of the following: `LIG`, `/LIG`, `LIG/`, `/LIG/`, `/LIG>`, `LIG/>`, `/LIG/>`, `/LIG/>>`.

Everytime you kern some letter, all previous kerning pairs and ligatures are erased. By the `UNKERN` command you can erase these, without inserting a new character. Commands are executed sequentially, and there is no consistence test; so you can ask something and then the opposite: nobody will complain.

3 An Example: Esperanto

Esperanto needs the following characters which are not provided in the DC font: ĉ, ŝ, ˆ, ĝ, ĥ, ŭ (and the corresponding uppercase letters). Dirk Everdeen which is an Esperanto guru (and has prepared a β version of Esperanto hyphenation patterns) asked me to use the following input mechanism: these letters should be accessed by ligatures `cx`, `sx`, `jx`, `gx`, `hx`, `ux`, because the letter 'x' is not used in Esperanto.

Since the "phantom" letter 'x' comes *after* the real letter, there is no problem with kerning (like in the case of the input ligature `ts` of the `wncyr` fonts). So this method could eventually be adopted as a standard transliteration of Esperanto. But this is another issue[3].

Our problem now is to create a virtual font with these letters, the right kerning pairs and the right ligatures. I have chosen positions which would harm the least amount of languages: only Turkish and Slovakian are excluded when using this virtual font.

How to call it? well, of course `eocr10` since `eo` is the two-letter code for Esperanto.

3.1 First step: character description

How do we describe the accented characters? Let's use Eberhard Mattes' `QDTeXVPL`. For this we need a configuration file, which will specify the positions of new characters, and their descriptions in the form of TEX macros. Here is this file (let's call it `esperanto-wannabe.tex`):

```
\font\f=dcr10
\input qdtexvpl
\texvpl{^^ad}{\f\^s}
\texvpl{^^8d}{\f\^S}
\texvpl{^^a0}{\f\^c}
\texvpl{^^80}{\f\^C}
\texvpl{^^a8}{\f\^h}
\texvpl{^^88}{\f\^H}
\texvpl{^^a9}{\f\^\j}
\texvpl{^^89}{\f\^J}
\texvpl{^^a7}{\f\^g}
\texvpl{^^87}{\f\^G}
\texvpl{^^b8}{\f\u u}
\texvpl{^^98}{\f\u U}
\bye
```

The good thing is that we can quickly describe the characters using TEX macros, like `\^`, `\u`, `\j`. The bad thing is that this is all we can do. Fine tuning must be done by hand.

You run this file through TEX and get file `esperanto-wannabe.dvi`. Then you run `QDTeXVPL` with the following command line:

```
QDTeXVPL -d10.0 esperanto-wannabe.dvi \
                   esperanto-wannabe.vpl
```

Here is an extract of what we get:

```
(MAPFONT D 16
    (FONTNAME dcr10)
    (FONTCHECKSUM O 30523766474)
    (FONTDSIZE R 10.000000))
(CHARACTER O 255
    (CHARWD R 0.394347)
    (CHARHT R 0.694275)
    (CHARDP R 0.000000)
    (MAP
        (MOVERIGHT R -0.052765)
        (SELECTFONT D 16)
        (SETCHAR O 2)
        (MOVERIGHT R -0.447113)
        (SETCHAR C s)))
(CHARACTER O 215
    (CHARWD R 0.555420)
    (CHARHT R 0.939255)
    (CHARDP R 0.000000)
    (MAP
        (PUSH)
        (MOVERIGHT R 0.027771)
        (MOVEDOWN R -0.244980)
        (SELECTFONT D 16)
        (SETCHAR O 2)
        (POP)
        (SETCHAR C S)))
...
```

Now we have to replace these characters inside `dcr10.pl` and name the new file `eocr10.vpl` (hopefully someday somebody will find the time to write some utility to do this automatically).

