, seminars, and demonstrations, by Dr. Partha will be based, only on Linux and Linux supported tools. Microsoft worshippers please abstain.

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After this Preamble, all the text is in 2 columns, normal font size.

## 2 LaTeX is not Greek and Latin any more

Say that in Greek –  $\epsilon = 0.5(\pi_1 + \pi_2 + \pi_3 + \pi_4)$

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<sup>2</sup>and “who will bell the cat ?” asked the wise mice

<sup>3</sup>sfd ssfd sfd sfsjsgfs jhs s sff hsf ghsf sgf sf sfs gfs gfs gf sfs sfgfs sf sghsf sgfs s fsgg  
wwwg sg 12345678900987654321

**Or, say that in Latin, like this** <sup>2 3</sup>

Cum M. Cicero consul Nonis Decembris senatum in aede Iovis Statoris consuleret, quid de iis coniurationis Catilinae sociis fieri placeret, qui in custodiam traditi essent, factum est, ut duae potissimum sententiae proponerentur, una D. Silani consulis designati, qui morte multandos illos censebat, altera C. Caesaris, qui illos publicatis bonis per municipia Italiae distribuendos ac vinculis sempiternis tenendos existimabat.

**Or, say that in French, like this :**

*Le café français est très bon à cause de son goût. A Noël, tout le monde boit du café.*

Or, let us say that like the **Germans**:  
straße, or like the **Spanish** : Viva España

### 3 Rolling your own commands

You can define your own macros (commands), and use them like any other  $\text{\LaTeX}$  command. The logo of *algo<sup>logic</sup>* was made using a  $\text{\LaTeX}$  command created by Dr. Partha. *algo<sup>logic</sup>* is a great place to work and learn. *algo<sup>logic</sup>* is the creation of Dr. Partha. The general mail address of *algo<sup>logic</sup>* is :  
info.algolog@gmail.com.  
*algo<sup>logic</sup>* encourages and promotes the use of Linux, and  $\text{\LaTeX}$  This template is designed to help you follow

the example set by *algo<sup>logic</sup>* .

## 4 Cross referencing – $\text{\LaTeX}$ 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 5.2 we see how a clever tailor hoodwinked a haughty emperor. And in section 6 we see a famous theorem which took 200 years to prove correct.
- **Cross-referencing a page :** Of course the first reference (the robe which made people blush) is in page 8 and the author's bio is in page 11. You can also refer to the page where an equation occurs - like this. In page 9 we have the enigmatic theorem attributed to Louis de Fermat (aka Fermat's last theorem).
- **Cross-referencing an equation :** Equation 13 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.

## 5 Saying that mathematically

L<sup>A</sup>T<sub>E</sub>X is good for writing maths, like this article will show you. In fact, the paper [6] will give you many more examples of using L<sup>A</sup>T<sub>E</sub>X for mathematically rich text. You must also see the paper [7] to get more examples and ideas. You can get both these papers from Dr. Partha.

Two ways of writing maths text are given here. The output is the same. See the LaTeX source of this document, to understand how these two methods of writing maths, are used.

The solution of a quadratic equation is given by

$$x_1, x_2 = -b \pm \sqrt{(b^2 - 4ac)}/2a$$

The solution of a quadratic equation is given by

$$x_1, x_2 = -b \pm \sqrt{(b^2 - 4ac)}/2a$$

There is also a third way in which maths can be written along with text. Here is an example : The solution of a quadratic equation is given by

$$x_1, x_2 = -b \pm \sqrt{(b^2 - 4ac)}/2a$$

This time, the roots show up in the same line ! (because we removed the double slash to break the line).<sup>4</sup>

Here is more magic: Evaluate the sum  $\sum_{i=0}^n i^3$ . This way of writing maths makes sure that the line spacing is not disturbed. Notice how the limits of the summation are displayed. Or, notice the size of the sigma symbol.

All this is different from – Evaluate the sum  $\sum_{i=0}^n i^3$ .

*We switch over to a single column format because the following equations do not fit in into a column width.*

To get numbers for equations, use the equation environment like this :

$$2 + 2 = 4 \tag{1}$$

$$2 + 2 * 2 - 2 = 4 \tag{2}$$

$$2^2 = 4 - 4 + 4 * /4 \tag{3}$$

Notice that the equations are not aligned vertically. This is not a nice way to write mathematical material.

