Fonts

lxfonts: LaTeX slide fonts revived

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Abstract

The LaTeX 2ε class `slides` used special fonts whose readability was exceptional. However, despite being part of the TeX system, they were not particularly efficient where mathematics was concerned. Since the time the LaTeX3 Team abandoned `slides`, they have almost disappeared.

This article describes the modifications and enhancements made to revive these historical fonts, and explains the package making the new font version usable with modern presentation classes, in order to produce slides that were unthinkable during the olden times of `slides`.

1 Some history

Once upon a time there was a program, SliTeX [4], when the TeX interpreter's version was 2.x. This was the 1980s, almost the prehistory of TeX, certainly LaTeX's infancy, when in order to typeset a document in a language different from English it was necessary to have suitable format files, since that old TeX could handle only one hyphenation pattern set at a time.

With version 3.0 of TeX, the ability to typeset in a variety of languages different from English spread the TeX system, with its LaTeX dialect, in the old continent, and it became so important that the Europeans set up the LaTeX3 team. This new team produced, in 1994, the new LaTeX 2ε, and with this SliTeX died for good, replaced by the standard class `slides` [5].

Actually, other than using the same interpreter and the same LaTeX set of macros, with the `slides` class things did not change very much. In the short term, in 1999 the LaTeX3 team gave up the maintenance of the `slides` class; even if it still is a standard LaTeX class distributed with every new release of the TeX system, the Team formally invited the users of TeX to develop new classes to produce presentations and slide shows. This warm invitation included the strong suggestion that such new creations should be made available to the whole TeX user community.

For these reasons, in the past several years we have witnessed the proliferation of many systems, packages and classes to produce excellent presentations, fully colored, with some animations, making use of a large variety of outline fonts, particularly well suited for use with modern video beamers.

In this article I describe the old fonts used by SliTeX and by the `slides` class, with their pros and cons. I further describe the modifications I have introduced, and in particular how I produced their PostScript versions, necessary in order to be used with the modern classes and packages. I describe the `.sty` file with which a complete substitution of the CM/EC (Computer Modern/European Modern) or LM (Latin Modern) families, together with the American Mathematical Society's fonts may be made in order to produce nice presentations that use such fonts and exploit their legibility. What I produced may be considered an alpha-release; in order to become a beta or a definitive release, some feedback is required so as to repair the various glitches that may possibly still be present (and certainly there are many...).

2 The quotation fonts

The SliTeX fonts derive from the ones that Knuth created for typesetting those witty quotations at the end of every chapter of *The TeXbook* [2] and *The METAFONTbook* [3].

They are sans serif fonts, formally designed at a design size of 8 pt, but with a large x-height and short ascenders and descenders. Anybody who handled those books knows perfectly what we are talking about, but here a specimen is replicated in order to describe the successive modifications.

> *If you can't solve a problem,*
> *you can always look up the answer.*
> *But please, try first to solve it by yourself;*
> *then you'll learn more and you'll learn faster.*
> — DONALD E. KNUTH, *The TeXbook* (1983)

The elegance and style of this sans serif font is immediately evident, simple and perfectly readable. Although it is used at size 8 pt, its x-height appears as large as that of the roman font of the main text.

Its drawback, though, is that the lower case 'l' and the upper case 'I' and, in math mode (not shown), the 'absolute value' sign are indistinguishable. This appealing font, well-suited for Knuth's quotations, is thus not suited for typesetting mathematics.

3 The slide fonts

This is why since the beginning of SliTeX, Leslie Lamport created a new font for slides by modifying

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the quotation fonts, essentially by substituting the upper case 'i' with a seriffed variant.

If you can't solve a problem,
you can always look up the answer.
But please, try first to solve it by yourself;
then you'll learn more and you'll learn faster.
— DONALD E. KNUTH, *The TEXbook* (1983)

4 The new fonts for slides

As is clear from the previous example, this modified capital 'I' solves part of the problem; there remains the fact that the lower case 'l' may still be confused with the mathematical sign for marking the absolute value, or the norm, or this sort of mathematical entity.

For this reason, the new fonts under discussion here have been created with the lowercase 'l' drawn with a hook at the bottom, similar to the foot of the lower case 't'. The result is the following.

