Aaxes, aaxes, aaxes

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Abstract

The fontaxes package simulates multiple independent font selection axes on top of certain single NFSS axes: base family, figure style, and figure alignment on top of family; primary shape and secondary shape on top of shape; and math weight and math figure alignment on top of math version.

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1 Introduction

The introduction of the New Font Selection Scheme (NFSS) has greatly simplified the usage of \TeX with fonts different from the Computer Modern fonts originally
designed for \TeX. However, the NFSS has some limitations. In particular, it defines only one axis for the font shape, which caters for both the actual \textit{shape} of the font (e.g. upright, italic or slanted) and the \textit{case} of the font (e.g. upper-lower case and small-caps). For example, if the current font shape is italic, then selecting small capitals using \texttt{\textscshape} or \texttt{\textsc{scshape}} will revert to an upright shape, even if the font has italic small capitals.

The fontaxes package alleviates the deficiencies of the NFSS by simulating multiple axes on top of single NFSS axes. In particular, it replaces the single NFSS shape axis by a primary and a secondary shape axis, catering for the shape and the case of the font, respectively. Moreover, the package introduces three new axes to deal with different \textit{figure versions}, which are provided by many professional fonts.

## 2 Usage

You can load this package by adding

\begin{verbatim}
\usepackage{fontaxes}
\end{verbatim}

to the preamble of your document. This redefines and makes available certain font selection commands, which are described in the rest of this section.

### 2.1 Shape

The fontaxes package splits the NFSS’s single shape axis into two: the primary shape axis (n, it, etc.) and the secondary shape axis (ulc, sc, etc.).

\begin{verbatim}
\upshape
\itshape
\slshape
\swshape
\ulcshape
\scshape
\sscshape
\fontprimaryshape
\fontsecondaryshape
\swdefault
\sscdefault
\ulcdefault
\end{verbatim}

The commands \texttt{\upshape}, \texttt{\itshape}, and \texttt{\slshape} are redefined to access the primary axis only. For access to a swash shape, the command \texttt{\swshape} has been added.

The commands \texttt{\scshape} and \texttt{\sscshape} (spaced small caps) access the secondary axis. To return from any small-caps shape to upper-lower case, you can use the command \texttt{\ulcshape}.

All these commands update the two shape axes using the low-level commands \texttt{\fontprimaryshape{⟨value⟩}} and \texttt{\fontsecondaryshape{⟨value⟩}}.

If you want to change which values are used by the various commands \texttt{⟨abbr⟩shape}, redefine the corresponding \texttt{⟨abbr⟩default}. The additional commands \texttt{\swdefault}, \texttt{\sscdefault}, and \texttt{\ulcdefault} are provided with their default values sw, ssc, and ulc, respectively.

### 2.2 Figure version

Different figure versions are usually implemented as different font families (e.g. MinionPro-⟨0sF,LF,T0sF,TLF⟩ or ppl{⟨j,x⟩}). The fontaxes package splits off the axes \textit{figure style} and \textit{figure alignment}, which leaves the base family (e.g. MinionPro or ppl).
The fontaxes package knows two figure styles, text and lining (accessible via \textfigures and \liningfigures), and two modes of figure alignment, tabular and proportional (accessible via the switches \tabfigures and \proportionalfigures).

Additionally, you can access both axes directly using the low-level commands \fontfigurestyle{⟨value⟩} and \fontfigurealignment{⟨value⟩}.

If you want to change the font family without changing the figure version, use \fontbasefamily{⟨value⟩}. (All \font... commands require a successive \selectfont to make the changes take effect.)

For choosing the figure versions to be used in math mode, you can use the corresponding axis math figure alignment. Note that there is currently no means for changing the figure style used in math.

### 2.3 Math version

\boldmath \unboldmath

By default, \LaTeX provides two math versions, normal and bold, as well as commands \boldmath and \unboldmath for switching between them. The fontaxes packages redefines these commands to operate on the axis math weight.

A second axis math figure alignment is introduced that allows you to switch between tabular and proportional figures using \tabularmath and \proportionalmath. (This assumes the presence of additional math versions tabular and boldtabular; the package will copy the setups of math versions normal and bold at the end of the preamble in case you do not provide your own declarations.)

\mathweight \mathfigurealignment

You can directly assign values to the axes using the low-level commands \mathweight{⟨value⟩} and \mathfigurealignment{⟨value⟩}.

Table 1 summarizes which commands set which values on which axes.

### 2.4 Additional commands

\textsw \textssc \textulc \textfigures \liningfigures \tabularfigures \proportionalfigures

Similar to the well-known \textit, \textsc, etc. this package provides commands \textsw, \textssc, \textulc, \textfigures, \liningfigures, \tabularfigures and \proportionalfigures that take one argument and apply the font change only to the argument. For example, \textsw{⟨text⟩} is roughly equivalent to \swshape{⟨text⟩} (but automatically adds italic corrections).

The command \figureversion{⟨options⟩} allows easy switching of multiple aspects of figures simultaneously. It takes as an argument a comma-separated list of one or more of the following options:

- text, osf for text figures,
- lining, lf for lining figures,
- tabular, tab for tabular figures,
- proportional, prop for proportional figures.

For example, \figureversion{lf, tab} selects tabular lining figures.
Table 1: Summary of commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Axis</th>
<th>Value</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>\upshape</td>
<td>\fontprimaryshape</td>
<td>updefault</td>
<td>n</td>
</tr>
<tr>
<td>\itshape</td>
<td>\fontprimaryshape</td>
<td>itdefault</td>
<td>it</td>
</tr>
<tr>
<td>\slshape</td>
<td>\fontprimaryshape</td>
<td>sldefault</td>
<td>sl</td>
</tr>
<tr>
<td>\swshape</td>
<td>\fontprimaryshape</td>
<td>swdefault</td>
<td>sw</td>
</tr>
<tr>
<td>\ulcshape</td>
<td>\fontsecondaryshape</td>
<td>ulcdefault</td>
<td>ulc</td>
</tr>
<tr>
<td>\scshape</td>
<td>\fontprimaryshape</td>
<td>scdefault</td>
<td>sc</td>
</tr>
<tr>
<td>\sscshape</td>
<td>\fontprimaryshape</td>
<td>sscdefault</td>
<td>ssc</td>
</tr>
<tr>
<td>\txfigures</td>
<td>\fontfigurestyle</td>
<td>text</td>
<td></td>
</tr>
<tr>
<td>\lnfigures</td>
<td>\fontfigurestyle</td>
<td>lining</td>
<td></td>
</tr>
<tr>
<td>\tbfigures</td>
<td>\fontfigurealignment</td>
<td>tabular</td>
<td></td>
</tr>
<tr>
<td>\prfigures</td>
<td>\fontfigurealignment</td>
<td>proportional</td>
<td></td>
</tr>
<tr>
<td>\langle\rangle</td>
<td>\fontfigurealignment</td>
<td>(font-dependent)</td>
<td></td>
</tr>
<tr>
<td>\boldmath</td>
<td>\mathweight</td>
<td>bold</td>
<td></td>
</tr>
<tr>
<td>\unboldmath</td>
<td>\mathweight</td>
<td>normal</td>
<td></td>
</tr>
<tr>
<td>\tabularmath</td>
<td>\mathfigurealignment</td>
<td>tabular</td>
<td></td>
</tr>
<tr>
<td>\proportionalmath</td>
<td>\mathfigurealignment</td>
<td>proportional</td>
<td></td>
</tr>
</tbody>
</table>

3 Implementation

3.1 High-level author commands (Level 1)

3.1.1 Shape

\upshape Axis 1: primary shape
1 (\package*)
2 \DeclareRobustCommand\upshape{\not@math@alphabet\upshape\relax}
3 \fontprimaryshape\updefault\selectfont
4 \DeclareRobustCommand\itshape{\not@math@alphabet\itshape\mathit}
5 \fontprimaryshape\itdefault\selectfont
6 \DeclareRobustCommand\slshape{\not@math@alphabet\slshape\relax}
7 \fontprimaryshape\sldefault\selectfont
8 \DeclareRobustCommand\swshape{\not@math@alphabet\swshape\relax}
9 \fontprimaryshape\swdefault\selectfont

