Axes, axes, axes

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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*.

Contents

1 Introduction

The introduction of the New Font Selection Scheme (NFSS) has greatly simplified the usage of LaTeX 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 *shape* of the font (e.g. upright, italic or slanted) and the *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 `\scshape` or `\textsc` will revert to an upright shape, even if the font has italic small capitals

The fontaxes package tries to remedy 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 *figure versions*, which are provided by many professional fonts.

2 Usage

Usually, this package will be included by a package that provides support for a certain font family. Nevertheless, you can load the package manually by adding

```
\usepackage{fontaxes}
```

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.).

`\upshape`
`\itshape`
`\slshape`

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

`\swshape`
`\ulcshape`
`\scshape`

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

`\sscshape`
`\fontprimaryshape`

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

`\fontsecondaryshape`
`\swdefault`
`\sscdefault`
`\ulcdefault`

If you want to change which values are used by the various commands `\`⟨*abbr*⟩`shape`, redefine the corresponding `\`⟨*abbr*⟩`default`. The additional commands `\swdefault`, `\sscdefault`, and `\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-{OsF,LF,TOsF,TLF}` or `ppl{j,x}`). The fontaxes package splits off the axes *figure style* and *figure alignment*, which leaves the *base family* (e.g. `MinionPro` or `ppl`).

`\txfigures`
`\lnfigures`
`\tbfigures`
`\prfigures`
`\fontfigurestyle`
`\fontfigurealignment`
`\fontbasefamily`

The fontaxes package knows two figure styles, `text` and `lining` (accessible via `\txfigures` and `\lnfigures`), and two modes of figure alignment, `tabular` and `proportional` (accessible via the switches `\tbfigures` and `\prfigures`).

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 these 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*.

`\tabularmath`
`\proportionalmath`

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`
`\figureversion`

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

Command	Axis	Value	Default
\upshape	\fontprimaryshape	\updefault	n
\itshape		\itdefault	it
\slshape		\sldefault	sl
\swshape		\swdefault	sw
\ulcshape	\fontsecondaryshape	\ulcdefault	ulc
\scshape		\scdefault	sc
\sscshape		\sscdefault	ssc
\txfigures	\fontfigurestyle	text	
\lnfigures		lining	
\tbfigures	\fontfigurealignment	tabular	
\prfigures		proportional	
⟨*none*⟩	\fontbasefamily	⟨*font-dependent*⟩	
\boldmath	\mathweight	bold	
\unboldmath		normal	
\tabularmath	\mathfigurealignment	tabular	
\proportionalmath		proportional	

3 Implementation

3.1 High-level author commands (Level 1)

3.1.1 Shape

\upshape
\itshape
\slshape
\swshape

Axis 1: primary shape

```
⟨*package⟩
\DeclareRobustCommand\upshape{\not@math@alphabet\upshape\relax
  \fontprimaryshape\updefault\selectfont}
\DeclareRobustCommand\itshape{\not@math@alphabet\itshape\mathit
  \fontprimaryshape\itdefault\selectfont}
\DeclareRobustCommand\slshape{\not@math@alphabet\slshape\relax
  \fontprimaryshape\sldefault\selectfont}
\DeclareRobustCommand\swshape{\not@math@alphabet\swshape\relax
  \fontprimaryshape\swdefault\selectfont}
```

\scshape
\sscshape
\ulcshape

Axis 2: secondary shape

```
\DeclareRobustCommand\scshape{\not@math@alphabet\scshape\relax
  \fontsecondaryshape\scdefault\selectfont}
\DeclareRobustCommand\sscshape{\not@math@alphabet\sscshape\relax
  \fontsecondaryshape\sscdefault\selectfont}
\DeclareRobustCommand\ulcshape{\not@math@alphabet\ulcshape\relax
  \fontsecondaryshape\ulcdefault\selectfont}
```

\swdefault
\ulcdefault
\sscdefault

```
\providecommand\swdefault{sw}
\providecommand\ulcdefault{ulc}
\providecommand\sscdefault{ssc}
```

\textsw
\textssc
\textulc

```
\DeclareTextFontCommand{\textsw}{\swshape}
\DeclareTextFontCommand{\textssc}{\sscshape}
\DeclareTextFontCommand{\textulc}{\ulcshape}
```

3.1.2 Figure version

\txfigures
\lnfigures

Axis 1: figure style

```
\def\txfigures{\@nomath\txfigures
  \fontfigurestyle{text}\selectfont}
\def\lnfigures{\@nomath\lnfigures
  \fontfigurestyle{lining}\selectfont}
```