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you can always look up the answer.
But please, try first to solve it by yourself;
then you'll learn more and you'll learn faster.
— DONALD E. KNUTH, *The TEXbook* (1983)

Of course this also implies the modification of the metric files `.tfm`, and, more intrusive than anything else, the correction of all the ligatures and kerns where the lower case 'l' is involved. Having designed these fonts for both the old OT1 and the T1 Latin encodings, this implied also the Polish ł with its kerns, and all the other signs where some sort of diacritic mark is used with the base sign 'l'. The revisions involved both the normal and the slanted styles, as well as both the medium and the bold weights. For completeness, the same design parameters were used for the Text Companion font in encoding TS1 in all its versions, so that the new fonts could be paired harmoniously.

5 Typesetting problems in mathematics

When typesetting mathematics new problems arise; in the old SliTeX math expressions were typeset with the normal CM math fonts; but this produced undesirable effects even beyond the obvious stylistic clash, because the operators font was substituted by the upright version of the slide fonts, but all the other signs were taken from the letters, symbols, and large delimiters CM fonts. This produced a bad rendering of those signs that were produced by kerning a symbol from the operators font and another symbol from the symbols font. For example, the double long arrows are produced by joining an 'equals sign' from the operators font and a 'double arrow tip' from the symbols font. It seems complicated, but it suffices to observe the `\Longrightarrow` sign $\Longrightarrow$ to understand the problem; the mathematical axes do not match and the stroke thicknesses are different; the final result is very unsatisfying.

For math mode typesetting it was thus necessary to create math fonts that had the same design parameters as the new slide fonts. This implied the creation of the 'letters' font (essentially the math italics, the Greek upper and lower case letters and a good number of other symbols), the symbols font (most operator symbols, the old style numbers and the calligraphic letters), and the large delimiters and display math operators font. This further work did not consist simply of changing the design parameters in the master METAFONT file, but also reviewing each glyph in order to assure its adequacy to the typesetting of (hopefully) beautiful mathematics, as good as the CM math fonts do in normal text. Those unsatisfying compound math signs, so frequent in the definitions of math symbols, had to be checked one by one, in order to assure the perfect match of the new glyphs with one another.

6 Examples

Besides the last text example in section 4, I now show some examples where different series and typesetting modes are mixed.

6.1 The medium and the bold series

The preceding running title is typeset with the **bold** series, while this text is composed with the **medium** one.

Notice that the previous example, unlike the one given in section 4, is typeset at size 10 pt, as is this normal text (which is typeset with the standard roman font of the CM collection). The larger x-height induces one to think that the example is typeset with a larger font, possibly size 12 pt.

6.2 The font sizes

The new font, like the old one, is designed at just one size, and other sizes are obtained by shrinking or enlarging this single size. Table 1 shows some sizes and it's evident that the smaller sizes are definitely too thin, while the larger ones do not appear blacker as the normal CM fonts do, with their multiple design sizes.

But this is a deficiency that was already inherent in the old slide font, and it also manifests itself with the vast majority of the available Type 1 or Open Type fonts when they are excessively shrunk or magnified.

Size	Example
5 pt	ABCD abcd
7 pt	ABCD abcd
10 pt	ABCD abcd
12 pt	ABCD abcd
14 pt	ABCD abcd
17 pt	ABCD abcd
20 pt	ABCD abcd

Table 1: The new font in different sizes

As things are, the first level sub- and superscripts are certainly readable, while the second level ones may be a bit too thin. Nevertheless, some of the examples shown below contain such second-order subscripts, and one hardly notices they are so thin.

6.3 Comparison with the standard sans serif CM font

It's interesting to compare the normal sans serif font selectable with the command `\textsf`, with the new font drawn at the same optical size — see table 2. It's evident that the new font, in spite of being at the same size, appears definitely larger than the normal sans serif one.

OT1/cmss	abcdefghijklmnopqrstuvwxyz
OT1/llcmss	abcdefghijklmnopqrstuvwxyz

Table 2: The regular CM sans serif font compared with the slide font

6.4 Some mathematics

It's worth typesetting some simple math expression as if we were preparing a slide: see figure 1. Probably at first sight what strikes our attention is that the exponents are a little lighter than expected, since we are used to math expressions typeset with the CM math fonts, where exponents are drawn from the right optical size, not merely reduced versions of a larger size. But this problem, as was already pointed out, occurs with almost all outline fonts, except those specific to the TEX system collections where optical sizes are conveniently available, especially for purposes of typesetting math.