\scshape Axis 2: secondary shape
10 \DeclareRobustCommand\scshape{\not@math@alphabet\scshape\relax}
11 \fontsecondaryshape\scdefault\selectfont
12 \DeclareRobustCommand\sscshape{\not@math@alphabet\sscshape\relax}
13 \fontsecondaryshape\sscdefault\selectfont
14 \DeclareRobustCommand\ulcshape{\not@math@alphabet\ulcshape\relax}
15 \fontsecondaryshape\ulcdefault\selectfont
\noscshape  Provide an alias for compatibility with the slantsc package.
16 \let\noscshape\ulcshape

\swdefault \ulcdefault \sscdefault
17 \providecommand\swdefault{sw}
18 \providecommand\ulcdefault{ulc}
19 \providecommand\sscdefault{ssc}

\textsw \textssc \textulc
20 \DeclareTextFontCommand{\textsw}{\swshape}
21 \DeclareTextFontCommand{\textssc}{\sscshape}
22 \DeclareTextFontCommand{\textulc}{\ulcshape}

3.1.2 Figure version

\txfigures \lnfigures
Axis 1: figure style
23 \def\txfigures{\@nomath\txfigures
24 \fontfigurestyle{text}\selectfont}
25 \def\lnfigures{\@nomath\lnfigures
26 \fontfigurestyle{lining}\selectfont}

\tbfigures \prfigures
Axis 2: figure alignment
27 \def\tbfigures{\@nomath\tbfigures
28 \fontfigurealignment{tabular}\selectfont}
29 \def\prfigures{\@nomath\prfigures
30 \fontfigurealignment{proportional}\selectfont}

\figureversion
This code originally appeared in the package MinionPro. We have adapted it to work within fontaxes’ framework and also changed some option names.
31 \newcommand\fontaxes@fv@prefix{fontaxes@fv@switch@}
32 \newcommand\fontaxes@fv@newoption{1}
33 \expandafter\newcommand\csname\fontaxes@fv@prefix C1\endcsname\fontaxes@fv@newoption[1][%
34 \\fontaxes@fv@newoption{text}{\txfigures}
35 \\fontaxes@fv@newoption{osf}{\txfigures}
36 \\fontaxes@fv@newoption{lining}{\lnfigures}
37 \\fontaxes@fv@newoption{lf}{\lnfigures}
38 \\fontaxes@fv@newoption{tabular}{\tbfigures\tabularmath}
39 \\fontaxes@fv@newoption{tab}{\tbfigures\tabularmath}
40 \\fontaxes@fv@newoption{proportional}{\prfigures\proportionalmath}
41 \\fontaxes@fv@newoption{prop}{\prfigures\proportionalmath}

We simply iterate over the list of figure versions specified in the argument to \figureversion and check if we have specified a matching option.
42 \newcommand\fontaxes@fv@list{ }
43 \newcommand\fontaxes@fv{ }
44 \DeclareRobustCommand*{\figureversion}[1][% 
45 \def\fontaxes@fv@list{\zap@space#1 \@empty}]
46 \@for\fontaxes@fv:=\fontaxes@fv@list\do{%
47 \@ifundefined{\fontaxes@fv@prefix\fontaxes@fv}{%
3.1.3 Math version

Axis 1: weight
\def\boldmath{\@nomath\boldmath
\mathweight{bold}}
\def\unboldmath{\@nomath\unboldmath
\mathweight{normal}}

Axis 2: figure alignment
\def\tabularmath{\@nomath\tabularmath
\mathfigurealignment{tabular}}
\def\proportionalmath{\@nomath\proportionalmath
\mathfigurealignment{proportional}}

3.2 Low-level author commands (Level 2)
\mathweight{bold, normal} sets \mathversion;
\mathfigurealignment{tabular, proportional} sets \mathversion;
\fontfigurestyle{text, lining} sets \fontfamily;
\fontfigurealignment{tabular, proportional} sets \fontfamily;
\fontbasefamily{...} sets \fontfamily;
\fontprimaryshape{n, it, sl, sw} sets \fontshape;
\fontsecondaryshape{ulc, sc, ssc} sets \fontshape.