\tbfigures
\prfigures

Axis 2: figure alignment

```
\def\tbfigures{\@nomath\tbfigures
  \fontfigurealignment{tabular}\selectfont}
\def\prfigures{\@nomath\prfigures
   \fontfigurealignment{proportional}\selectfont}
```

\figureversion

This code originally appeared in the package MinionPro. I have adapted it to work within fontaxes' framework and also changed some option names.

```
\newcommand\fontaxes@fv@prefix{fontaxes@fv@switch@}
\newcommand*\fontaxes@fv@newoption[1]
  {\expandafter\newcommand\csname\fontaxes@fv@prefix #1\endcsname}
\fontaxes@fv@newoption{text}        {\txfigures}
\fontaxes@fv@newoption{osf}         {\txfigures}
\fontaxes@fv@newoption{lining}      {\lnfigures}
\fontaxes@fv@newoption{lf}          {\lnfigures}
\fontaxes@fv@newoption{tabular}     {\tbfigures\tabularmath}
\fontaxes@fv@newoption{tab}         {\tbfigures\tabularmath}
\fontaxes@fv@newoption{proportional}{\prfigures\proportionalmath}
\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.

```
\newcommand\fontaxes@fv@list{}
\newcommand\fontaxes@fv{}
\DeclareRobustCommand*\figureversion[1]{%
  \edef\fontaxes@fv@list{\zap@space#1 \@empty}%
  \@for\fontaxes@fv:=\fontaxes@fv@list\do{%
    \@ifundefined{\fontaxes@fv@prefix\fontaxes@fv}{%
      \PackageWarning{fontaxes}%
      {Unknown figure style `\fontaxes@fv'\MessageBreak
       specified as the argument to \string\figureversion.\MessageBreak
       Figure style not changed}%
    }{%
      \@nameuse{\fontaxes@fv@prefix\fontaxes@fv}%
    }%
  }%
}
```

We have made \figureversion robust to protect it in moving arguments (e.g., section titles). Additionally, we want it to simply be ignored when hyperref is building PDF strings (e.g., for bookmarks). The same is true for similar commands, but we only include a selection of them (only the forms with arguments).

```
\AtBeginDocument{
  \@ifpackageloaded{hyperref}{%
    \pdfstringdefDisableCommands{%
      \let\figureversion\@gobble
      \let\textfigures\@firstofone
      \let\liningfigures\@firstofone
      \let\tabularfigures\@firstofone
      \let\proportionalfigures\@firstofone
      \let\textsw\@firstofone
      \let\textssc\@firstofone
      \let\textulc\@firstofone
    }%
  }{}%
}
```

Axis 3: base family \fontbasefamily{...}

\textfigures
\liningfigures
\tabularfigures
\proportionalfigures

```
\DeclareTextFontCommand{\textfigures}{\txfigures}
\DeclareTextFontCommand{\liningfigures}{\lnfigures}
\DeclareTextFontCommand{\tabularfigures}{\tbfigures\tabularmath}
\DeclareTextFontCommand{\proportionalfigures}
  {\prfigures\proportionalmath}
```

3.1.3 Math version

\boldmath
\unboldmath

Axis 1: weight

```
\def\boldmath{\@nomath\boldmath
  \mathweight{bold}}
\def\unboldmath{\@nomath\unboldmath
  \mathweight{normal}}
```

\tabularmath
\proportionalmath

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

\mathweight
\mathfigurealignment

```
\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}
```

\fontfigurestyle
\fontfigurealignment
\fontbasefamily

```
\DeclareRobustCommand\fontfigurestyle[1]{%
  \fontaxes@get@family \edef\fontaxes@figure@style{#1}\fontaxes@set@family}
\DeclareRobustCommand\fontfigurealignment[1]{%
  \fontaxes@get@family \edef\fontaxes@figure@align{#1}\fontaxes@set@family}
\DeclareRobustCommand\fontbasefamily[1]{%
  \fontaxes@get@family \edef\fontaxes@family@base{#1}\fontaxes@set@family}
```

\fontprimaryshape
\fontsecondaryshape

```
\DeclareRobustCommand\fontprimaryshape[1]{%
  \fontaxes@get@shape \edef\fontaxes@shape@one{#1}\fontaxes@set@shape}
\DeclareRobustCommand\fontsecondaryshape[1]{%
  \fontaxes@get@shape \edef\fontaxes@shape@two{#1}\fontaxes@set@shape}
```

3.3 Internals (Layer 3)

\fontaxes@set@math sets \mathversion
\fontaxes@set@family sets \fontfamily
\fontaxes@set@shape sets \fontshape

\fontaxes@math@weight
\fontaxes@math@align
\fontaxes@family@base
\fontaxes@figure@style
\fontaxes@figure@align
\fontaxes@shape@one
\fontaxes@shape@two

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