Another point is that math italics are real italics, not a slanted version of the upright font, as happens with the default settings for some classes for slide production and conference presentations. This happens with both CM sans serif fonts and with Helvetica, the two most common sans serif fonts for preparing

The second degree equation with constant real coefficients:

$$ax^2 + bx + c = 0 \tag{1}$$

has solutions

$$x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \tag{2}$$

with

$$\begin{cases} x_{1,2} \in \mathbb{R} & \text{se } b^2 - 4ac > 0 \\ x_1 = x_2 = -\dfrac{b}{2a} & \text{se } b^2 - 4ac = 0 \\ x_{1,2} \in \mathbb{C} & \text{se } b^2 - 4ac < 0 \end{cases} \tag{3}$$

Figure 1: Some text and math

presentations.

Another point is evident: figure 1 contains symbols, such as the blackboard bold capital letters, that belong to the AMS math font collections. Yes, the new slide font collection contains also the sans serif version of the AMS fonts, redrawn with the same graphic parameters used for the other fonts of this collection.

The equations shown in figure 1 appear out of their typical context of a slide show, since they are intermixed with the rest of this article's text, typeset with the normal Computer Modern roman font. It is better to examine a whole slide show displayed with an actual projector in order to appreciate the beautiful effect of these fonts maintaining the legibility associated with the old SLiTEX. To this end, the new fonts' distribution package contains a demo beamer show contained in the file `Slidesfonts-demo.pdf` where everything is typeset with these new fonts and where some more information is given in addition to what is provided here.

6.5 Some more math

Of course it is impossible to display here all the available LATEX math symbols, AMS math included. Nevertheless, in order to evaluate what you can get with these new fonts when typesetting math, it's worthwhile to typeset some more expressions, for example an expression where large operators appear; see figure 2.

Notice that the expression in figure 2 contains also the counterclockwise oriented circle, taken from the redrawn AMS math font collection.

Another formula, figure 3, contains a triple integral, a typical construct obtainable with standard amsmath commands, but here they directly access the newly redrawn math symbols and operators. The

The residues theorem states that if $f(z)$: $z, f \in \mathbb{C}$ is analytic in $\mathbb{D}$ except in a finite set of singularities, then it is

$$\oint_\gamma f(z)\,\mathrm{d}z = 2\pi\mathrm{j}\sum_{k=1}^{N_{\mathsf{sing}}} R_k$$

where γ is a simply connected line totally lying in $\mathbb{D}$ and N_{sing} is the number of singularities contained within γ.

Figure 2: Some more math

$$\iiint_V F(\boldsymbol{P})\,\mathrm{d}x\,\mathrm{d}y\,\mathrm{d}z$$

Figure 3: Large operators

mixture of medium and bold math symbols is obtained with the `\boldsymbol` command, but all the symbols are taken from the new fonts.

More examples could be produced endlessly — all constructs that can be typeset with LaTeX and its extension packages are compatible with the new fonts.

7 Text symbols

Since the Text Companion font [7] has also been redrawn with the graphic parameters of these fonts, all symbols available with that Companion font are accessible together with these slide fonts; some glyphs are shown in figure 4.

£ μ Ω ¥ $ € ℃

Figure 4: A specimen of Text Companion symbols

Notice in particular the Euro symbol: in contrast to the original Text Companion font, this glyph is without serifs, according to the style of these new slide fonts.

Obviously this font variety has the same shapes and series of the main text font, that is upright medium and bold, and slanted medium and bold; the italic variant is missing as is customary with sans serif fonts. In any case, with symbols the difference between slanted and italics is rather uncertain.

8 The PostScript Type 1 implementation

All fonts described so far have been transformed into PostScript Type 1 format by means of mftrace [8]. This script provides for calling a number of other programs in order to trace the contours of bitmapped fonts produced with METAFONT, clean up the results, and assemble the final `.pfb` font files.

