

How pdfT_EX can improve your pages

typographic extensions

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Marginal kerning

- we want the margins of text to look even
- text without marginal kerning looks ragged rather than justified
- certain marginal characters can make a line look shorter, especially hyphen characters, punctuation and dashes
- letters from an italic font can make a line look longer
- hanging punctuation can be done at the macro level, but only with great difficulties
- font metrics changes are needed for hanging the hyphen character
- not only punctuation and hyphens need marginal kerning, certain letters also do
- a good typesetting engine should have this feature

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Composing with font expansion

- we want to get better interword spacing
- currently the only variable factor to justify lines is the interword glue
- we want to change other parameters to justify a line like
 - glyph scaling
 - interletter spacing
- such manipulations can impair readability and harmony of text
- such techniques are widely used; however they are often misused
- therefore they are considered awful
- with careful use it can help to improve interword spacing

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- after all we want to examine whether such techniques are useable to not
- even if this feature is not up to our expectations, by implementing it we can at least investigate it

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Design and implementation of marginal kerning

- the concept of character protruding
- integration to paragraph building
- choosing appropriate parameters

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The concept of character protruding

- each character from a font is associated with a left character protruding factor
- the factor gives the amount by which the character should 'protrude' out to the left margin
- similarly, the right character protruding factor is used for the right margin
- these parameters only affect characters positioned at the margins
- one unit of character protruding factor corresponds to one thousandth of the character width

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Level 1 character protruding

- is applied after line breaking
- does not count the protruding amount in badness calculation
- thus does not affect the choice of final breakpoints
- provided for backward compatibility
- can slightly impair interword spacing

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Level 2 character protruding

- is applied during line breaking
- counts the protruding amount into badness calculation
- can change the choice of final breakpoints
- gives better interword spacing than level 1

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Choosing appropriate parameters

- step by step elimination of ‘raggedness’ of various samples
- common cases that need marginal adjustment:
 - hyphen char, en dash, em dash
 - punctuation characters
 - quotes
 - characters with a lot of white area in the side bearing

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Now it happened that his father said to him one day: "Hearken, you there in the corner; you are growing big and strong, and you must learn to earn your own bread. Look at your brother, what pains he takes; but all the money I've spent on your education is thrown away." "My dear father," he replied, "I will gladly learn—in fact, if it were possible I should like to learn to shudder; I don't understand that a bit yet." The eldest laughed when he heard this, and thought to himself: "Good heavens! what a ninny my brother is! he'll never come to any good; as the twig is bent, so is the tree inclined." The father sighed, and answered him: "You'll soon learn to shudder; but that won't help you to make a living."

Shortly after this, when the sexton came to pay them a visit, the father broke out to him, and told him what a bad hand his youngest son was at everything: he knew nothing and learned nothing. "Only think!

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Minion at 12pt. Left: normal TeX output. Right: with marginal kerning.

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Composing using font expansion

- the concept of font expansion in pdf_TE_X
- integration to paragraph building
 - level 1 font expansion
 - level 2 font expansion
- making expanded fonts
- choosing appropriate parameters
- interletter spacing
- selective use of multiple glyphs

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The concept of font expansion in pdfTeX

- each font (TFM) can have an associated set of extra fonts, called expanded fonts
- each expanded font corresponds to an expansion amount, given in expansion units
- condensing is treated as expansion by a negative amount
- font stretchability: the maximum expansion amount
- font shrinkability: the minimum expansion amount
- to limit the number of expanded fonts, each expansion amount must be a multiple of an expansion step
- expanded fonts have the same (TFM) name as the base font, followed by the expansion amount
- a character can be ‘stretched’ using a wider variant or ‘shrunk’ using a narrower variant
- ‘character stretchability’: the variance of the character width between the base and the widest variant
- character shrinkability is defined in a similar way

