

# 1 mftrace - Scalable PostScript Fonts for MetaFont

## 1.1 Introduction

**mftrace** is a small Python program that lets you trace a TeX bitmap font into a PFA or PFB font (A PostScript Type1 Scalable Font) or TTF (TrueType) font. It is licensed under the GNU GPL.

Scalable fonts offer many advantages over bitmaps, as they allow documents to render correctly at many printer resolutions. Moreover, Ghostscript can generate much better PDF, if given scalable PostScript fonts.

Versions prior to 1.0.5 were called ‘pktrace’.

## 1.2 Download

- <http://lilypond.org/download/sources/mftrace/mftrace-1.2.20.tar.gz>
- GIT at <https://github.com/hanwen/mftrace>

## 1.3 Required

**mftrace** is a thin Python wrapper around some other programs that do the real work: a tracing program and `tlasm`. To run **mftrace** you need:

- A tracing program: `autotrace`  $\geq$  0.30 (see <http://autotrace.sourceforge.net> or `potrace` (see <http://potrace.sourceforge.net>).

Potrace is recommended as it runs quicker than `autotrace`.

- Python-2.2 or later. See <http://www.python.org/>
- `tlutils`. See <http://www.lcdf.org/~eddieltwo/type/>
- TeX—your tex installation should include
  - `kpsewhich`,
  - MetaFont

## 1.4 Recommended

- A recent version (040215 or newer) of FontForge (<http://fontforge.sourceforge.net>). Some of **mftrace** functionality requires FontForge to be present on user’s system. This includes rounding to integer, simplifying and autohinting font outlines, as well as generating any output formats except PFA, PFB and AFM. You should not request any of these features using **mftrace** options if you don’t like your font to be run through FontForge (note that in this case you also have to explicitly specify `--noround` to disable rounding to integer).
- Alternatively, you need GhostScript with its `printafm` utility, available somewhere in your PATH. **mftrace** uses `printafm` to generate AFM files in case there is no need to process the font with FontForge.

## 1.5 Red Hat

A RPM may be built by issuing

```
rpmbuild -tb mftrace-version.tar.gz
```

## 1.6 Debian GNU/Linux

Users of Debian unstable (and Debian 3.0 when it is released) can install all requirements by running (as root):

```
apt-get install mftrace
```

If you wish to also install the FontForge package to simplify and autohint the font, then run the command

```
apt-get install fontforge
```

## 1.7 Install

Install the prerequisite packages. Then run

```
./configure  
make install
```

in the mftrace directory. Run as follows:

```
mftrace cmr10
```

## 1.8 Invoking mftrace.

Command line options:

**--formats=LIST**

A comma-separated list of formats to generate. Choices include: AFM, PFA, PFB, TTF and SVG. Default is to generate a PFA file. Note that **fontforge** needs to be installed in order to generate any format except PFA or PFB. For generating AFM you need either **fontforge** or **ghostscript**.

**-e,--encoding=enc**

Use encoding file *enc*. Encoding files used by **mftrace** are basically in the GhostScript/dvips format, but you may use a special **.notavail** glyph name in order to tell mftrace not to process a specific glyph. If this option is not specified, mftrace will try to determine the encoding file automatically, from the encoding specified in the TFM file.

**--glyphs=*list***  
 Only process glyphs in *list*, which is a comma-delimited list of decimal numbers or ranges.  
     **--glyphs 1-10,50,55,90-100**

**--gffile=*name***  
 = Take glyphs from file *name*.

**--grid *gridsize***  
 Set reciprocal grid size in em units multiplied by ratio magnification/1000. For example **--grid 10 --magnification 1000** will round coordinates of control points to 1/10 of em unit. Useful simultaneously with **--noround** option. Default *gridsize* value is 1, i. e. round to integer.

**-h, --help**  
 help on options.

**-k, --keep**  
 Retain all temporary files in the directory **mftrace.dir/**. This is useful for debugging problems.

**--keep-trying**  
 Try to continue if external programs called by mftrace fail. If METAFONT crashes with overflow errors, but nevertheless outputs a GF file, try to process its output as is (useful for some buggy fonts, see below). If potrace/autotrace fails to trace a specific character, first try it with a less smoothed curve, and if that fails, skip the character.  
 By default mftrace outputs **trace-bug-FONTNAME-NUMBER.pbm** and stops the process with a request to file a bugreport.