```
\newcommand*\fontaxes@math@weight{normal}
\newcommand*\fontaxes@math@align{proportional}
\newcommand*\fontaxes@family@base{MinionPro}
\newcommand*\fontaxes@figure@style{text}
\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{%
  \fontaxes@encode@math
  \mathversion{\fontaxes@code}%
  \fontaxes@save\math@version}
\newcommand*\fontaxes@set@family{%
  \fontaxes@encode@family
  \fontfamily{\fontaxes@code}%
  \fontaxes@save\f@family}
\newcommand*\fontaxes@set@shape{%
  \fontaxes@encode@shape
  \fontshape{\fontaxes@code}%
  \fontaxes@save\f@shape}
```

\fontaxes@get@math
\fontaxes@get@family
\fontaxes@get@shape

Check for changes: if changed, try to decode and update axes.

```
\newcommand*\fontaxes@get@math{%
  \iffontaxes@changed\math@version{%
    \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
  }{}%
}
```

```
\newcommand*\fontaxes@get@family{%
  \iffontaxes@changed\f@family{%
    \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
```

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
        \edef\fontaxes@family@base{\fontaxes@split@prefix}%
        \edef\fontaxes@figure@style{\expandafter\@firstoftwo\fontaxes@edoc}%
```

Do not overwrite align (does not occur in alternative naming scheme)

```
      \fi
    \else
```

Store values

```
      \edef\fontaxes@family@base{\fontaxes@split@prefix}%
      \edef\fontaxes@figure@style{\expandafter\@firstoftwo\fontaxes@edoc}%
      \edef\fontaxes@figure@align{\expandafter\@secondoftwo\fontaxes@edoc}%
    \fi
  }{}%
}
```

```
\newcommand*\fontaxes@get@shape{%
  \iffontaxes@changed\f@shape{%
    \fontaxes@decode@{shape}{\f@shape}%
    \ifx\fontaxes@edoc\relax\else
      \edef\fontaxes@shape@one{\expandafter\@firstoftwo\fontaxes@edoc}%
      \edef\fontaxes@shape@two{\expandafter\@secondoftwo\fontaxes@edoc}%
    \fi
    \fontaxes@save\f@shape
  }{}%
}
```

3.4 Encoding

\fontaxes@encode@math
\fontaxes@encode@family
\fontaxes@encode@figures
\fontaxes@encode@figuresalt
\fontaxes@encode@shape

```
\newcommand*\fontaxes@encode@math{%
  \fontaxes@encode@{math}{{\fontaxes@math@weight}{\fontaxes@math@align}}%
}
```

Default is concatenation

```
\newcommand*\fontaxes@encode@math@default{%
  \edef\fontaxes@code{\fontaxes@math@weight\fontaxes@math@align}}
```

```
\newcommand*\fontaxes@encode@family{%
  \fontaxes@encode@{family}
    {{\fontaxes@family@base}{\fontaxes@figure@style}{\fontaxes@figure@align}}%
}
```

Try different naming conventions

```
\newcommand*\fontaxes@encode@family@default{%
  \fontaxes@encode@figures
  \edef\fontaxes@code{\fontaxes@family@base-\fontaxes@code}%
  \fontaxes@check@family\fontaxes@code
  \iffontaxes@exists\else
    \fontaxes@encode@figuresalt
    \edef\fontaxes@code{\fontaxes@family@base\fontaxes@code}%
    \fontaxes@check@family\fontaxes@code
    \iffontaxes@exists\else
      \edef\fontaxes@code{\fontaxes@family@base}%
    \fi
  \fi
}
```

```
\newcommand*\fontaxes@encode@figures{%
  \fontaxes@encode@{figures}{{\fontaxes@figure@style}{\fontaxes@figure@align}}%
}
\newcommand*\fontaxes@encode@figures@default{%
  \edef\fontaxes@code{OsF}%
  \PackageWarning{fontaxes}{Unknown figure version
    ‘\fontaxes@figure@style\space + \fontaxes@figure@align’\MessageBreak
    Encoding to ‘\fontaxes@code’}%
}
```

```
\newcommand*\fontaxes@encode@figuresalt{%
  \fontaxes@encode@{figuresalt}{{\fontaxes@figure@style}{\fontaxes@figure@align}}%
}
\newcommand*\fontaxes@encode@figuresalt@default{%
  \PackageWarning{fontaxes}{Unknown figure version
    ‘\fontaxes@figure@style\space + \fontaxes@figure@align’\MessageBreak
    Encoding to ‘\fontaxes@code’}%
  \edef\fontaxes@code{j}%
}
```

```
\newcommand*\fontaxes@encode@shape{%
  \fontaxes@encode@{shape}{{\fontaxes@shape@one}{\fontaxes@shape@two}}%
}
```