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Examples

- font: cmr10
- stretchability: 20
- shrinkability: 10
- expansion step: 5
- expanded fonts: cmr10+20, cmr10+15, cmr10+10, cmr10+5, cmr10-5, cmr10-10
- character stretchability: variance of the character width between cmr10 and cmr10+20
- character shrinkability: variance of the character width between cmr10 and cmr10-10

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Level 1 font expansion

- is applied after line breaking
- does not count character stretchability and shrinkability into choosing breakpoints
- before line justification is done, font expansion is applied to minimize the amount that a line should be stretched or shrunk by
- thus does not affect the choice of final breakpoints
- can slightly improve interword spacing

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Level 2 font expansion

- is applied during line breaking
- considers character stretchability and shrinkability while choosing breakpoints
- can give completely different final breakpoints
- can considerably improve interword spacing

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Making expanded fonts

- by convention, one expansion unit corresponds to one thousandth of the character width
- the distortion of character shapes must be as small as possible
- the most important factor is to keep the stroke width of letterforms unchanged
- tested with fonts: CM (from METAFONT source), Type 1, and MM

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CM fonts

- increase the unit width in the mf source by the desired amount
- cmr10+10.mf is created from cmr10.mf as follows:

```
u# := 20/36pt# ;      % unit width
u# := u#+10/1000u# ;
```

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MM fonts with width axis

- create the new instance with the width value increased by the required amount
- pmnr8a12.pfb (Regular Minion at 12pt) used in the sample was generated as follows:

```
mmpfb
--width=535
--weight=400
--optical-size=12
-o pmnr8a12.pfb MinionMM.pfb
```

- the width value used is 535, thus expansion by 10 units corresponds to $535 \times (1 + 10/1000) = 540.35$.
- thus pmnr8a12+10.pfb would be generated as follows:

```
mmpfb
--width=540.35
--weight=400
--optical-size=12
-o pmnr8a12+10.pfb MinionMM.pfb
```

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Type 1 fonts

- use horizontal scaling to expand a font by the required amount
- uplr8a+10 (Palatino expanded by 10 units) will have a map entry like follows:

```
uplr8a+10
  "1.010 ExtendFont"
  <uplr8a.pfb
  <8a.enc
```

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The effect of font expansion on character width

- CM and Type 1 fonts: all characters are expanded by approximately the required amount
- MM fonts: depends rather on character shapes, the variance in character width is often much smaller than the required amount

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Choosing appropriate parameters

- the higher limit of expansion, the better word spacing
- but too much expansion impairs readability
- reasonable limits:
 - 20 units for CM/Type 1 fonts
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Minion at 12pt. Left: normal TeX output. Right: with font expansion by 4%.

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Expansion of selected characters

- certain characters are more sensitive to font expansion
- we want to expand such characters by a smaller amount
- character expansion factor: how much a character can be expanded
 - full expansion: 1000
 - no expansion: 0
 - 50% expansion: 500
- this can help to increase the limit of font expansion
- 30 for CM/Type 1 fonts and 60 for MM fonts

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Interletter spacing

- we use the expanded font metrics but do not expand the character shapes
- thus the amount gained by font expansion is distributed to space between letters.
- the effect on readability is not changed much in comparison with font expansion
- very sensitive eye can find that letter spacing causes a little bit more distortion of type than font expansion

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Selective use of multiple glyphs

- we apply font expansion only to several characters
- some letters have their wider counterparts
- these wider variants can be used according to the need to justify a line
- such wider glyphs should exist in the font for this purpose
- their appearance should be different from the base letterform, and should fit well with all other characters

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Conclusions

- marginal kerning:
 - turned out to be a very good thing to have
 - easy to use, no extra setup, no intervention to font metrics
 - the improvement is substantial
 - strongly recommended to regular use
- composing with font expansion
 - less desirable than marginal kerning
 - difficult to use (complicated font setup)
 - the improvement is not so substantial
 - misuse can heavily damage readability
 - not recommended for normal use
 - can be helpful in some rare applications where special care of interword spacing is desired
 - 2% of variance in character width is the limit

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