**--magnification**  
 The magnification to use for the PFA file. The default is 1000. The larger the more precise the PFA file will be. However, when magnification is too large METAFONT can crash with overflow errors.  
 Sadly, many MF fonts contain resolution checks  
     **if dots\_per\_inch \* design\_size > 1500:**  
     ...  
 This check is susceptible to overflow errors. Such code should be reported as a bug, and changed to  
     **if dots\_per\_inch > (1500 / design\_size):**  
     ...

**--noround**  
 Don't round coordinates of control points to integer values. Useful simultaneously with **--grid** option. Disabled by default.

**-o, --output-base=FILE**  
 Output to FILE.pfa or FILE.pfb.

**--simplify**  
 Pass the font through FontForge for automatic simplification and hinting.

**--tfmfile=FILE**  
 Use *file* for the TFM file. This file is needed to determine at what resolution to run MetaFont.

**-V,--verbose**  
 Be verbose: print all commands as they are invoked. This is useful for debugging.

**-v,--version**  
 Print version number

**--dos-kpath**  
 Try to kludge up the paths coming from MikTeX for a cygwin environment. If this doesn't work, specify **--tfmfile** and **--encoding** manually.

**-w,--warranty**  
 show warranty and copyright

**--potrace**  
 use Potrace (default).

**--autotrace**  
 use AutoTrace.

**-D,--define=symbol=value**  
 Set the font info *symbol* to the given *value*. For example **-DFamilyName=Foo** sets the font family name to **Foo**.  
 Mftrace tries to fill in sensible values for the FontName, FamilyName, FullName and Weight fields. It does so by guessing values for the CM font series. For other fonts, it tries to read an AFM file (which is not likely to exist). Suggestions for a more generic way to handle this are welcome.

Mftrace uses kpathsea for finding fonts, so any kpathsea variable can be used to fine-tune which files should be loaded. For example, you can set **MFINPUTS** to specify which paths to search for **.mf** files.

Additional options may be passed to the backend program (potrace or autotrace) with the **MFTRACE\_BACKEND\_OPTIONS** environment variable.

## 1.9 Discussion

Why use **mftrace** over **textrace** (<http://textrace.sourceforge.net>)? **Textrace** and **mftrace** are functionally similar. However, **mftrace** is quicker, more cleanly written and can be installed using standard methods. Additionally, **textrace** requires perl, ghostscript and dvips.

How about **MetaFog** (<http://www.trueteX.com>)? **MetaFog** operates directly on the curves that generate the bitmap font, its outlines will probably be smaller and better. However, **MetaFog** is a proprietary product: its source code is not available, and it will only run on a limited number of platforms.

How about **MetaType1** (<ftp://bop.eps.gda.pl/pub/metatype1/>)? **MetaType1** is an approach that puts severe constraints on what may be done in a font program. It does not work for fonts containing overlaps and shaped pens.

How about FontForge (<http://fontforge.sourceforge.net/>) itself? FontForge is an interactive editor, but it can be scripted. Since it supports bitmap tracing and T<sub>E</sub>X bitmap fonts, it is possible to duplicate the functionality of m<sub>f</sub>trace. However, out of the box, FontForge does not recognize T<sub>E</sub>X encodings.

## 1.10 Bugs and todo

- Environment variables containing relative directories, such as MFINPUTS or TFMINPUTS, are not handled correctly.
- Discuss fonts & copyright.
- Submit `tfm.py` to [www.python.org](http://www.python.org). `tfm.py` is a python module to parse Tex Font Metric file.

Should you encounter any bug or problem, then please send a bugreport to Han-Wen Nienhuys.

## 1.11 Author

Han-Wen Nienhuys

## 1.12 Credits

Gf2pbm, the utility to convert a MetaFont GF file to a PBM file was based on Paul Vojta's Xdvi. The license notice is reproduced below.

Thanks to all bughunters and contributors: Andrey V. Panov, Geoffrey Alan Washburn, Julian Gilbey (<http://www.maths.qmul.ac.uk/~jdg/>) Günther Spahlinger, Richard Mahoney, Stanislav Brabec, and Thomas Bushnell BSG.

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The rest of the package m<sub>f</sub>trace script itself is licensed under the GNU General Public License (<http://www.gnu.org/licenses/gpl.txt>).

### 1.13 See also

- Type1 font specification (<http://partners.adobe.com/asn/developer/pdfs/tn/T1Format.pdf>)
- Supplement to the Type1 specification ([http://partners.adobe.com/asn/developer/pdfs/tn/5015.Type1\\_Supp.pdf](http://partners.adobe.com/asn/developer/pdfs/tn/5015.Type1_Supp.pdf)).