\def\fontaxes{get@math@{}edef\fontaxes@math@weight{\#1}\fontaxes@set@math}
\DeclareRobustCommand{\mathweight}{1}%
\fontaxes{get@math\edef\fontaxes@math@weight{\#1}\fontaxes@set@math}
\DeclareRobustCommand{\mathfigurealignment}{1}%
\fontaxes{get@math\edef\fontaxes@math@align{\#1}\fontaxes@set@math}
We have made most commands robust to protect them in moving arguments (e.g. section titles). Additionally, we want these commands to be ignored when hyperref is building PDF strings (e.g. for bookmarks).

3.3 Internals (Layer 3)

The macros that hold the current values of the axes (here with some default values that will most certainly be overwritten during initialization; see \fontaxes@get@...).

\fontaxes@math@weight
\fontaxes@math@align
\fontaxes@family@base
\fontaxes@figure@style
\fontaxes@figure@align
\fontaxes@shape@one
\fontaxes@shape@two
\newcommand*{\fontaxes@figure@style}{lining}
\newcommand*{\fontaxes@figure@align}{proportional}
\newcommand*{\fontaxes@shape@one}{n}
\newcommand*{\fontaxes@shape@two}{ulc}
\fontaxes@set@math
\fontaxes@set@family
\fontaxes@set@shape
\newcommand*{\fontaxes@set@math}{E}
\fontaxes@encode@math
\mathversion{\fontaxes@code}
\fontaxes@save\math@version
\newcommand*{\fontaxes@set@family}{E}
\fontaxes@encode@family
\fontfamily{\fontaxes@code}
\fontaxes@save\f@family
\newcommand*{\fontaxes@set@shape}{E}
\fontaxes@encode@shape
\fontshape{\fontaxes@code}
\fontaxes@save\f@shape
Check for changes: if changed, try to decode and update axes.
\newcommand*{\fontaxes@get@math}{E}
\iffontaxes@changed\math@version{E}
\fontaxes@decode{\math}{\math@version}
\ifx\fontaxes@edoc\relax\else
\edef\fontaxes@math@weight{\expandafter\@firstoftwo\fontaxes@edoc}
\edef\fontaxes@math@align{\expandafter\@secondoftwo\fontaxes@edoc}
\fi
\fontaxes@save\math@version
\}{}E
\newcommand*{\fontaxes@get@family}{E}
\iffontaxes@changed\f@family{E}
\let\fontaxes@edoc\relax
\expandafter\fontaxes@split@family\f@family\@nnil
\ifx\fontaxes@split@suffix\relax\else
\fontaxes@decode{\figures}{\fontaxes@split@suffix}
\fi
\ifx\fontaxes@edoc\relax
\fontaxes@warn@undecodable{family ‘\f@family’}
\edef\fontaxes@family@base{\f@family}
\else
Try alternative.
\expandafter\fontaxes@split@familyalt\f@family
\empty\empty\empty\empty\@nnil
\ifx\fontaxes@split@suffix\relax\else
\fontaxes@decode{\figuresalt}{\fontaxes@split@suffix}
\fi
\ifx\fontaxes@edoc\relax
\fontaxes@warn@undecodable{family ‘\f@family’}
\edef\fontaxes@family@base{\f@family}
\else
3.4 Encoding

Try different naming conventions.

Default is concatenation.
The following alias is defined for compatibility with package files generated by \texttt{autoinst}.

\let\fa@naming@exception\fontaxes@naming@exception\fontaxes@naming@exception

The defaults \texttt{n} and \texttt{ulc} disappear when combined.

\fontaxes@naming@exception{shape}{(n)(ulc)}(n)
The defaults disappear in the concatenation. \texttt{boldtabular} is formed regularly.

Provide abbreviations for font family suffixes.

The \texttt{j/x} naming convention does not know about different figure alignments; let us silently ignore these.