3.2 Second step: adjusting kerning pairs and ligatures

As you saw, we have modified character descriptions, but neither kerning pairs, nor ligatures. This will be done by `AdjKerns`. Here is the necessary configuration file `eo.kcf`:

```
% Kerning and ligature configuration
% for Esperanto virtual fonts, based
% on DC Semi-official (not yet
% approved by TWGMLC)
KERN H AD LIKE C s
KERN H 8D LIKE C S
KERN H A0 LIKE C c
KERN H 80 LIKE C C
KERN H A8 LIKE C h
KERN H 88 LIKE C H
KERN H A9 LIKE C j
KERN H 89 LIKE C J
KERN H A7 LIKE C g
```

[3] To be solved by the Esperanto subgroup of the Technical Working Group on Multiple Language Coordination.

```
KERN H 87 LIKE C G
KERN H B8 LIKE C u
KERN H 98 LIKE C U
ADD LIG C s C x -> H AD
ADD LIG C S C x -> H 8D
ADD LIG C S C X -> H 8D
ADD LIG C c C x -> H A0
ADD LIG C C C x -> H 80
ADD LIG C C C X -> H 80
ADD LIG C h C x -> H A8
ADD LIG C H C x -> H 88
ADD LIG C H C X -> H 88
ADD LIG C j C x -> H A9
ADD LIG C J C x -> H 89
ADD LIG C J C X -> H 89
ADD LIG C g C x -> H A7
ADD LIG C G C x -> H 87
ADD LIG C G C X -> H 87
ADD LIG C u C x -> H B8
ADD LIG C U C x -> H 98
ADD LIG C U C X -> H 98
```

Note that we have included ligatures both for 'Cx' and 'CX' etc.: the former will be used in text, the latter in titles. Now we run `AdjKerns`, with the following command line:

```
AdjKerns -c eo.kcf eocr10.vpl
```

After some lines:

```
**************************************************************

     This is program AdjKerns (= Adjust Kerning Pairs)

                      Version beta-1
          written for you by a lousy C programmer
               (Yannis Haralambous, 1993)

       It shall help you make efficient virtual fonts
       This software belongs to the public domain

**************************************************************
Loading input file preamble...
Reading kern and ligature data...
Reading lines from configuration file and executing them...
..............................
Finished reading the configuration file
Writing down new lig/kern data...
Writing input file remaining data...
```

we get the expected result (our file `eocr10.vpl` is overwritten.

3.3 Final step: using the font

Once we have the `VPL` file, we are done. Run `VFtoVP` and use the font. Here is a small text file to test the font (file `eotest.tex`):

```
\magnification=1200
\font\myfont=eocr10
\myfont
Berto staras antaux la vendejo. Sxi estas rigardanta la
montran fenestregon. Si vidas multajn obiektojn. En la
montra fenestrego trovigxas skatoloj kai faruno. Sub
klosxo kusxas fromagxo, kiu havas multajn truojn. Ankaux
botelojn sxi estas vidanta. La boteloj, kiujn sxi estas
rigardanta, estas egale grandaj. En la mezo de la
fenestrego pendas afisxo, sur kiu estas skribita la
frazo: ,,Cxi tie oni parolas Esperanton``. La pordo
de la vendejo estas malfermita. En la vendejo en angulo
oni vidas barelon kun haringoj. Haringoj estas fisxoj.
La fromagxa klosxo estas farita el vitro. La posedanto
de la vendejo nun estas vendanta fumajxojn kaj cindrujon
al sinjoro. Berto demandas la vendistinon, cxu cxokolado
kaj dolcxajxoj estas haveblaj. La vendistino neas tion.
Ankaux teo, kafo kaj rizo ne plu estas haveblaj. Vino
estas trinkajxo. Berto volas acxeti unue fromagxon kaj
due haringojn. La acxetita fromagxo kostas unu marko. Nun
```

```
sxi estas portanta la acxetitan hejmen.
\end
```

taken from a Esperanto reader my mother had at school (nice brown and thin „Nachkriegspapier“).

