

The macro package `lucimatx`*

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Abstract

This document describes the macro package `lucimatx`, which serves for using the Lucida® Bright and Lucida® New Math fonts¹ with \LaTeX . It constitutes a successor to the packages `lucidabr` and `lucbmath`. The present document serves also as a font sample, since it was typeset using the Lucida fonts and shows at least one member of each single font family in the collection.

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*This document refers to version 1.0.1 of the package. © 2005 Personal TeX, Inc.

¹ Lucida ® is a trademark of Bigelow & Holmes Inc. registered in the U. S. Patent & Trademark Office and other jurisdictions.

The fonts are non-free and must be acquired from a licensed distributor.

1 Introduction

Lucida is a ‘super-family’ of harmonized typefaces that includes a variety of styles: serified and sans-serif, roman and italic, normal and bold weights, scripts, typewriter and blackletter. The related math fonts (‘Lucida New Math’) contain the character set needed for use with T_EX, including the ‘AMS symbols’, fraktur and doublestroke alphabets and complete Greek alphabets in both upright and slanted form. Even though they were designed for use with the Lucida text fonts, they may blend harmoniously with other typefaces, too.

To make the use of the Lucida text and math fonts with L^AT_EX most easy, the macro package `lucimatx` is provided. Loading the package

```
\usepackage[options]{lucimatx}
```

makes L^AT_EX use the Lucida Bright and Lucida New Math fonts in place of the default Computer Modern text and math fonts. In detail:

- ▷ Computer Modern Roman is replaced with Lucida Bright,
- ▷ CM Sans is replaced with Lucida Sans,
- ▷ CM Typewriter is replaced with Lucida Sans Typewriter,
- ▷ the CM Math fonts are replaced with Lucida New Math.

The following sections describe the Lucida fonts, the particular features of the package, and the additional options that control its behavior.

2 Package option syntax

All package options are set using a $\langle key \rangle = \langle value \rangle$ scheme; valid keys and values will be explained in the course of this document. So-called ‘boolean’ options accept `true` and `false` as values. Specifying a boolean key without a value is equivalent to setting it to `true`.

For a summary of all package options see section 8.

3 Font size and baseline distance

The Lucida text and math fonts are larger than many other typefaces (including CM) when used at the same nominal size. This may lead to problems with the default vertical spacing of existing document classes and with the blending with other fonts possibly used in the document. The package `lucimatx` provides two alternative means to control the effective font size, if you cannot (or do not want to) modify the document class accordingly:

First, there is an option key `scale`.² Its value indicates a factor by which the Lucida fonts will be scaled; for instance, `scale=0.9` causes the Lucida fonts to be used at 90% of their nominal size (which is a reasonable value under normal circumstances).

²Notice that the key is named `scale`, rather than `scaled` as in certain other packages.

Second, for the sake of compatibility with the package `lucidabr`, `lucimatx` provides also an alternative way to control the effective font size: When the package is loaded with the boolean option `lucidascale` or `lucidasmallscale` set to `true`, a sort of ‘nonlinear’ scaling is enabled, i.e., different sizes are scaled differently:

	< 5 pt	...	10 pt	...	≥ 22.5 pt
<code>lucidascale:</code>	1.04	...	0.95	...	0.89
<code>lucidasmallscale:</code>	0.98	...	0.90	...	0.85

Notice that linear and nonlinear scaling cannot be combined, i.e., you can select either the option `scale=...` or `lucidascale` or `lucidasmallscale`.

Because of the relatively large x-height of the Lucida fonts, the ratio of baseline distance to font size must be considerably larger than with Computer Modern. The standard document classes (and most others, too) are, however, optimized for the CM fonts, so the leading must be enlarged, even when the Lucida fonts are already scaled down. