A Sample Document *

Leslie Lamport
Author's Affiliation

April 15, 1993

Abstract. This is a sample input file. Comparing it with the output it generates can show you how to produce a simple document of your own.

Keywords: sample, LaTeX

1. Ordinary Text

The ends of words and sentences are marked by spaces. It doesn't matter how many spaces you type; one is as good as 100. The end of a line counts as a space.

One or more blank lines denote the end of a paragraph.

Since any number of consecutive spaces are treated like a single one, the formatting of the input file makes no difference to TeX, but it makes a difference to you. When you use LaTeX, making your input file as easy to read as possible will be a great help as you write your document and when you change it. This sample file shows how you can add comments to your own input file.

Because printing is different from typewriting, there are a number of things that you have to do differently when preparing an input file than if you were just typing the document directly. Quotation marks like "this" have to be handled specially, as do quotes within quotes: "'this' is what I just wrote, not 'that'".

Dashes come in three sizes: an intra-word dash, a medium dash for number ranges like 1–2, and a punctuation dash—like this.

A sentence-ending space should be larger than the space between words within a sentence. You sometimes have to type special commands in conjunction with punctuation characters to get this right, as in the following sentence. Gnats, gnus, etc. all begin with G. You should check the spaces after periods when reading your output to make sure you haven't forgotten any special cases. Generating an ellipsis … with the right spacing around the periods requires a special command.

TeX interprets some common characters as commands, so you must type special commands to generate them. These characters include the following: $ & % # { and }.

* Footnote to the title with the 'thanks' command.

In printing, text is emphasized by using an *italic* type style.

A long segment of text can also be emphasized in this way. Text within such a segment given additional emphasis with Roman *type. Italic type loses its ability to emphasize and become simply distracting when used excessively.*

It is sometimes necessary to prevent TEX from breaking a line where it might otherwise do so. This may be at a space, as between the "Mr." and "Jones" in "Mr. Jones", or within a word—especially when the word is a symbol like *itemnum* that makes little sense when hyphenated across lines.

TEX is good at typesetting mathematical formulas like $x - 3y = 7$ or $a_1 > x^{2n}/y^{2n} > x'$. Remember that a letter like x is a formula when it denotes a mathematical symbol, and should be treated as one.

2. Notes

Footnotes[1] pose no problem[2]. Endnotes[1] pose no problem either[2].

When using the KLUWER style file, you can produce endnotes analogous to footnotes. Instead of the LATEX command `\footnote{}`, you can use `\endnote{}`. The command `\theendnotes` can be used to place the endnotes in the text. They will be put in a separate section in the `\footnotesize` font.

3. Displayed Text

Text is displayed by indenting it from the left margin. Quotations are commonly displayed. There are short quotations

> This is a short a quotation. It consists of a single paragraph of text. There is no paragraph indentation.

and longer ones.

> This is a longer quotation. It consists of two paragraphs of text. The beginning of each paragraph is indicated by an extra indentation.
>
> This is the second paragraph of the quotation. It is just as dull as the first paragraph.

Another frequently-displayed structure is a list. The following is an example of an *itemized* list, four levels deep.

[1] This is an example of a footnote.
[2] And another one

- This is the first item of an itemized list. Each item in the list is marked with a “tick”. The document style determines what kind of tick mark is used.

- This is the second item of the list. It contains another list nested inside it. The three inner lists are an *itemized* list.

  - This is the first item of an enumerated list that is nested within the itemized list.
  - This is the second item of the inner list. LaTeX allows you to nest lists deeper than you really should.

  This is the rest of the second item of the outer list. It is no more interesting than any other part of the item.

- This is the third item of the list.

The following is an example of an *enumerated* list, four levels deep.

1. This is the first item of an enumerated list. Each item in the list is marked with a “tick”. The document style determines what kind of tick mark is used.

2. This is the second item of the list. It contains another list nested inside it. The three inner lists are an *enumerated* list.

   a) This is the first item of an enumerated list that is nested within the enumerated list.

   b) This is the second item of the inner list. LaTeX allows you to nest lists deeper than you really should.

   This is the rest of the second item of the outer list. It is no more interesting than any other part of the item.

3. This is the third item of the list.

The following is an example of a *description* list.

Cow Highly intelligent animal that can produce milk out of grass.

Horse Stupid animal that has legs.

Human being Stupid animal that can talk and think.

You can even display poetry.

Table I. Parameter set used in the model of (1990)

$Q_{s,\max}$	[g/g DM h]	0.18
K_s	[g/L]	1.0
$Y_{x/s}$	[g DM/g]	0.5
$Y_{p/s}$	[g/g]	0.854
$Q_{p,\max}$	[g/g DM h]	0.0045
μ_{crit}	[h^{-1}]	0.01
k_h	[h^{-1}]	0.002
m_s	[g/g DM h]	0.025

There is an environment for verse
Whose features some poets will curse.

For instead of making
Them do *all* line breaking,
It allows them to put too many words on a line when they'd
rather be forced to be terse.

Mathematical formulas may also be displayed. A displayed formula is one-line long; multiline formulas require special formatting instructions.

$$x' + y^2 = z_i^2$$

Don't start a paragraph with a displayed equation, nor make one a paragraph by itself.

Example of a theorem:

Conjecture 1. All conjectures are interesting, but some conjectures are more interesting than others.

4. Tables and Figures

Cross reference to labelled table: As you can see in Table II on page 5 and also in Table I on page 4.

A major point of difference lies in the value of the specific production rate π for large values of the specific growth rate μ. Already in the early publications (Falzon, 1987) it appeared that high glucose concentrations in the production phase are well correlated with a low penicillin yield (the 'glucose effect'). It has been confirmed recently

Table II. The spherical case ($I_1 = 0$, $I_2 = 0$).

Equil. Points	x	y	z	C	S
L_1	−2.485252241	0.000000000	0.017100631	8.230711648	U
L_2	0.000000000	0.000000000	3.068883732	0.000000000	S
L_3	0.009869059	0.000000000	4.756386544	−0.000057922	U
L_4	0.210589855	0.000000000	−0.007021459	9.440510897	U
L_5	0.455926604	0.000000000	−0.212446624	7.586126667	U
L_6	0.667031314	0.000000000	0.529879957	3.497660052	U
L_7	2.164386674	0.000000000	−0.169308438	6.866562449	U
L_8	0.560414471	0.421735658	−0.093667445	9.241525367	U
L_9	0.560414471	−0.421735658	−0.093667445	9.241525367	U
L_{10}	1.472523232	1.393484549	−0.083801333	6.733436505	U
L_{11}	1.472523232	−1.393484549	−0.083801333	6.733436505	U

(Bunt, 1990; Cahour, 1988; Brown and Burton, 1978; Carr and Goldstein, 1977) that high glucose concentrations inhibit the synthesis of the enzymes of the penicillin pathway, but not the actual penicillin biosynthesis. In other words, glucose represses (and not inhibits) the penicillin biosynthesis.

These findings do not contradict the results of Chin (on which (1990) based their production kinetics) and of 1987 which were obtained for continuous culture fermentations. Because for high values of the specific growth rate μ it is most likely (as shall be discussed below) that maintenance metabolism occurs, it can be shown that in steady state continuous culture conditions, and with μ described by a Monod kinetics

$$C_s = K_M \frac{\mu/\mu_x}{1-\mu/\mu_x} \tag{1}$$

Pirt & Rhigelato determined π for μ between 0.023 and 0.086 h^{-1}. They also reported a value $\mu_x \approx 0.095$ h^{-1}, so that for their experiments μ/μ_x is in the range of 0.24 to 0.9. Substituting K_M in Eq. (1) by the value $K_M = 1$ g/L as used by (Bunt, 1990), one finds with the above equation $0.3 < C_s < 9$ g/L. This agrees well with the work of (1990), who reported that penicillin biosynthesis repression only occurs at glucose concentrations from $C_s = 10$ g/L on. The conclusion is that the glucose concentrations in the experiments of Pirt & Rhigelato probably were too low for glucose repression to be detected. The experimental data published by Ryu & Hospodka are not detailed sufficiently to permit a similar analysis.

Table III. Parameter sets used by Bajpai & Reuß

parameter		*Set 1*	*Set 2*
μ_x	[h^{-1}]	0.092	0.11
K_x	[g/g DM]	0.15	0.006
μ_p	[g/g DM h]	0.005	0.004
K_p	[g/L]	0.0002	0.0001
K_i	[g/L]	0.1	0.1
$Y_{x/s}$	[g DM/g]	0.45	0.47
$Y_{p/s}$	[g/g]	0.9	1.2
k_h	[h^{-1}]	0.04	0.01
m_s	[g/g DM h]	0.014	0.029

Bajpai & Reuß decided to disregard the differences between time constants for the two regulation mechanisms (glucose repression or inhibition) because of the relatively very long fermentation times, and therefore proposed a Haldane expression for π.

It is interesting that simulations with the (Bunt, 1990) model for the initial conditions given by these authors indicate that, when the remaining substrate is fed at a constant rate, a considerable and unrealistic amount of penicillin is produced when the glucose concentration is still very high (Carberry, 1988) Simulations with the Bajpai & Reuß model correctly predict almost no penicillin production in similar conditions.

The maintenance coefficient used by (Bunt, 1990) ($m_s = 0.025$ g/g DM h) corresponds well to the value $m_s = 0.029$ g/g DM h (Set 2 of (Buchanan, 1984)), to the value $m_s = 0.024$ g/g DM h reported by Chappel and Cahour, and to the value used by ((in press)) ($m_s = 0.022$ g/g DM h) (1983). However, these values differ from the value in Set 1 of (Buchanan, 1984) ($m_s = 0.014$ g/g DM h). It is not clear where this difference originated from. Simulations indicated that the dynamic behaviour of the model is rather sensitive with respect to the value of m_s.

In the model van (1990), at severe substrate limitation conditions, and thus most probably corresponding to endogenous metabolic behaviour, the biomass consumption due to maintenance and production requirements may exceed the conversion of substrate into biomass and μ eventually may become negative. This situation may occur at the end of the growth phase during a fed-batch fermentation. For these conditions π is not defined. A straightforward extension of the $\pi(\mu)$ kinetics (10) could be $\pi(\mu \leq 0) = 0$, but there are some biochemical

Figure 1. Pathway of the penicillin G biosynthesis.

indications that the penicillin biosynthesis actually does not stop in that case.

Sample of cross-reference to figure. Figure 1 shows that is not easy to get something on paper.

5. Headings

5.1. Subsection

based their model on balancing methods and biochemical knowledge. The original model (1980) contained an equation for the oxygen dynamics which has been omitted in a second paper (1981). This simplified model shall be discussed here.

5.1.1. *Subsubsection*

(Carr and Goldstein, 1977; Cohen and Jones, 1989) based their model on balancing methods and biochemical knowledge. The original model (1980) contained an equation for the oxygen dynamics which has been omitted in a second paper (1981). This simplified model shall be discussed here.

5.1.1.1. *Paragraph.* (Carr and Goldstein, 1977; Cohen and Jones, 1989) based their model on balancing methods and biochemical knowledge. The original model (1980) contained an equation for the oxygen dynamics which has been omitted in a second paper (1981). This simplified model shall be discussed here.

Subparagraph. (Carr and Goldstein, 1977; Cohen and Jones, 1989) based their model on balancing methods and biochemical knowledge. The original model (1980) contained an equation for the oxygen dynamics which has been omitted in a second paper (1981). This simplified model shall be discussed here.

6. Equations and the Like

Two equations:

$$C_s = K_M \frac{\mu/\mu_x}{1-\mu/\mu_x} \tag{2}$$

and

$$G = \frac{P_{\mathrm{opt}} - P_{\mathrm{ref}}}{P_{\mathrm{ref}}}\ 100\ (\%) \tag{3}$$

Two equation arrays:

$$\begin{aligned}
\frac{dS}{dt} &= -\sigma X + s_F F && (4)\\
\frac{dX}{dt} &= \mu X && (5)\\
\frac{dP}{dt} &= \pi X - k_h P && (6)\\
\frac{dV}{dt} &= F && (7)
\end{aligned}$$

and,

$$\begin{aligned}
\mu_{\mathrm{substr}} &= \mu_x \frac{C_s}{K_x C_x + C_s} && (8)\\
\mu &= \mu_{\mathrm{substr}} - Y_{x/s}(1 - H(C_s))(m_s + \pi/Y_{p/s}) && (9)\\
\sigma &= \mu_{\mathrm{substr}}/Y_{x/s} + H(C_s)(m_s + \pi/Y_{p/s}) && (10)
\end{aligned}$$

7. References in the THEBIBLIOGRAPHY Environment

The first reference in the list below has the key {BrownAndBurton}. Together with the bibitem option \citeauthoryear{Brown and Burton}{1978} the follwing cross-references can be used:
\cite{BrownAndBurton} produces: (Brown and Burton, 1978)
\shortcite{BrownAndBurton} produces: (1978)
\citeauthor{BrownAndBurton} produces: Brown and Burton
\citeyear{BrownAndBurton} produces: 1978

Appendix

And this is my Appendix.

Acknowledgements

And this is an acknowledgements section with a heading that was produced by the \acknowledgements command. Thank you all for helping me writing this LaTeX sample file.

Notes

[1] This is an example of an endnote.
[2] And another one.

References

J. S. Brown and R. R. Burton. Diagnostic Models for Procedural Bugs in Basic Mathematical Skills. *Cognitive Science*, 2(2):155–192, 1978.

Bruce G. Buchanan and Edward H. Shortliffe. *Rule-Based Expert Systems: The MYCIN Experiments of the Stanford Heuristic Programming Project.* Addison-Wesley Publishing Company, 1984.

H. C. Bunt. Modular Incremental Modelling of Belief and Intention. In *Proceedings of the Second International Workshop on User Modeling*, 1990.

Béatrice Cahour. Competence Modelling in Consultation Dialogs. In L. Berlinguet and D. Berthelette, editors, *Proceedings of the International Congress, Work With Dispay Units' 89*, Montreal, Canada, September 1990. North Holland, Amsterdam.

Béatrice Cahour. *La Modélisation de l'Interlocuteur: Elaboration du Modèle et Effets au Cours de Dialogues de Consultation.* PhD thesis, Université Paris 8, France, 1991. Cognitive psychology PhD.

Sandra M. Carberry. Modeling the User's Plans and Goals. *Computational Linguistics*, 14(3):23–37, September 1988.

J. R. Carbonell. AI in CAI: An Artificial Intelligence Approach to Computer-Aided Instruction. *IEEE Transactions on Man-Machine Systems*, 11:190–202, 1970.

B. Carr and I. Goldstein. Overlays: A Theory of Modelling for Computed Aided Instruction. AI Memo 406, 1977.

Alison Cawsey. Planning Interactive Explanations. *International Journal of Man-Machine Studies*, in press.

B. Chandrasekaran and William Swartout. Explanations in Knowledge Systems: The Role of Explicit Representation of Design Knowledge. *IEEE Expert*, 6(3):47–50, June 1991.

Helen Chappel and Béatrice Cahour. User Modeling for Multi-Modal Co-Operative Dialogue with KBS. Deliverable D3, Esprit Project P2474, 1991.

David N. Chin. *Intelligent Agents as a Basis for Natural Language Interfaces.* PhD thesis, University of California at Berkeley, 1987.

David N. Chin. KNOME: Modeling What the User Knows in UC. In Alfred Kobsa and Wolfgang Wahlster, editors, *User Models in Dialog Systems.* Springer-Verlag, Symbolic Computation Series, Berlin Heidelberg New York Tokyo, 1989.

Robin Cohen and Marlene Jones. Incorporating User Models into Expert Systems for Educational Diagnosis. In Alfred Kobsa and Wolfgang Wahlster, editors, *User*

Models in Dialog Systems, pages 35 – 51. Springer-Verlag, Symbolic Computation Series, Berlin Heidelberg New York Tokyo, 1989.

Pierre Falzon. Les Dialogues de Diagnostic: L'évaluation des Connaissances de l'Interlocuteur. Technical Report 747, INRIA, Rocquencourt, France, 1987.

Timothy W. Finin, Aravind K. Joshi, and Bonnie Lynn Webber. Natural Language Interactions with Artificial Experts. *Proceedings of the IEEE*, 74(7), July 1986.