quasiresid-ual	qua-si-resid-ual
qua-sis-mooth	qua-si-smooth
qua-sis-ta-tion-ary	qua-si-sta-tion-ary
qu-a-si-tri-an-gu-lar	qua-si-tri-an-gu-lar
re-ar-range-ment	re-arrange-ment
Rie-man-nian	Rie-mann-ian
righ-teous(ness)	right-eous(-ness)
schedul-ing	sched-ul-ing
schot-tis-che	schot-tische
Schrodinger	Schro-ding-er
Schwarzschild	Schwarz-schild
semidef-i-nite	semi-def-i-nite
semi-ho-mo-th-etic	semi-ho-mo-thet-ic
seroepi-demi-o-log-i-cal	sero-epi-de-mi-o-log-i-cal
ser-vomech-a-nism	ser-vo-mech-anism
setup	set-up
severely	se-vere-ly
solenoid	so-le-noid
spheroid	spher-oid
spinors	spin-ors
stan-dalone	stand-alone
startling	star-tling
statis-tics	sta-tis-tics
stochas-tic	sto-chas-tic
Stokess-che	Stokes-sche
summable	sum-ma-ble
tele-g-ra-pher	te-leg-ra-pher
tech-nis-che	tech-ni-sche
ther-moe-las-tic	ther-mo-elas-tic
times-tamp	time-stamp
ve-r-all-ge-mein-erte	ver-all-ge-mein-erte
Verteilun-gen	Ver-tei-lun-gen
vs-pace	\vspace
Wahrschein-lichkeit-s-the-o-rie	Wahr-schein-lich-keits-the-o-rie
waveg-uide	wave-guide
whitesided	white-sided
whites-pace	white-space
widespread	wide-spread
Winch-ester	Win-ches-ter
workhorse	work-horse
wraparound	wrap-around
Yingy-ong Shuxue Jisuan	Ying-yong Shu-xue Ji-suan

Fonts

LaTeX Fonts and Suggested Magnifications

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In [1], BART CHILDS has presented several tables which contain fonts used by TeX and LaTeX. Such tables with all fonts required by a macro package are urgently needed in order to allow (TeX) system administrators or users to customize their fonts. But Bart Childs' tables miss some required fonts of LaTeX. Before I list all missing fonts I will give an overview about the way LaTeX does its font handling.

The data in this article is based on a UNIX tape from PIERRE MACKAY which was written in the beginning of June, 1988.

1. Font Handling of LaTeX

The font handling of LaTeX is described in the file `lfonts.tex` [4]. This file consists of four parts: First the principles of font usage are explained and commands are declared to realize these principles. Then all preloaded fonts are specified and the usage of the fonts is defined. Finally follows the definition of some LaTeX-specific symbols.

1.1. Principles

For LaTeX users several size-changing commands are available. According to the selected document style option they address different type sizes. Table 1 gives an overview about the used type sizes; it is taken from [5]. To realize the switch to the different type sizes, `lfonts.tex` contains a size changing (internal) command for each pt-size that is needed, e.g. `\xpt` for the switch to the 10pt-fonts and `\viiipt` for the 8pt-fonts. After giving one of these commands, the typeface change will be done in this size, e.g. `\xpt\bf` leads to the usage of font `cmbx10` and `\viiipt\bf` addresses font `cmbx8` (sic!).

In LaTeX fonts are grouped in three classes: (1) preloaded, (2) loaded-on-demand, and (3) unavailable. Please note that the expression 'preloaded' has a different meaning here than in the article of Bart Childs. There fonts are named 'preloaded' if they are provided in `plain.tex` with the control sequence `\preloaded`, i.e. the fonts of which the font metrics (from the `TFM` files) are loaded during an INITEX run and written to the `FMT` file, but which are not available directly for

SIZE	DEFAULT (10PT)	11PT	12PT
\tiny	5pt	6pt	6pt
\scriptsize	7pt	8pt	8pt
\footnotesize	8pt	9pt	10pt
\small	9pt	10pt	11pt
\normalsize	10pt	11pt	12pt
\large	12pt	12pt	14pt
\Large	14pt	14pt	17pt
\LARGE	17pt	17pt	20pt
\huge	20pt	20pt	25pt
\Huge	25pt	25pt	25pt

Table 1: Type Sizes

the user as control sequences (see [2, p. 350]). In this article 'preloaded' means all fonts of which the font metrics are loaded by INITEX. These are those fonts of which it is assumed that they are used often in many documents and where the TFM file should not be read every time again. The rest of the fonts LATEX uses are loaded at the time of the first usage.

