Modernizing Computer Modern Fonts

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Many TEX users know that the workhorse TEX font, Computer Modern Roman (CMR; we'll refer frequently to the Computer Modern fonts as CM), was modelled after a real-life font called Modern 8a. To name a font in this way is to invite questions: are there other members in the Modern font sequence? what does the suffix 'a' denote? I can't claim comprehensive answers to these questions, but I've kept my eyes and ears open over the years, and have occasionally come across other members of this font family. One of my most intriguing possessions is of a novel by Herman Melville set entirely in Modern fonts, namely numbers 8 (no suffix) and 4. Appropriately enough, the novel is called *Typee*! These types are extremely readable. In fact, they positively invite the reader to set a spell and lose themself in the volume.

The digital age has not been kind to this superfamily of fonts. As far as I can tell, only one of the Modern types is available in digital form. (I welcome correction on these matters.) The font in question is called simply Monotype Modern, and is, to my eyes, extremely handsome; see figure 1 for an extended selection .

Monotype Modern bears an unquestioned resemblance to Computer Modern (or is it the other way 'round?), but somehow the printed page using this font comes across as brighter and more interesting, at least to my eyes. The TEX user quickly comes a cropper when she tries to adapt this font for use with TEX—there are no expert fonts available for Monotype Modern, so matching small caps and the full suite of double-f ligatures appear to be unavailable.

The purpose of my work in this area has been to try to flesh out this font to the point where not only are all ligatures and small caps are available, but matching math fonts and some others specialty fonts are available too.

This is a test of the TEX typesetting system. Abcd Efgh Ijkl Mnop Qrst Uvwx Yzab; Cdeg Ghij Klmn Opqr Stuv Wxyz. (0123456789!)
Nàíve garçöñ.
The quick brown fox jumps over the lazy cow. Now is the time for all good men to come to the aid of the party.
Efficient effluent effectively fights flightiness.

Do you see this Ring?
'T is Rome-work, made to match
(By Castellani's imitative craft)
Etrurian circlets found, some happy morn,
After a dropping April; found alive
Spark-like 'mid unearthed slope-side figtree-roots
That roof old tombs at Chiusi; soft, you see,
Yet crisp as jewel-cutting. There's one trick,
(Craftsmen instruct me) one approved device
And but one, fits such slivers of pure gold
As this was, such mere oozings from the mine,
Virgin as oval tawny pendent tear
At beehive-edge when ripened combs o'erfow,
Since hammer needs must widen out the round,
And file emboss it fine with lily-flowers,
Ere the stuff grow a ring-thing right to wear.
(Browning, *The Ring and the Book*)

Figure 1: An extended selection set in Monotype Modern.

A Meta-font Monotype Modern?

My first approach was reasonable, but misguided. I reasoned that if I carefully measured the dimensions of the anatomy of letters in a Modern font, and then put those values in a METAFONT parameter file,

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Figure 2: Monotype Modern plus meta-ligatures in one virtual font.

then METAFONT could simply generate a variant of Computer Modern which would essentially "be" Monotype Modern. This approach appealed to me for a variety of reasons. First of all, it was an excuse to mess around with METAFONT, one of the neater computer languages around! Second, I looked forward to being able to "discover" in this way a new and exciting typeface that lay hidden in the space of all possible values of parameter values.

Although this approach remained my meat-and-potatoes approach for this project, it was far from satisfactory. Basically, the letter forms of the Monotype font were often different in non-trivial ways than their meta-font cousins. The strokes were different in kind. For example, many thin strokes in CM (Computer Modern) are modelled by a curved pen stroke:  . However, the corresponding part of a MM (Monotype Modern) font did not have the feel of a stroke:  . There's no reason why METAFONT's `stroke` commands couldn't mimic this kind of form, but that's not how the CM fonts have been set up.

I had looked forward to a meta-Monotype Modern font, but *c'est la vie*. Really, though, such a font would have been overkill—after all, Monotype's own Modern font is perfectly good enough—or is it? Could I create proper sets of ligatures and small caps in the closest Meta-equivalent to MM, to create a virtual font which would combine the meta-ligatures and small caps to the Monotype glyphs, and to see how all this looks?

I decided that measuring the parameters of Monotype Modern and inserting them into a METAFONT parameter file would give me the "best" approximation to MM possible from the existing CM-METAFONT program files. Measuring was easy, but a bit tedious. You can easily do this by creating a document with the MM font at some humongous design size, say 500-pt. Then, you view it under Ghostscript. It's a little-known fact, but under the 'Edit' pull-down menu, there's an option called 'Measure'. If you click on this option, you awaken the utility that allows you to measure distances on screen between a click of the mouse and any other position. Thus, it's easy enough to measure the 61 parameters that go into a meta-font. The resulting font, though, didn't look much like Monotype Modern—it still bore the look and feel of a CM font.