---

<sup>4</sup>Friends, Romans, Countrymen ..... said the faithful Mark Anthony as he stood grieving over the body of the one and only Julius Caesar.

L<sup>A</sup>T<sub>E</sub>X will help you set up arrays of **unnumbered** (but aligned) equations like this :

$$\begin{aligned} 2x^2 + 3(x - 1)(x - 2) &= 2x^2 + 3(x^2 - 3x + 2) \\ &= 2x^2 + 3x^2 - 9x + 6 \\ &= 5x^2 - 9x + 6 \end{aligned}$$

Or get them numbered (and aligned) like this:

$$2x^2 + 3(x - 1)(x - 2) = 2x^2 + 3(x^2 - 3x + 2) \quad (4)$$

$$= 2x^2 + 3x^2 - 9x + 6 \quad (5)$$

$$= 5x^2 - 9x + 6 \quad (6)$$

$$P(X_{t+1} = s_{t+1} | X_t) \quad (7)$$

$$= s_t, X_{t-1} \quad (8)$$

$$= s_{t-1}, \dots, X_0 \quad (9)$$

$$= (s_0) + h/c \quad (10)$$

$$= P(X_{t+1}) \quad (11)$$

$$= s_{t+1} | X_t = s_t \quad (12)$$

Continuing this example, let  $p_{ij}$  denote the probability of going from position  $i$  to position  $j$  in one step. For example,  $p_{21} = p_{23} = \frac{1}{3}$ , while  $p_{24} = 0$  (we can reach position 4 from position 2 in two steps, but not in one step). The numbers  $p_{ij}$  are called the **one-step transition probabilities** of the process. Denote by  $P$  the matrix whose entries are the  $p_{ij}$ . Then as  $t \rightarrow \infty$  in this equation, intuitively we would have This is a bulleted list:

- (3,1), if a 0 arrives, and the receiver does not fail;
- (0,1), if a 1 arrives, and the receiver does not fail; or
- (3,0), if the receiver fails

How about some numbered list , like this :

- (a) We are in state (4,0). Here, since the receiver has failed, the next reported bit will definitely be a 0, regardless of that bit's true value. We will then have a total of  $k = 5$  consecutive received 0s, and therefore will replace the receiver.



- (b) We are in the state (4,1), and the next bit to arrive is a true 0. It then will be reported as a 0, our fifth consecutive 0, and we will replace the receiver, as in (a).
- (c) We are in the state (4,1), and the next bit to arrive is a true 1, but the receiver fails at that time, resulting in the reported value being a 0. Again we have five consecutive reported 0s, so we replace the receiver.

Now, we move to a two-column format because our material fits in easily in the space provided for a column width. But, this text itself is across both columns because it is the preface of the two-column matter.

### 5.1 Let's play a while

Do you notice a blank line above this line ?

Now, have some fun with text size.

HUGE : Friends,  
Romans, Country-  
men – lend me your  
ears...

LARGE : Friends, Romans,  
Countrymen – lend me your  
ears...

Tiny : Friends, Romans, Countrymen – lend me your  
ears...

That's a size you can hardly read  
without a microscope !

### 5.2 A tailor and an emperor

The clever tailor proposed to the dumb emperor "Your Majesty – I will stitch you a robe which no one can see"

#### 5.2.1 The emperor's magic robe

Then the emperor asked the tailor to stitch him the magical robe.

#### 5.2.2 The robe which no one could see

Then, the emperor put on his invisible robe. And proudly walked out of his palace.

#### 5.2.3 The robe which made people blush

"Why is everyone blushing and closing their eyes ?" asked the wise emperor.

## 6 The argument

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 triangle equals the sum of the squares of the lengths of the other two sides (a,b).* In other words,:

$$c^2 = a^2 + b^2$$

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

$$x^n + y^n = z^n \text{ for } n \geq 3 \quad (13)$$

Some words might be appropriate describing equation (14), if we had but time and space enough.

$$\frac{\partial F}{\partial t} = D \frac{\partial^2 F}{\partial x^2}. \quad (14)$$

A word or two to conclude, and this even includes some inline maths:  $R(x, t) \sim t^{-\beta} g(x/t^\alpha) \exp(-|x|/t^\alpha)$ , which is a great way to demonstrate the power of  $\LaTeX$ . Everyone knows that the **Golden ratio** is not made out of gold. We have this ratio given by  $g = (1 + \sqrt{5})/2$  which works out be about 1.618034.

