

# The GFSNEOHELLENIC font family

Antonis Tsolomitis  
Laboratory of Digital Typography  
and Mathematical Software  
Department of Mathematics  
University of the Aegean

12 May 2006

## 1 Introduction

The NeoHellenic family of the Greek Font Society was made available for free during the winter of 2006. 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. With the free availability of the fonts I have modified the original package so that it reflects the changes occurred in the latest releases by GFS.

The package supports three encodings: OT1, T1 and LGR to the extend that the font themselves cover these. OT1 and LGR should be fairly complete. The greek part is to be used with the greek option of the Babel package.

The fonts are loaded with

```
\usepackage{gfsneohellenic} or \usepackage[default]{gfsneohellenic}.
```

The latter one sets NeoHellenic as the default document font. The former defines the environment `neohellenic` and the command `\textneohellenic`. For example, while in Greek language

```
\textneohellenic{dokim'h}
```

produces

δοκιμή.

x-height is adjusted so that it matches with the x-height of the `cmbright` package. This is done to help with documents requiring mathematics. In this case load `cmbright` *but before* `gfsneohellenic.sty`.

## 2 Installation

Copy the contents of the subdirectory afm in texmf/fonts/afm/GFS/NeoHellenic/

Copy the contents of the subdirectory doc in texmf/doc/latex/GFS/NeoHellenic/

Copy the contents of the subdirectory enc in texmf/fonts/enc/dvips/GFS/NeoHellenic/

Copy the contents of the subdirectory map in texmf/fonts/map/dvips/GFS/NeoHellenic/

Copy the contents of the subdirectory tex in texmf/tex/latex/GFS/NeoHellenic/

Copy the contents of the subdirectory tfm in texmf/fonts/tfm/GFS/NeoHellenic/

Copy the contents of the subdirectory type1 in texmf/fonts/type1/GFS/NeoHellenic/

Copy the contents of the subdirectory vf in texmf/fonts/vf/GFS/NeoHellenic/

In your installation's updmap.cfg file add the line

```
Map gfsneohellenic.map
```

Refresh your filename database and the map file database (for example, on Unix systems run mktexlsr and then run the updmap-sys (or updmap on older systems) script as root).

You are now ready to use the fonts.

## 3 Usage

As said in the introduction the package covers both english and greek. 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[iso-8859-7]{inputenc}
\usepackage{cmbright}
\usepackage[default]{gfsneohellenic}
```

will be the correct setup for articles in Greek using NeoHellenic for the main font.

### 3.1 Transformations by dvips

Other than the shapes provided by the fonts themselves, this package provides a slanted small caps shape using the standard mechanism provided by dvips. Get slanted small caps with `\scslshape`. For example, the code

```
\textsc{small caps \textgreek{pezokefala'ia} 0123456789} {\scslshape
\textgreek{pezokefala'ia 0123456789}}
```

will give

```
SMALL CAPS ΠΕΖΟΚΕΦΑΛΑΙΑ 0123456789 ΠΕΖΟΚΕΦΑΛΑΙΑ 0123456789
```

The command `\textscsl{}` are also provided.

### 3.2 Alternative characters

There are alternative designs for delta, Epsilon, zeta, Xi and Omega. Xi has two alternatives. These glyphs are accessed with the following commands:

Default design	Alternative design	Command
δ	Δ	<code>\deltaatl</code>
Ε	Ε	<code>\Epsilonalt</code>
ζ	ζ	<code>\zetaalt</code>
Ξ	Ξ	<code>\Xionealt</code>
Ξ	Ξ	<code>\Xitwoalt</code>
Ω	Ω	<code>\Omegaalt</code>

### 3.3 Tabular numbers

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

Compare

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

### 3.4 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.

### 3.5 Additional characters

<code>\textbullet</code>	•
<code>\textparagraph</code>	¶
<code>\numero</code>	№
<code>\estimated</code>	€
<code>\textlozenge</code>	◇
<code>\eurocurrency</code>	€
<code>\textdagger</code>	†
<code>\textdaggerdbl</code>	‡
<code>\yencurrency</code>	¥

Euro is also available in LGR encoding. `\textgreek{\euro}` gives €.

## 4 Problems

The accents of the capital letters should hang in the left margin when such a letter starts a line.  $\text{T}_E\text{X}$  and  $\text{L}^A\text{T}_E\text{X}$  do not provide the tools for such a feature. However, this seems to be possible with  $\text{pdfT}_E\text{X}$ . As this is work in progress, please be patient. . .

## 5 Samples

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

Adding up these inequalities with respect to  $i$ , we get

$$\sum c_i d_i \leq \frac{1}{p} + \frac{1}{q} = 1 \quad (1)$$

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

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  $[\alpha, b]$  such that the integrals  $\int_{\alpha}^b |f(t)|^p dt$ ,  $\int_{\alpha}^b |g(t)|^q dt$  and  $\int_{\alpha}^b |f(t)g(t)| dt$  exist (as Riemann integrals), we have

$$\int_{\alpha}^b |f(t)g(t)| dt \leq \left( \int_{\alpha}^b |f(t)|^p dt \right)^{1/p} \left( \int_{\alpha}^b |g(t)|^q dt \right)^{1/q}. \quad (2)$$

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

$$\left| \int_{\alpha}^b f(t)g(t) dt \right| \leq \left( \int_{\alpha}^b |f(t)|^p dt \right)^{1/p} \left( \int_{\alpha}^b |g(t)|^q dt \right)^{1/q}. \quad (3)$$

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

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

- Εμβαδόν επιφάνειας από περιστροφή

**Πρόταση 5.1** Έστω  $\gamma$  καμπύλη με παραμετρική εξίσωση  $x = g(t)$ ,  $y = f(t)$ ,  $t \in [\alpha, b]$  αν  $g'$ ,  $f'$  συνεχείς στο  $[\alpha, b]$  τότε το εμβαδόν από περιστροφή της  $\gamma$  γύρω από τον  $xx'$  δίνεται

$$B = 2\pi \int_{\alpha}^b |f(t)| \sqrt{g'(t)^2 + f'(t)^2} dt.$$

Αν η  $\gamma$  δίνεται από την  $y = f(x)$ ,  $x \in [\alpha, b]$  τότε  $B = 2\pi \int_{\alpha}^b |f(x)| \sqrt{1 + f'(x)^2} dx$

- Όγκος στερεών από περιστροφή

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

• Αν  $f, g : [\alpha, b] \rightarrow \mathbb{R}$  και  $0 \leq g(x) \leq f(x)$  τότε ο όγκος στερεού που παράγεται από περιστροφή των γραφημάτων των  $f$  και  $g$ ,  $R = \{f, g, Ox, x = \alpha, x = b\}$  είναι

$$V = \pi \int_{\alpha}^b \{f(x)^2 - g(x)^2\} dx.$$

• 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  $g(t_1) = \alpha$ ,  $g(t_2) = b$ .

## 6 Ασκήσεις

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

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

*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

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