### 3.5 Decoding

Detect if \texttt{mathversion}, \texttt{fontshape}, \texttt{fontfamily} have been used not under control of this package.

```latex
\fontaxes@create@decode@table
\begin{enumerate}
\item name, \#2 list of axes
\end{enumerate}
\newcommand*{\fontaxes@create@decode@table}[2]{%
\begin{group}
\foreach[\nameuse{fontaxes@encode@#1}]{#2}{%
\def\csname fontaxes@decode@#1\endcsname{#2}%
\endgroup
}
3.6 Compatibility

Declare math version #1 to be a copy of math version #2 if #1 does not exist already. To accomplish this, we have to know that a math version's configuration is basically stored in a macro `\mv\langle name\rangle` (which makes us dependent on the NFSS implementation; sigh ...).

\newcommand{\fontaxes@provide@mv@copy}{\ifdefined{mv@#1}{}%}
\newcommand{\iffontaxes@changed}{\expandafter{\iffontaxes@last\string#1\endcsname}%}
\newcommand{\fontaxes@save}{\expandafter{\expandafter\let\csname fontaxes@last\string#1\endcsname\csname fontaxes@#1\endcsname}%}
\newcommand{\fontaxes@decode@}{\if\ifdefined{fontaxes@decode@#1}%
\let\fontaxes@edoc\relax
\fontaxes@warn@undecodable[#1]%
\edef\fontaxes@edoc{\@nameuse{fontaxes@decode@#1}}%
\expandafter{\iffontaxes@changed}%
\expandafter{\iffontaxes@save}%}
\newcommand{\fontaxes@provide@mv@copy}{\ifdefined{mv@#1}{}%}
\newcommand{\iffontaxes@changed}{\expandafter{\iffontaxes@last\string#1\endcsname}%}
\newcommand{\fontaxes@save}{\expandafter{\expandafter\let\csname fontaxes@last\string#1\endcsname\csname fontaxes@#1\endcsname}%}
If no math versions \texttt{tabular} and \texttt{boldtabular} are defined in the preamble, we provide defaults by copying the states of \texttt{normal} and \texttt{bold} (assuming, in turn, that these two exist).

\begin{verbatim}
\AtBeginDocument{%
  \fontaxes@provide@mv@copy{tabular}{normal}%
  \fontaxes@provide@mv@copy{boldtabular}{bold}%
}\end{verbatim}

\section{Tools}

\begin{verbatim}
\fontaxes@check@family Check if family switching would yield an existing shape.
\iffontaxes@exists
\newcommand*{\fontaxes@check@family}{1}{%\begingroup
  \fontfamily{C1}\try@load@fontshape
  \expandafter\ifx\csname\curr@fontshape\endcsname\relax
    \aftergroup\fontaxes@existsfalse
  \else
    \aftergroup\fontaxes@existstrue
  \fi
  \endgroup}

\fontaxes@split@prefix The results of splitting a family name.
\fontaxes@split@suffix
\newcommand*{\fontaxes@split@prefix}{%}
\newcommand*{\fontaxes@split@suffix}{%}
\fontaxes@split@family Font name contains one hyphen; split there.
\fontaxes@split@familyalt Name consists of four characters; split off the last one. If there are just three characters, the default suffix is ‘x’.
\end{verbatim}
\texttt{\fontaxes@foreach} Execute \#2 for each combination of values of the axes given in \#1 (in the form \{\texttt{\cs}\}{\texttt{\cs}}...).

\texttt{\newcommand\fontaxes@foreach[2][\%}
\texttt{\texttt{\begin{group}}}
\texttt{\def\fontaxes@foreach[#2][\%}
\texttt{\atfor\@tempa:=#1\do[\%}
\texttt{\@temptokena\expandafter\{ontaxes@foreach\}
\texttt{\edef\fontaxes@foreach[#2][\%}
\texttt{\noexpand\atfor\expandafter\@tempa:=\%}
\texttt{\expandafter\noexpand\csname
\texttt{\expandafter\expandafter
\expandafter\@gobble
\expandafter\string\@tempa
@domain\}
\texttt{\noexpand\do\{\the\@temptokena\}
\texttt{\}
\texttt{\endcsname}
\texttt{\noexpand\do\{\the\@temptokena\}
\texttt{\}
\texttt{\endgroup}}
\texttt{\fontaxes@foreach[\%}
\texttt{\end{group}}
\texttt{\fontaxes@foreach[]}
\texttt{/\package}

\section{Tests}

The file \texttt{test-mfontaxes.tex} (docstrip target \texttt{test}) exercises some features of \texttt{fontaxes}. Since it is rather ad-hoc code, it is not shown here. (It also requires the MinionPro package.)