Default is (reverse) concatenation

```
\newcommand*\fontaxes@encode@shape@default{%
  \edef\fontaxes@code{\fontaxes@shape@two\fontaxes@shape@one}%
}
```

\fontaxes@encode@

```
\newcommand*\fontaxes@encode@[2]{%
  \@ifundefined{fontaxes@encode@#1#2}
    {\@nameuse{fontaxes@encode@#1@default}}
    {\edef\fontaxes@code{\@nameuse{fontaxes@encode@#1#2}}}%
}
```

\fontaxes@naming@exception

To do: Add a user interface to specify naming exceptions

```
\newcommand*\fontaxes@naming@exception[3]{%
  \expandafter\edef\csname fontaxes@encode@#1#2\endcsname{#3}%
}
```

The defaults n and ulc disappear when combined.

```
\fontaxes@naming@exception{shape}{{n}{ulc}}{n}
\fontaxes@naming@exception{shape}{{n}{sc}}{sc}
\fontaxes@naming@exception{shape}{{n}{ssc}}{ssc}
\fontaxes@naming@exception{shape}{{it}{ulc}}{it}
\fontaxes@naming@exception{shape}{{sl}{ulc}}{sl}
\fontaxes@naming@exception{shape}{{sw}{ulc}}{sw}
```

The defaults disappear in the concatenation. boldtabular is formed regularly.

```
\fontaxes@naming@exception{math}{{normal}{proportional}}{normal}
\fontaxes@naming@exception{math}{{normal}{tabular}}{tabular}
\fontaxes@naming@exception{math}{{bold}{proportional}}{bold}
```

Provide abbreviations for font family suffixes.

```
\fontaxes@naming@exception{figures}{{text}{proportional}}{OsF}
\fontaxes@naming@exception{figures}{{text}{tabular}}{TOsF}
\fontaxes@naming@exception{figures}{{lining}{proportional}}{LF}
\fontaxes@naming@exception{figures}{{lining}{tabular}}{TLF}
```

The j/x naming convention does not know about different figure alignments. Let us silently ignore these.

```
\fontaxes@naming@exception{figuresalt}{{text}{proportional}}{j}
\fontaxes@naming@exception{figuresalt}{{text}{tabular}}{j}
\fontaxes@naming@exception{figuresalt}{{lining}{proportional}}{x}
\fontaxes@naming@exception{figuresalt}{{lining}{tabular}}{x}
```

3.5 Decoding

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

\fontaxes@figure@style@domain
\fontaxes@figure@align@domain
\fontaxes@shape@one@domain
\fontaxes@shape@two@domain
\fontaxes@math@weight@domain
\fontaxes@math@align@domain

Assuming an injective encoding function, we can construct decoding tables when we know the function's domain. To do: Warn if decoding entries are overwritten (if the function is not injective).

```
\newcommand*\fontaxes@figure@style@domain{text,lining}
\newcommand*\fontaxes@figure@align@domain{proportional,tabular}

\newcommand*\fontaxes@shape@one@domain{n,it,sl,sw}
\newcommand*\fontaxes@shape@two@domain{ulc,sc,ssc}

\newcommand*\fontaxes@math@weight@domain{normal,bold}
\newcommand*\fontaxes@math@align@domain{proportional,tabular}
```

\fontaxes@create@decode@table

#1 name, #2 list of axes

```
\newcommand*\fontaxes@create@decode@table[2]{%
  \begingroup
  \fontaxes@foreach{#2}{%
    \@nameuse{fontaxes@encode@#1}%
    \global\expandafter
    \edef\csname fontaxes@decode@#1{\fontaxes@code}\endcsname{#2}%
  }%
  \endgroup
}

\AtEndOfPackage{
  \fontaxes@create@decode@table{figures}
    {{\fontaxes@figure@style}{\fontaxes@figure@align}}
  \fontaxes@create@decode@table{figuresalt}
    {{\fontaxes@figure@style}{\fontaxes@figure@align}}
  \fontaxes@create@decode@table{shape}
    {{\fontaxes@shape@one}{\fontaxes@shape@two}}
  \fontaxes@create@decode@table{math}
    {{\fontaxes@math@weight}{\fontaxes@math@align}}
}
```

