The GFSDIDOT font family

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1 Introduction

The Didot family of the Greek Font Society was made available for free in autumn 2005. This font existed with a commercial license for many years before. Support for LaTeX and the babel package was prepared several years ago by the author and I. Vasilogiorgakis (A. Aubord has done some modifications to improve the support of the accented and other special characters). With the free availability of the fonts I have modified the original package so that it reflects the changes occured in the latest releases by GFS.

The package supports four encodings: OT1, T1, TS1 and LGR. When some characters are missing in the Didot font, they are taken from the font TEX Gyre Pagella and, for the oblique rule (character 0x20 in OT1 encoding) used to build the character *L with stroke* (Ł), from the cmr family. All the provided encodings should be fairly complete. The greek part is to be used with the greek option of the Babel package. The Didot family in LGR and OT1 encoding has been tested successfuly with Plain TEX too.

The fonts are loaded with the LATEX command (to be given in the preamble of a LATEX document): `\usepackage{gfsdidot}`.

This command loads implicitely the package `textcomp` (Text Companion) which defines the default values for some characters in the NFSS LATEX font selection mechanism. If this behaviour is not desired, it is possible to prevent the loading of the `textcomp` package by passing the option `noGFSDidotTS1` when calling the package `gfsdidot`: `\usepackage[noGFSDidotTS1]{gfsdidot}`.

The package provides a new test to check if the package `textcomp` is loaded. It can be used like that:

```
\ifthenelse{\boolean{GFSDidotTS1}}%
{What to do when "textcomp" is loaded}%
{What to do when "textcomp" is not loaded}
```

The fonts as released contain an italic version, but its greek part is just the roman in slanted form. To overcome this problem for the greek part, we use for italic another font by GFS called Olga. As far as the latin part is concerned the italic characters are taken from Didot-Italic (Olga contains no latin characters). The package provides also a matching small caps shape for both latin and greek including old style numbers.

Finally, the math symbols are taken from the pxfonts package except of course the characters that are already provided by Didot and Olga. The choice of pxfonts was made on the basis that the latin part of Didot is based on Palatino. Moreover, all Didot characters are scaled in the .fd files by a factor of 1.04 in order to match the x-height of pxfonts.

2 Installation

1. Copy the contents of the subdirectories:
   - afm in texmf/fonts/afm/GFS/Didot
   - doc in texmf/doc/latex/GFS/Didot
   - enc in texmf/fonts/enc/dvips/GFS/Didot
   - map in texmf/fonts/map/dvips/GFS/Didot
   - tex in texmf/tex/latex/GFS/Didot
   - tfm in texmf/fonts/tfm/GFS/Didot
   - type1 in texmf/fonts/type1/GFS/Didot
   - vf in texmf/fonts/vf/GFS/Didot
   - vpl in texmf/fonts/source/public/GFS/Didot/vpl.
     The vpl files are the sources used to produce vf and tfm files. In theory, with the utilities *tftopl* and *vftovp*, these files can be rebuilded. Unfortunately, the comments are lost and they are useful with some utilities.
2. In your installations updmap.cfg file add the line: `Map gfsdidot.map`

   If you use MikTEX (one of the commonly used TEX distribution in Windows) you should add the following line too: `Map qpl-cs.map` which describe the fonts used for the Czech TeX encoding for font Pagella.

   This encoding is identical to the OT1 encoding for the lower part (slots under 128) and it is used to add the missing character (the dotless j) to the Didot font.

The file updmap.cfg should not be edited directly under MikTeX but edit it with the command *initexmf –edit-config-file updmap*. This command can be typed by opening a command prompt from the Windows utility provided by MikTeX.

3. Finally, you have to refresh the different databases by passing (as the user owning the different TeX trees) the two following commands:
   - *mktexlsr* to rebuild the list of all the files located in the different texmf tree.
   - *updmap-sys* to rebuild the map files for the different backend drivers (*dvips*, *pdftex* etc.).

In the subdirectory "tools", the Perl script *installDidot.pl* automatizes this process. This script should be called with two arguments:

1. the root directory of the distribution of the GFS Didot package;
2. the root directory of a texmf tree where the GFS Didot package should be installed.

You are now ready to use the fonts provided that you have a relatively modern installation that includes pxfonts.

3 Usage

As said in the introduction the package covers both english and greek (and most western languages if the output encoding T1 is specified). Greek covers polytonic too through babel (read the documentation of the babel package and its greek option).
For example, the preamble:

```
\documentclass{article}
\usepackage[english,greek]{babel}
\usepackage[T1]{fontenc}
\usepackage[iso-8859-7]{inputenc}
\usepackage{gfsdidot}
```

will be the correct setup for articles in Greek.

