Tight setting with TeX

Alan Jeffrey

1 Introduction

This note describes some experiments with setting text matter in TeX using Adobe Times, which is a very tightly spaced text font. Acceptable results are possible with TeX, but some tweaking is required.

2 Setting text

Here is some text set in Computer Modern:

> On November 14, 1885, Senator & Mrs. Leland Stanford called together at their San Francisco mansion the 24 prominent men who had been chosen as the first trustees of The Leland Stanford Junior University. They handed to the board the Founding Grant of the University, which they had executed three days before. This document—with various amendments, legislative acts, and court decrees—remains as the University's charter. In bold, sweeping language it stipulates that the objectives of the University are "to qualify students for personal success and direct usefulness in life; and to promote the publick welfare by exercising an influence in behalf of humanity and civilization, teaching the blessings of liberty regulated by law, and inculcating love and reverence for the great principles of government as derived from the inalienable rights of man to life, liberty, and the pursuit of happiness."

And here is the same text set in Adobe Times:

> On November 14, 1885, Senator & Mrs. Leland Stanford called together at their San Francisco mansion the 24 prominent men who had been chosen as the first trustees of The Leland Stanford Junior University. They handed to the board the Founding Grant of the University, which they had executed three days before. This document—with various amendments, legislative acts, and court decrees—remains as the University's charter. In bold, sweeping language it stipulates that the objectives of the University are "to qualify students for personal success and direct usefulness in life; and to promote the publick welfare by exercising an influence in behalf of humanity and civilization, teaching the blessings of liberty regulated by law, and inculcating love and reverence for the great principles of government as derived from the inalienable rights of man to life, liberty, and the pursuit of happiness."

The first thing I can see about these two texts is how much darker Adobe Times is—partially this is because Computer Modern is a very light, brilliant face, but partially it's because Adobe's Times is a very dark cut, of somewhat dubious character.[1]

The next point of note is that the Times setting is two lines shorter. This economy of space is one of the main reasons for publishers selecting Times as a book font!

Looking at the Computer Modern setting, it is very variably set: the difference between the setting of tight and loose lines is very high, and is much less so with the Times setting, which is generally much tighter. In fact, we can make the setting of Times tighter still, by appropriate settings of the TeX paragraph parameters:

> On November 14, 1885, Senator & Mrs. Leland Stanford called together at their San Francisco mansion the 24 prominent men who had been chosen as the first trustees of The Leland Stanford Junior University. They handed to the board the Founding Grant of the University, which they had executed three days before. This document—with various amendments, legislative acts, and court decrees—remains as the University's charter. In bold, sweeping language it stipulates that the objectives of the University are "to qualify students for personal success and direct usefulness in life; and to promote the publick welfare by exercising an influence in behalf of humanity and civilization, teaching the blessings of liberty regulated by law, and inculcating love and reverence for the great principles of government as derived from the inalienable rights of man to life, liberty, and the pursuit of happiness."

The settings which achieved this were:

```
\frenchspacing
\leftskip=0pt minus 1pt
\rightskip=0pt minus 1pt
\hfuzz=0pt
\tolerance=800
\emergencystretch=0pt
\doublehyphendemerits=2500
```

Or, in English:

- No extra space after punctuation, for example "by law, and".
- Up to 2pt shrink in the line width, which allows tight lines to have up to 1pt of "wadding" added at the left and right.
- No overfull \hboxes allowed, since the wadding compensates.

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[1] The settings of Times described are with the older metrics (pre mid-1995).

- Less tolerance of underfull boxes.
- No extra space for underfull boxes.
- Two hyphenated lines in a row aren't too bad.

In producing these settings, I realized that Knuth allowed TeX a lot of flexibility about producing underfull boxes, but very little about producing overfull boxes, without jutting out into the margin. An `\emergencyshrink` would be very useful! In addition, some typesetters would allow double hyphenated lines but not triple hyphenated lines, but TeX has no way of specifying that.

One unfortunate result of these settings is the three stacked occurrences of 'the' at the end of the paragrapgh, especially since the last one has noticably less wadding than the first and second. A bit of hand-correction produces what I think is probably the best achievable setting with standard Adobe Times:

> On November 14, 1885, Senator & Mrs. Leland Stanford called together at their San Francisco mansion the 24 prominent men who had been chosen as the first trustees of The Leland Stanford Junior University. They handed to the board the Founding Grant of the University, which they had executed three days before. This document—with various amendments, legislative acts, and court decrees—remains as the University's charter. In bold, sweeping language it stipulates that the objectives of the University are "to qualify students for personal success and direct usefulness in life; and to promote the publick welfare by exercising an influence in behalf of humanity and civilization, teaching the blessings of liberty regulated by law, and inculcating love and reverence for the great principles of government as derived from the inalienable rights of man to life, liberty, and the pursuit of happiness."