From now on I call fonts of the class preloaded as P, loaded-on-demand as D, and unavailable as X.

All fonts of the class P are loaded in `lfonts.tex` with the command `\font`, with one line for each font. But 70% of the lines are commented out and serve only as indicators which other fonts could be preloaded this way.

The fonts of class D are loaded with the command `\@getfont` which also selects this font. These commands can be found in the third part of `lfonts.tex` where for each type size the fonts for the type faces are specified. E.g. the command

```
\def\pbf{\@getfont\pbf\bffam\@viiipt{cmbx8}}
```

in the definition of `\viiipt` means that the font `cmbx8` is to be loaded at the first usage.[1]

If a font is not available, i.e. is of class X, it will be substituted by another with the command `\@subfont`.

As the true font selection is done with the size changing commands like `\viiipt`, the simple change of fonts from class D to class P is not always successful. If, e.g., the font `\fivbf` is preloaded as `cmbx7 scaled 714` this doesn't prevent LATEX from loading the font `cmbx5` on demand. To achieve that a change of the definition of `\pbf` in `\vpt` would be necessary.

[1] This can happen, e.g., if some text in a footnote is typeset in bold face (for a standard document style in 10pt).

1.2. Actual Contents of `lfonts.tex`

The text fonts that are defined in `lfonts.tex` at the moment are listed in table 2 which is taken from [5].[2] All fonts which belong to class D were not listed by Bart Childs; a complete list can be found in section 1.4.

	\it	\bf	\sl	\sf	\sc	\tt
5pt	X	D	X	X	X	X
6pt	X	D	X	X	X	X
7pt	P	D	X	X	X	X
8pt	P	D	D	D	D	D
9pt	P	P	D	D	D	P
10pt	P	P	P	P	D	P
11pt	P	P	P	P	D	P
12pt	P	P	P	P	D	P
14pt	D	P	D	D	D	D
17pt	D	P	D	D	D	D
20pt	D	D	D	D	D	D
25pt	X	D	X	X	X	X

Table 2: Font Classes

For every installation a 'Local Guide' should be available (provided as a special version by the site coordinator!?) in which it can be looked up if `lfonts.tex` was changed so that additional fonts are used. (E.g. our Atari STTEX distribution contains no fonts of class X any more.)

Caveat: `lfonts.tex` contains inconsistencies in the definitions of boldface (`\pbf`) in 5pt resp. in 6pt, and in the definition of sans serif (`\psf`) in 17pt. The (outcommented) `\font` specifications are different from those which are loaded-on-demand. And `lfonts.tex` still contains a 'kludge': The font `amcsc10` (sic!) is used.

1.3. Desired Contents

`lfonts.tex` should be changed so that for the scaled `amcsc10` fonts corresponding `cmcsc10` fonts are used. And for all unavailable fonts corresponding scaled fonts could be provided. Of course it would be preferable to use fonts in the correct design size — the work of JOHN SAUTER is a step forward. But then `lfonts.tex` must be customized, too. There was a file on the UNIX tape which claims to be such a customized version, but this is only true for the fonts of class P. In class D they are

[2] Well, almost. In [5] `\it` in 5pt was classed as D which does not match `lfonts.tex`.

still loaded in different magnifications. (But this is described in `lfonts.tex` itself—if all else fails...)