For articles written exclusively in Greek, the line `\usepackage[T1]{fontenc}` is not mandatory. This instruction forces the use of the T1 encoding which is designed to write texts in most of the languages of western Europe (including English).

However, even if one writes exclusively in English or Greek, the encoding T1 can be useful. Without specifying the T1 encoding, the encoding OT1 is used. This is the original encoding of TeX. Unfortunately this encoding (based on 128 characters/slots only) is variable and it does not match the ASCII code for all characters.

For instance the dollar ($) is unavailable in italic fonts (in the same slot the english pound £ is defined). The pipe character (|) is not correctly printed either.

The T1 encoding is identical to the ASCII code for all the printable slots (32 to 127) and all the ASCII characters are printed as expected.

3.1 Transformations by dvips

Other than the shapes provided by the fonts themselves, this package provides an upright italic shape and a slanted small caps shape using the standard mechanism provided by dvips. Upright italics are called with `\uishape` and slanted small caps with `\scslshape`.
For example, the code:

```
{\itshape italics} {\uishape upright italics}
{\itshape italics again}
\textgreek{{\itshape ἄβγδζξφψὠ} {\uishape ἄβγδζξφψὠ}
{\itshape ἄβγδζξφψὠ}}

\textsc{small caps \textgreek{πεζοκεφαλαία} 0123456789}
{\scslshape \textgreek{πεζοκεφαλαία 0123456789}}
```

will give:

italics upright italics *italics again* *ἄβγδζξφψὠ* ἄβγδζξφψὠ *ἄβγδζξφψὠ*

SMALL CAPS ΠΕΖΟΚΕΦΑΛΑΙΑ 0123456789 *ΠΕΖΟΚΕΦΑΛΑΙΑ 0123456789*

The commands `\textui{}` and `\textscsl{}` are also provided.

3.2 Tabular numbers

Tabular numbers (of fixed width) are accessed with the command `\tabnums{}`. Compare

```
|0|1|2|3|4|5|6|7|8|9|
\tabnums{|0|1|2|3|4|5|6|7|8|9|}
```

|0|1|2|3|4|5|6|7|8|9|
|0|1|2|3|4|5|6|7|8|9|

3.3 Text fractions

Text fractions are composed using the lower and upper numerals provided by the fonts, and are accessed with the command `\textfrac{}{}`. For example, `\textfrac{-22}{7}` gives $^{-22}/_{7}$.

Precomposed fractions are provided too by `\onehalf`, `\onethird`, etc.

3.4 Additional characters

\textbullet	•	\textparagraph	¶
\textparagraphalt	¶	\careof	℅
\numero	№	\estimated	℮
\whitebullet	◦	\textlozenge	◊
\eurocurrency	¤	\interrobang	⸘
\textdagger	†	\textdaggerdbl	‡
\yencurrency	¥	\texteuro[1]	€

3.5 Alternate characters

In the greek encoding the initial theta is chosen automatically. Compare: θάλασσα but Αθηνά. Other alternate characters are not chosen automatically.

Olga provides a double lambda: ƛƛ. This can be accessed with the command `\lambdadbl` in textmode.

For example, in LGR encoding

```
\textit{a\lambdadbl'a kat'allhlos metasjhmatism;oc}
```

gives

aλλά κατάλληλος μετασχηματισμός.

4 Problems

The accents of the capital letters should hang in the left margin when such a letter starts a line. TEX and LATEX do not provide the tools for such a feature. However, this seems to be possible with pdfTEX As this is work in progress, please be patient...

5 Samples

The next two pages provide samples in english and greek with math.

[1] This command is available only if the package `textcomp` is used. Euro is also available in LGR enconding. `\textgreek{\euro}` gives €.

Adding up these inequalities with respect to i, we get

$$\sum c_i d_i \leq \frac{1}{p} + \frac{1}{q} = 1 \tag{1}$$

since $\sum c_i^p = \sum d_i^q = 1$. □

In the case $p = q = 2$ the above inequality is also called the *Cauchy-Schwartz inequality*.

Notice, also, that by formally defining $(\sum |b_k|^q)^{1/q}$ to be $\sup |b_k|$ for $q = \infty$, we give sense to (9) for all $1 \leq p \leq \infty$.

A similar inequality is true for functions instead of sequences with the sums being substituted by integrals.