However, for those willing to brave virtual fonts, one last improvement can be achieved. The hyphen character in Adobe Times has large sidebearings, which can be reduced by an appropriate virtual font. This produces:

> On November 14, 1885, Senator & Mrs. Leland Stanford called together at their San Francisco mansion the 24 prominent men who had been chosen as the first trustees of The Leland Stanford Junior University. They handed to the board the Founding Grant of the University, which they had executed three days before. This document—with various amendments, legislative acts, and court decrees—remains as the University's charter. In bold, sweeping language it stipulates that the objectives of the University are "to qualify students

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The Cork fonts include separate hyphen characters for in-line hyphenation (for example in the word 'inline') and for line-breaking hyphenation. It may be that this can be exploited to produce more beautiful pages with PostScript fonts.

3 Setting math

Now we can play the same game with some mathematics. Here's some Computer Modern mathematics (shown ragged right, to make it easier to see what's going on):

> Suppose $f \in \mathcal{S}_n$ and $g(x) = (-1)^{|\alpha|} x^\alpha f(x)$. Then $g \in \mathcal{S}_n$; now (c) implies that $\hat{g} = D_\alpha \hat{f}$ and $P \cdot D_\alpha \hat{f} = P \cdot \hat{g} = (P(D)g)\hat{\ }$, which is a bounded function, since $P(D)g \in L^1(R^n)$. This proves that $\hat{f} \in \mathcal{S}_n$. If $f_i \to f$ in $\mathcal{S}_n$, then $f_i \to f$ in $L^1(R^n)$. Therefore $\hat{f}_i(t) \to \hat{f}(t)$ for all $t \in R^n$. That $f \to \hat{f}$ is a *continuous* mapping of $\mathcal{S}_n$ into $\mathcal{S}_n$ follows now from the closed graph theorem. *Functional Analysis*, W. Rudin, McGraw–Hill, 1973.

And again in Times, using the mathptm math fonts:

> Suppose $f \in \mathcal{S}_n$ and $g(x) = (-1)^{|\alpha|} x^\alpha f(x)$. Then $g \in \mathcal{S}_n$; now (c) implies that $\hat{g} = D_\alpha \hat{f}$ and $P \cdot D_\alpha \hat{f} = P \cdot \hat{g} = (P(D)g)\hat{\ }$, which is a bounded function, since $P(D)g \in L^1(R^n)$. This proves that $\hat{f} \in \mathcal{S}_n$. If $f_i \to f$ in $\mathcal{S}_n$, then $f_i \to f$ in $L^1(R^n)$. Therefore $\hat{f}_i(t) \to \hat{f}(t)$ for all $t \in R^n$. That $f \to \hat{f}$ is a *continuous* mapping of $\mathcal{S}_n$ into $\mathcal{S}_n$ follows now from the closed graph theorem. *Functional Analysis*, W. Rudin, McGraw–Hill, 1973.

And again with tighter setting:

> Suppose $f \in \mathcal{S}_n$ and $g(x) = (-1)^{|\alpha|} x^\alpha f(x)$. Then $g \in \mathcal{S}_n$; now (c) implies that $\hat{g} = D_\alpha \hat{f}$ and $P \cdot D_\alpha \hat{f} = P \cdot \hat{g} = (P(D)g)\hat{\ }$, which is a bounded function, since $P(D)g \in L^1(R^n)$. This proves that $\hat{f} \in \mathcal{S}_n$. If $f_i \to f$ in $\mathcal{S}_n$, then $f_i \to f$ in $L^1(R^n)$. Therefore $\hat{f}_i(t) \to \hat{f}(t)$ for all $t \in R^n$. That $f \to \hat{f}$ is a *continuous* mapping of $\mathcal{S}_n$ into $\mathcal{S}_n$ follows now from the closed graph theorem. *Functional Analysis*, W. Rudin, McGraw–Hill, 1973.

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Figure 1: Math in Computer Modern, Adobe Times, and tight Adobe Times

The additional math parameters are taken from the mathptm LATEX 2_ε package:

```
\thinmuskip=2mu
\medmuskip=2.5mu plus 1mu minus 1mu
\thickmuskip=4mu plus 1.5mu minus 1mu
```

It's impossible to show the effects of tight text and math setting in the narrow measure of a *TUGboat* quotation, so in Figure 1 you can see the effect of Computer Modern, Adobe Times, and tight Adobe Times flush right.

It's worth noting that there's very little difference between the loose and tight settings of Adobe Times, becuase there are very few good linebreaks for mathematically heavy material, so the only difference is that the text stretches more and the math stretches a bit less.

Acknowledgements

This note was inspired by a talk by Richard Southall at TUG 93, in which he described the problems with setting tight text with TEX and Computer Modern. I hope this note shows that acceptable results are possible with TEX, as long as care is taken with fonts and setting parameters. However, as Richard Southall pointed out, TEX is much more prone to loose setting than to tight.

⋄ Alan Jeffrey
  School of Cognitive and
      Computing Sciences
  University of Sussex
  Falmer
  Brighton
  BN1 9QH
  UK
  Email: `alanje@cogs.susx.ac.uk`