4 Go forth, etc. etc.

I am tempted to say "Go forth and make masterpieces of virtual fonts", but I have a small request: if you wish to make fonts for languages (Welsh, Maltese, etc.) please contact the Technical Working Group on Multiple Language Coordination first; it might very well be that somebody is already preparing this language; and if not, you may be that person. But in any case, we can share our experiences to make *consistent* and *compatible* TeX Language Packages.

5 Availability

You will find all the mentionned files, as well as the sources (and Macintosh-executables) of `AdjKerns` on `spi.ens.fr`, directories
`/pub/tex/yannis/adjkerns` and
`/pub/tex/yannis/adjkerns/examples`.
`QDTeXVPL` can be found in Stuttgart, directory
`/soft/tex/fonts/utilities/qdtexvpl`.

A TeX Language Package for Esperanto is prepared by the TWGMLC (Technical Working Group on Multiple Language Coordination).

When TEX and Metafont Work Together*

Alan Hoenig

Department of Mathematics, John Jay College
Mail: 17 Bay Avenue
Huntington, NY 11743 USA
(516) 385-0736
ajhjj@cunyvm

Abstract

When TEX and Metafont communicate to each other, they can do more together than they can alone. This presentation concentrates on two illustrations of this principal, and urges readers to come up with more.

When TEX becomes sensitive to information passed to it from Metafont, it is possible to prepare diagrams and figures using Metafont and then to have TEX prepare labels which can be precisely positioned within the figure. When communication goes the other way, TEX and Metafont can prepare special purpose fonts which (among other things) can be set along curved baselines. Illustrations of both techniques are presented.

Keywords: TEX, Metafont, labelling figures, figures with labels, curvilinear typesetting, special effects typesetting, typesetting special effects

1 Introduction

When we force TEX and METAFONT to talk to each other, they can do different things and more interesting things than when they work in isolation, and I will give two major examples of this. For the sake of completeness, though, I will try to cover these examples in depth, even though I am more interested in the overview than the details. Plus, I plan to allow myself the luxury of several major digressions whenever I feel like it.

2 Setting the Stage: Labelled Diagrams; Non-standard Typesetting

If you need graphics, especially mathematical figures, for a document, I strongly recommend Metafont. Parabolas and normal curves look like they are supposed to look, and all elements of the picture are placed where they are supposed to be.

But there is a great problem. Figures often need labels or tags to be positioned precisely with respect to the figure, and this Metafont does not give us. I've seen people insert graphics prepared by other programs in their TEX documents that come with text in some typeface completely different from the Computer Modern that's usually used in the main text. This is an unacceptable deviation from Knuth's vision, in my opinion, and my first example will be a discussion of ways to use TEX to label figures.

A second issue concerns the setting of type along non-horizontal baselines. I freely admit that this is not the kind of thing TEX was designed for, nor is it the kind of thing that TEX users should normally care about, unless they need to set type around a circular university or institutional seal. Nevertheless, it's fun (that's definitely part of Knuth's vision!), and it fits right in with the context of this presentation. It will also be possible to apply a variety of other special effects to the type for something a bit out of the ordinary.

3 A Basic Idea

TEX and Metafont have strengths in quite different areas. For example, Metafont is quite good at arithmetic, while TEX is not. TEX, on the other hand, is decent at reading and writing files, while Metafont is *seriously* deficient in that area.

The idea behind having TEX and Metafont work together is to have each do the things each is good at, and communicate these results to the other.

The best way to transfer information from TEX to Metafont is to ask TEX to write this information to a file using statements like figure 1. [1] TEX is good at this, and we can do this so the information in the file conforms to standard Metafont syntax. Then, Metafont simply

*An earlier version has appeared in EuroTEX '92 conference proceedings.

[1] Figures containing bits of text delimited by horizontal rules correspond to the slides that accompanied the oral presentation of this paper.