Theorem *Let $1 < p < \infty$ and let q be such that $1/p + 1/q = 1$. Then, for all functions f, g on an interval $[a, b]$ such that the integrals $\int_a^b |f(t)|^p \, dt$, $\int_a^b |g(t)|^q \, dt$ and $\int_a^b |f(t)g(t)| \, dt$ exist (as Riemann integrals), we have*

$$\int_a^b |f(t)g(t)| \, dt \leq \left(\int_a^b |f(t)|^p \, dt \right)^{1/p} \left(\int_a^b |g(t)|^q \, dt \right)^{1/q}. \tag{2}$$

Notice that if the Riemann integral $\int_a^b f(t)g(t) \, dt$ also exists, then from the inequality $\left| \int_a^b f(t)g(t) \, dt \right| \leq \int_a^b |f(t)g(t)| \, dt$ follows that

$$\left| \int_a^b f(t)g(t) \, dt \right| \leq \left(\int_a^b |f(t)|^p \, dt \right)^{1/p} \left(\int_a^b |g(t)|^q \, dt \right)^{1/q}. \tag{3}$$

Proof: Consider a partition of the interval $[a, b]$ in n equal subintervals with endpoints $a = x_0 < x_1 < \cdots < x_n = b$. Let $\Delta x = (b - a)/n$. We have

$$\begin{aligned} \sum_{i=1}^n |f(x_i)g(x_i)| \Delta x &\leq \sum_{i=1}^n |f(x_i)g(x_i)| (\Delta x)^{\frac{1}{p} + \frac{1}{q}} \\ &= \sum_{i=1}^n \left(|f(x_i)|^p \Delta x \right)^{1/p} \left(|g(x_i)|^q \Delta x \right)^{1/q}. \end{aligned} \tag{4}$$

- Εμβαδόν επιφάνειας από περιστροφή

Πρόταση 5.1 *Έστω γ καμπύλη με παραμετρική εξίσωση $x = g(t)$, $y = f(t)$, $t \in [a, b]$ αν g', f' συνεχείς στο $[a, b]$ τότε το εμβαδόν από περιστροφή της γ γύρω από τον xx' δίνεται*
$B = 2\pi \int_a^b |f(t)| \sqrt{g'(t)^2 + f'(t^2)}dt.$

Αν η γ δίνεται από την $y = f(x)$, $x \in [a, b]$ τότε $B = 2\pi \int_a^b |f(t)| \sqrt{1 + f'(x)^2}dx$

- Όγκος στερεών από περιστροφή

Έστω $f : [a, b] \to \mathbb{R}$ συνεχής και $R = \{f, Ox, x = a, x = b\}$ είναι ο όγκος από περιστροφή του γραφήματος της f γύρω από τον Ox μεταξύ των ευθειών $x = a$, και $x = b$, τότε $V = \pi \int_a^b f(x)^2 dx$

- Αν $f, g : [a, b] \to \mathbb{R}$ και $0 \leq g(x) \leq f(x)$ τότε ο όγκος στερεού που παράγεται από περιστροφή των γραφημάτων των f και g, $R = \{f, g, Ox, x = a, x = b\}$ είναι
$V = \pi \int_a^b \{f(x)^2 - g(x)^2\}dx.$

- Αν $x = g(t)$, $y = f(t)$, $t = [t_1, t_2]$ τότε $V = \pi \int_{t_1}^{t_2} \{f(t)^2 g'(t)\}dt$ για $g(t_1) = a$, $g(t_2) = b$.

6 Ασκήσεις

Άσκηση 6.1 *Να εκφραστεί το παρακάτω όριο ως ολοκλήρωμα Riemann κατάλληλης συνάρτησης*

$$\lim_{n\to\infty} \frac{1}{n} \sum_{k=1}^{n} \sqrt[n]{e^k}$$

Υπόδειξη: Πρέπει να σκεφτούμε μια συνάρτηση της οποίας γνωρίζουμε ότι υπάρχει το ολοκλήρωμα. Τότε παίρνουμε μια διαμέριση P_n και δείχνουμε π.χ. ότι το $U(f, P_n)$ είναι η ζητούμενη σειρά.

Λύση: Πρέπει να σκεφτούμε μια συνάρτηση της οποίας γνωρίζουμε ότι υπάρχει το ολοκλήρωμα. Τότε παίρνουμε μια διαμέριση P_n και δείχνουμε π.χ. ότι το $U(f, P_n)$ είναι η ζητούμενη σειρά.
Έχουμε ότι

$$\begin{aligned}\frac{1}{n} \sum_{k=1}^{n} \sqrt[n]{e^k} &= \frac{1}{n} \sqrt[n]{e} + \frac{1}{n} \sqrt[n]{e^2} + \cdots + \frac{1}{n} \sqrt[n]{e^n} \\ &= \frac{1}{n} e^{\frac{1}{n}} + \frac{1}{n} e^{\frac{2}{n}} + \cdots + \frac{1}{n} e^{\frac{n}{n}}\end{aligned}$$