It was my hope, though, that the double-f ligatures, the oldstyle numerals, and the small caps generated in this manner were visually compatible with MM. It was relatively easy to cobble together a virtual font that incorporates the glyphs from MM

THIS IS A TEST OF THE TEX TYPESETTING SYSTEM. ABCD EFGH IJKL MNOP QRST UVWX YZAB; CDEG GHIJ KLMN OPQR STUV WXYZ. (01 23 456 789!) (THIS IS THE FAKE SMALL CAPS FONT.)

THIS IS A TEST OF THE TEX TYPESETTING SYSTEM. ABCD EFGH IJKL MNOP QRST UVWX YZAB; CDEG GHIJ KLMN OPQR STUV WXYZ. (01 23 456 789!) (THIS IS THE MM PLUS METAFONT-MODIFIED SMALL CAPS FONT.)

Figure 3: Comparison viewing—fake small caps (top) versus the real thing (bottom).

together with the METAFONT ligatures. A specimen from this font appears in figure 2.

Many people think that SMALL CAPS fonts are easy to create—simply use scaled-down uppercase letters as the lowercase counterparts in a small-caps font. This is not a bad approximation to such a font, but the proportions are not quite right, and any hard-core TEX user rejects this solution! In figure 3, you see the comparison between a MM fake small caps font, and a "real" small caps font, created with uppercase characters drawn from MM and lowercase letters drawn from a METAFONT approximation to MM-small caps. You should see that the second example is better.

Bold-face I've always found the decision to use `cmbx` as the workhorse **bold** font in TEX to be a mysterious one. To my mind, this font is far too in-your-face. Moreover, the bold face in all Modern, non-TEX contexts never resembles these fonts, but rather the bold font that's part of the MM suite of fonts, which closely resembles `cmb10` (at least at a 10-pt design size).

In figure 4, we see the virtual, improved version of MM Bold. The strategy is the same: we begin with font `mmb10`, the closest approximation we can make to MM Bold, and then we "virtualize" a new bold font that contains the `mmb10` ligatures with the MM Bold glyphs.

Italic Italic follows the same pattern. We create a font `mmti10`, a close approximation to MM Italic, and then we form the appropriate virtual font. This font appears in figure 5. To my eyes, this is the least successful experiment of all the ones I describe in this article, for the CM curves are somehow less pleasing than the MM curves.

This is a test of a modified bold font. This is a test of the TEX typesetting system. Abcd Efgh Ijkl Mnop Qrst Uvwx Yzab; Cdeg Ghij Klmn Opqr Stuv Wxyz. (0123456789!)

Nàíve garçöñ.

The quick brown fox jumps over the lazy cow. Now is the time for all good men to come to the aid of the party. Efficient effluent effectively fights flightiness.

Bold with roman. This is **bold** together with Modernized Roman.

Figure 4: Testing a modified bold font.

This is a test of mcmri7t, a modified italic font. This is a test of the TEX typesetting system. Abcd Efgh Ijkl Mnop Qrst Uvwx Yzab; Cdeg Ghij Klmn Opqr Stuv Wxyz. (0123456789!)

Nàíve garçöñ.

The quick brown fox jumps over the lazy cow. Now is the time for all good men to come to the aid of the party. Efficient effluent effectively fights flightiness.

Figure 5: Testing a modified italic font.

Sans-serif and typewriter fonts For some reason, a matching sans-serif to Monotype Modern was difficult to conjure up. In the course of my experiments, I stumbled upon one version, a sans serif of figure 6 that has an interesting 1920's *art deco* flavor to it that would not be out of place for the title of an Agatha Christie reprint or the cover of the *New Yorker* magazine. Close scrutiny shows some strokes of some types that need fixing; these are high on my to-do list. The best I could do for a more normal sans serif appears in figure 7.

I don't quite know how to characterize the quirkiness of the `mmtt10` font, although I personally like it. Take a look for yourself at figure 8 to decide how to characterize it. The proportionally greater

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Nàíve garçöñ.

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Figure 6: Modernized Modern 'art deco' sans serif.

Here's some Roman. This is a test of the TEX typesetting system. Abcd Efgh Ijkl Mnop Qrst Uvwx Yzab; Cdeg Ghij Klmn Opqr Stuv Wxyz. (0123456789!)