1.4. Required Fonts

In addition to those specified by Bart Childs, LaTeX uses the following fonts (all of class *D*).[3]

unscaled: `cmbx5`, `cmbx6`, `cmbx8`, `cmsl8`, `cmsl9`, `cmss8`, `cmss9`, `cmss17`, and `cmtt8`.

in `\magstep0` up to `\magstep2` (for bold math): `cmbsy10`, `cmmib10`, and `lasyb10`.

in `\magstep2` up to `\magstep4`: `cmsl10`, `cmti10`, and `cmtt10`.

in `\magstep2` and `\magstep4`: `cmss10`.

in `\magstep4` and `\magstep5`: `cmbx10`.

Caps and small caps: `cmcsc10` with scale factors `\magstep0` up to 4, `amcsc10 scaled 800` and `900`.

2. Font Groups Revisited

Now I will summarize all changes in the tables of Bart Childs that result from section 1. The table numbers are those of [1].

2.1. Additional Magnifications

The additionally needed magsteps are listed in section 1.4.

2.2. A Missing Font

The font `cmbsy10` is missing in the tables. It belongs to table 2 ('LaTeX Fonts') and is needed in the magnifications `\magstep0` up to `\magstep2`.

2.3. Rearrangements

The three fonts `cmcsc10`, `cmss17`, and `cmtt8`[4] from table 4 ('Fonts for Emphasis') must be moved to table 2 ('LaTeX Fonts').

Eight of the 'definite candidates for saving disk space' from table 5 are urgently needed by LaTeX and belong therefore to table 2: `cmbx6`, `cmbx8`, `cmmib10`, `cmsl8`, `cmsl9`, `cmss8`, `cmss9`, and `lasyb10`.

The fonts `cmtex8` and `cmtex10` can be moved from table 4 to table 5. They are only needed by `WEB` for the presentation of the extended character set (in strings) and are generally not necessary for installations that don't use `WEB`.

2.4. Non-standard Fonts

The fonts `lasyb5`, ..., `lasyb9` are unknown to me. They do not exist on the UNIX tape and are not mentioned in `lfonts.tex`. So they should be removed from table 5 (which will leave 10 of the 21 fonts).

Additionally it must be mentioned that the fonts `flogo` and `sklogo` are rather new and do not yet exist in all installations.

A delivery should never contain fonts named `gray`. As Knuth writes in [3] on page 330, all gray fonts are device dependent. Therefore they should be called `grimagen` or something like that—different `TFM` files are needed, too. During installation the local system administrator can rename his 'default' device dependent gray font to `gray`.

3. Conclusion

This article presents the principles of font usage in LaTeX and describes changes that should be made in the tables of Bart Childs in [1]. But this will still only result in a minimal subset of delivered fonts; additional requirements may come from macro package independent applications. E.g., the fonts scaled `\magstep2` are often used to reduce the resulting document afterwards: thus a resolution of 432 dpi can be achieved on a 300 dpi printer. The scaling factor `\magstep4` is often used for the preparation of slides if SliTeX is not used.

Because of these and other reasons we deliver with our sTeX all fonts in all seven magnification steps from `\magstep0` up to `\magstep5` (except for the fonts of SliTeX). Additionally we have included reduced fonts to discard the class *X*. But they will be replaced by fonts in the correct design sizes soon: I fully agree with the statements of Pierre MacKay and Bart Childs about 'scaled fonts.'

References

[1] Bart Childs. TeXfonts and suggested magnifications. *TUGboat*, 9(2):129–130, 1988.

[2] Donald E. Knuth. *The TeXbook*, volume A of *Computers and Typesetting*. Addison-Wesley Publishing Company, Reading, Massachusetts, 1986.

[3] Donald E. Knuth. *The METAFONTbook*, volume C of *Computers and Typesetting*. Addison-Wesley Publishing Company, Reading, Massachusetts, 1986.

[4] Leslie Lamport. `lfonts.tex`. TeX Macro File, DEC SRC, 11 November 1986.

[5] Leslie Lamport. *Using LaTeX at SRC*. DEC SRC, 17 January 1987.

[3] The font `cmbx7` (class *D*) was already mentioned by Bart Childs in his table 1.

[4] `cmtt8` is listed in table 3, too.