The TXFONTSB package

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1 Introduction

The txfontsb package is an extension of the txfonts package. Mainly it adds two things:

- true small caps and old style numbers for the OT1 encoding (through the `\textsc` and `\scshape` commands), and an oblique small caps shape (through the `\textscsl` and `\scslshape` commands).
- Greek support (LGR encoding) supporting monotonic and polytonic systems through the Babel package. This also includes true small caps for the Greek letters.

The greek shapes are based on the Free Font of GNU. However since Babel composes the Greek accented characters using the ligature mechanism, we had to modify the original GNU fonts, and this is the reason that they have been renamed as FreeSerifb (instead of FreeSerif).

Moreover, kerning information has been added for Greek letters that was missing from the original FreeSerif font.

The fonts are loaded with
`\usepackage{txfontsb}`.
The package has two one option:

- the option `Upsionalt` uses an alternative shape for the Greek capital and small capital Upsilon.

	Kerned (default)	Unkerned	Kerned SC (default)	Unkerned
Default Upsilon	ΑΫΛΟΣ	ΑΫΛΟΣ	Αϋʌοσ	Αϋʌοσ
Upsilonalt	ΑΫΛΟΣ	ΑΫΛΟΣ	Αϋʌοσ	Αϋʌοσ

2 Installation

Copy the contents of the subdirectory afm in texmf/fonts/afm/GNU/FreeFont/FreeSerifb/

Copy the contents of the subdirectory doc in texmf/doc/latex/GNU/FreeFont/FreeSerifb/

Copy the contents of the subdirectory enc in texmf/fonts/enc/dvips/GNU/FreeFont/FreeSerifb/

Copy the contents of the subdirectory map in texmf/fonts/map/dvips/GNU/FreeFont/FreeSerifb/

Copy the contents of the subdirectory tex in texmf/tex/latex/GNU/FreeFont/FreeSerifb/

Copy the contents of the subdirectory tfm in texmf/fonts/tfm/GNU/FreeFont/FreeSerifb/

Copy the contents of the subdirectory type1 in texmf/fonts/type1/GNU/FreeFont/FreeSerifb/

Copy the contents of the subdirectory vf in texmf/fonts/vf/GNU/FreeFont/FreeSerifb/

In your installations updmap.cfg file add the line

Map gptimes.map

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

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

3 Usage

As said in the introduction the package covers both english (txfonts) and greek. Greek covers polytonic too, through babel (read the documentation of the babel package and its greek option).

For example, the preample

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

will be the correct setup for articles in Greek.

4 Old style numbers

Old style numbers are accesed with the `\textsc` command:

The command `\textsc{0123456789}` gives 0123456789.

5 Samples

The next two pages provide samples in english (just txfonts) and greek with math.

Adding up these inequalities with respect to i, we get

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

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: Έχουμε ότι

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