Nàíve garçöñ.

The quick brown fox jumps over the lazy cow. Now is the time for all good men to come to the aid of the party. Efficient effluent effectively fights flightiness. Here's some Roman.

Figure 7: Modernized Modern sans serif.

depth of the descending characters is the strongest contributor to this slight idiosyncrasy.

Math fonts

In addition to your choice of text fonts, you need three kinds of special fonts in order to typeset mathematics properly. The first is the extension font, `cmex10`, and I decided to use this unchanged for "`mmex10`." In the same way, we need special symbol fonts, this time at three sizes, and I've appropriated them unchanged from CM. These have the names `cmsy10`, `cmsy7`, and `cmsy5`.

We also need three sizes of special math italic fonts. Although with other font families, we have to somehow adapt the text italic for math, it's nice here to be able to adapt the *cmmi* fonts. That's because Knuth paid close attention to certain details, such as a special math italic *a* (compare the text italic *a*) that you just don't see in these other fonts. I adapted them simply by adjusting the gross parameters—figure height, cap height, x-height, and so on—but leaving other parameters alone. The resulting math italics don't quite match the text font, but perhaps they shouldn't. After all, math *is* different from text. Anyway, the match is close enough. A sample appears in figure 9, and I hope you agree.

Installing and using the fonts

Notice: **Whenever you install new files or fonts, don't fail to update or refresh the filename database used by your version of TEX!** This filename updating is a consequence of Kpathsea's file searching mechanism which has become an integral component of most modern TEX's, or so I believe.

Let me emphasize that these fonts are no good without the Monotype Modern fonts in hand. You need them—you need to *buy* them, plus you need the adjunct files (`.tfm`, `.vf`, `.fd`, etc. files) to make them usable by TEX. These additional files

should be available for downloading from CTAN; the fontname family name is `mmo`.

The fonts here require ten METAFONT source files. These files have names like `mmr10.mf`, and should all be placed in a directory like

⟨*texmf*⟩`/fonts/source/public/modern`

In addition, place all `.tfm` and `.vf` font files in your TEX system in places like

⟨*texmf*⟩`/fonts/tfm/public/modern`

and

⟨*texmf*⟩`/fonts/vf/public/modern`.

Finally, put the files `moderniz.tex` and `moderniz.sty` in

⟨*texmf*⟩`/tex/plain/public/modern`

and

⟨*texmf*⟩`/tex/latex/public/modern`.

Plain documents To create documents in plain TEX, place the statement

```
\input moderniz
```

at the beginning of your source file. Thereafter, nicknames like `\it` and `\bf` use the modernized fonts. Note that this macro file provides two new commands, `\sc` and `\sans` for small caps and sans serif. To use the art deco font, place a statement like

```
\font\deco=mmdeco10
```

in your source, after which `\deco` invokes this font.

LATEX documents Place the incantation

```
\usepackage{moderniz}
```

following the `\documentclass` command. In the document, commands like `\rm`, `\bf`, `\it`, `\sc`, and `\tt` select modernized fonts. To use sans serif fonts, select font family `mmss` with the medium and normal series and shape:

```
\fontfamily{mmss}\fontseries{m}
  \fontshape{n}\selectfont
```

To use the art deco font, use the `de` fontshape:

```
\fontfamily{mmss}\fontseries{m}
  \fontshape{de}\selectfont
```

The normal math delimiters work to select the modernized math fonts.

Here's some Roman. This is the slightly quirky typewriter font that is part of the Modernized Computer Modern family. This is a test of the TEX typesetting system. Abcd Efgh Ijkl Mnop Qrst Uvwx Yzab; Cdeg Ghij Klmn Opqr Stuv Wxyz. (01 23 456 789!)

Nàíve garçöñ.

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Figure 8: Modernized Modern typewriter.

This is a test of the Modernized Computer Modern fonts. Let's do math: $\kappa = \int_0^{\frac{\pi}{2}} e^{-x^2}\,dx = \frac{\sqrt{2}}{\phi!}$. This doesn't look so bad.

Let's do some display math!

$$\kappa_{543_{21}} = \int_0^{\frac{\pi}{2}} e^{-x^2}\,dx = \frac{\sqrt{2}}{\phi!} \quad f'(x) = \frac{df}{dx} = \sum_{n=0}^{\infty} \frac{1}{x^i}$$

That's all, folks!

Figure 9: A snippet of modernized math, together with some text fonts.

Conclusion

This package can be obtained from CTAN. Alas, as of this writing, the exact folder there is not known. Please report all bugs, suggestions, or comments to the author at

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Thanks!