\fontaxes@warn@undecodable

```
\newcommand*\fontaxes@warn@undecodable[1]{%
  \PackageWarning{fontaxes}{I don’t know how to decode\MessageBreak #1}}
```

\fontaxes@decode@

Interpret the decoding tables.

```
\newcommand*\fontaxes@decode@[2]{%
  \@ifundefined{fontaxes@decode@#1{#2}}{%
    \let\fontaxes@edoc\relax
    \fontaxes@warn@undecodable{#1 ‘#2’}%
  }{\edef\fontaxes@edoc{\@nameuse{fontaxes@decode@#1{#2}}}}%
}
```

\fontaxes@save
\iffontaxes@changed

Save states of macros for future comparison

```
\newcommand*\iffontaxes@changed[1]{%
  \expandafter\ifx\csname fontaxes@last@\string#1\endcsname#1%
    \expandafter\@secondoftwo
  \else
    \expandafter\@firstoftwo
  \fi
}
\newcommand*\fontaxes@save[1]{%
  \expandafter\let\csname fontaxes@last@\string#1\endcsname#1%
}
```

3.6 Compatibility

If no math versions tabular and boldtabular are defined in the preamble, we provide defaults by copying the states of normal and bold (assuming, in turn, that these two exist).

```
\AtBeginDocument{%
  \fontaxes@provide@mv@copy{tabular}{normal}%
  \fontaxes@provide@mv@copy{boldtabular}{bold}%
}
```

\fontaxes@provide@mv@copy

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@⟨*name*⟩ (which makes us dependent on the NFSS implementation; sigh . . .).

```
\newcommand*\fontaxes@provide@mv@copy[2]{%
  \@ifundefined{mv@#1}{%
    \DeclareMathVersion{#1}%
    \expandafter\let\csname mv@#1\expandafter\endcsname
      \csname mv@#2\endcsname
  }{}%
}
```

3.7 Tools

\fontaxes@check@family
\iffontaxes@exists

Check if family switching would yield an existing shape.

```
\newif\iffontaxes@exists
\newcommand*\fontaxes@check@family[1]{%
  \begingroup
  \fontfamily{#1}\try@load@fontshape
  \expandafter
  \ifx\csname\curr@fontshape\endcsname\relax
    \aftergroup\fontaxes@existsfalse
  \else
    \aftergroup\fontaxes@existstrue
  \fi
  \endgroup
}
```

\fontaxes@split@prefix
\fontaxes@split@suffix

The results of splitting a family name.

```
\newcommand*\fontaxes@split@prefix{}
\newcommand*\fontaxes@split@suffix{}
```

\fontaxes@split@family

Font name contains one hyphen, split there

```
\newcommand*\fontaxes@split@family{}
\def\fontaxes@split@family#1-#2-#3\@nnil{%
  \let\fontaxes@split@prefix\relax
  \let\fontaxes@split@suffix\relax
  \def\@tempa{#3}%
  \ifx\@tempa\@empty\else
    \def\fontaxes@split@suffix{#2}%
    \ifx\fontaxes@split@suffix\@empty
      \let\fontaxes@split@suffix\relax
    \else
      \def\fontaxes@split@prefix{#1}%
    \fi
  \fi
}
```

\fontaxes@split@familyalt

Name consists of four characters, split off the last one

```
\newcommand*\fontaxes@split@familyalt{}
\def\fontaxes@split@familyalt#1#2#3#4#5\@nnil{%
  \let\fontaxes@split@prefix\relax
  \let\fontaxes@split@suffix\relax
  \edef\@tempa{#5}%
  \ifx\@tempa\@empty
    \ifx\@empty#4\else
      \def\fontaxes@split@prefix{#1#2#3}%
      \def\fontaxes@split@suffix{#4}%
    \fi
  \fi
}
```

`\fontaxes@foreach` Execute #2 for each combination of values of the axes given in #1 (in the form `{\cs}{\cs}...`).

```
\newcommand\fontaxes@foreach[2]{%
  \begingroup
  \def\fontaxes@foreach@{#2}%
  \@tfor\@tempa:=#1\do{%
    \@temptokena\expandafter{\fontaxes@foreach@}%
    \edef\fontaxes@foreach@{%
      \noexpand\@for
      \expandafter\noexpand\@tempa:=%
      \expandafter\noexpand\csname
        \expandafter\expandafter
        \expandafter\@gobble
        \expandafter\string\@tempa
        @domain%
      \endcsname
      \noexpand\do{\the\@temptokena}%
    }%
  }%
  \expandafter\endgroup\fontaxes@foreach@
}
⟨/package⟩
```

3.8 Tests

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