## 7 Postscript

This article was prepared using  $\LaTeX 2_\epsilon$  under Suse Linux 10, with the help of the front-end tool : Kile. All this comes free to you, if you use Linux. Maybe, you too should switch over to Linux and  $\LaTeX$  soon. It is easier than you think. Here's some centered text:

---

Are YOU HAPPY WITH THIS demo-tutorial on  $\LaTeX$  ?

If so, you can send a box of chocolates to Prof. Partha.

Otherwise, you can send your comments and suggestions to Dr Partha at : drpartha@gmail.com

---

End of centered text

## 8 Playing with spacing

### 8.1 1.5 space

Dr. Parthasarathy (Dr. Partha) brings with him a very rich experience of about 30 years (2010) in the software industry. He holds an Engineering Doctorate (Docteur Ingenieur) from Grenoble, France and was also a Post-Doctoral Scientist in Paris, France. He has visited and taught at several institutions worldwide (France, China, Thailand, Indonesia, Germany, Spain, UK). He is the author of several research publications and popular articles. He is an Editor of the international journal "Engineering Applications of Artificial Intelligence" , published from

the UK by published from the UK by Pergamon/Elsevier Press.

For more details about Dr. Partha, please visit :

<http://algolog.tripod.com>

## 8.2 2 space

[/nupartha.htm](#) Dr. Parthasarathy

Pergamon/Elsevier Press. He is an aggressive supporter of the Free Libre Open Source Software (FLOSS) movement, and is a regular contributor to the international effort on Linux. His contributions are part of all major Linux distributions worldwide. One of his contributions has been translated (from English), into seven different languages ! Partha speaks French and English (and many other languages) fluently. He is a Senior Member of IEEE and a Fellow of IETE.

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You can interact with him, by e-mail, on :

[drpartha@gmail.com](mailto:drpartha@gmail.com)

### 8.3 back to 1 space

He is an aggressive supporter of the Free Libre Open Saource Software (FLOSS) movement, and is a regular contributor to the international effort on Linux. His contributions are part of all major Linux distributions worldwide. One of his contributions has been translated (from English), into seven different languages ! Dr. Partha speaks French and English (and many other languages) fluently. He is a Senior Member of IEEE and a Fellow of IETE.

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For more details about Dr. Partha, please visit :

<http://algolog.tripod.com/nupartha.htm>

## 9 About Dr.Partha



Figure 1: The pensive Professor

Dr. S. Parthasarathy (Dr. Partha) brings with him, a very rich experience of about 30 years (in 2010) in the software industry. He holds an Engineering Doctorate

(Docteur Ingenieur) from Grenoble, France and was also a Post-Doctoral Scientist in Paris, France. He has visited and taught at several institutions worldwide (France, China, Thailand, Indonesia, Germany, Spain, UK, Poland). He is the author of several research publications and popular articles. He is an Editor of the international journal "Engineering Applications of Artificial Intelligence", published from the UK by Pergamon/Elsevier Press. He is an aggressive supporter of the Free Libre Open Source Software (FLOSS) movement, and is a regular contributor to the international effort on Linux. His contributions are part of all major Linux distributions worldwide. One of his contributions has been translated (from English) into seven different languages ! Dr. Partha speaks French and English (and many other

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**Baba**

**blacksheep**

How many blacksheep do you count before you go to sleep ?

## **10 Appendix A**

### **An apple a day**

**An**

**apple**

**is full of goodness**

**a day**

A day in the life of Dr. Partha. *A day in the life of Dr. Partha..* A day in the life of Dr. Partha. A day in the life of Dr. Partha.

## **11 Appendix B**

### **Baba blacksheep**

Of course, all of us have learnt this meaningless rhyme in our childhood. Have you ever wondered why the blacksheep has only three bags full of wool ?

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