In order to complete this transformation it is necessary to use particular encoding vectors; for the American Mathematical Society fonts such encoding vectors were not distributed with TeX Live in 2007, so it was necessary to create them. They are included in this font distribution package in the enc subdirectory; although they should not be necessary in normal use, now they are available.

9 Font installation

In order to use these fonts, it is necessary to install them. If the bitmapped versions are sufficient, then the `.mf` and the `.tfm` file should be copied to the right folders and the file name database should be updated.

Since the outline versions are available, there is no reason to avoid their installation. It is a little trickier than with the ordinary METAFONT version, but the instructions are given in the documentation contained in the distribution package. See also [6].

In fact, installation of the outline fonts is highly recommended. Even if PDF viewers are improving, it's still true that bitmapped fonts are not particularly suited for reading a document at various magnifications: enlarged bitmapped fonts appear as small tiles set close together, instead of fonts with smooth contours. Moreover, bitmapped fonts should be avoided when one uses programs, such as pdflatex, that directly use outline fonts, for the very reason described above. Presentations, which these fonts were intended for, are of course typically produced in PDF format.

10 The extension package for the fonts

Last and perhaps most important of all, it is necessary to copy `lxfonts.sty` into a suitable folder where LaTeX can find it.

This file, `lxfonts.sty`, is the keystone of the whole building, but it must be used with care. It must be invoked by means of `\usepackage` *after* all other font related packages have been loaded.

Some details:

- If no special font choices are made, the default settings of `lxfonts.sty` is to choose the `OT1` font encoding (not recommended when typesetting in languages that use many diacritical marks), and neither the Text Companion nor the AMS fonts are loaded.
- If the `T1` encoding is specified, then the package loads the `T1` encoded fonts, which is recommended when typesetting in most Latin-based languages other than English.
- If the Text Companion font was invoked, then `lxfonts.sty` loads the new substitution font,

in the sense that all normal Text Companion commands that access glyphs from the original font, after this substitution, access the glyphs from the new font.

- Finally, if the amsmath package was called for, that is, if the AMS math symbols are required, then the `lxfonts.sty` file takes care of substituting the original AMS fonts by the new ones.

There is no declaration to make in order to use these new fonts; everything is needed is provided by the new `lxfonts.sty` file. The curious ones who want to dig into this file will find only family and shape definitions that refer to just one size, 8 pt, that is magnified or shrunk according to necessity during the various typesetting stages. For this reason it is particularly convenient to use the scalable outline fonts; their installation might be a little tricky, but it is worth the effort.

11 Suggestions

The simple examples shown in the previous sections of this printed paper demonstrate the pros and cons of these new fonts. In particular, they display the extreme lightness of the smaller sizes, and this, perhaps, is the primary drawback of these fonts.

But when you use them for producing presentations, for example with the beamer class, you get the best out of them, because they appear to be particularly suited for presentations; after all, they were originally conceived with this aim as part of the old SliTeX system. And it is for this very reason that is suggested to avoid using these fonts for anything but presentations and, perhaps, for text to be printed at very large sizes.

12 Conclusion

While building these fonts I had to correct a certain number of glitches in the original METAFONT files originally produced by the American Mathematical Society. These glitches probably never showed up because nobody (I suppose) needed to produce new fonts with different graphical parameters while using the same METAFONT programs. By experience I know that more often than not the character programs are tweaked to the necessities of the graphic parameters, and probably I did the same with the AMS fonts. I do not want to blame at all the AMS experts who designed the AMS fonts, because their work is excellent and their fonts have been used for decades now, to the complete satisfaction of every user. I simply noticed that their METAFONT programming was specific for the particular glyphs that had to be produced.

The same holds true for the Text Companion fonts, where I had to 'correct' only the Euro sign — the original serifed one gave very strange results with the new parameters.

I am sure that many other corrections are necessary, but being the only user of these new fonts, I have not been able to discover more. Therefore the lxfonts package now available on CTAN [1] must be considered an alpha version, though reliably usable.

Therefore I invite all interested readers to use these new fonts, discover where they should be corrected and give me feedback on their findings. As with every piece of free and open source software, these fonts get better when constructive criticism is provided by the users, not to mention the software contribution that competent users can offer.

References

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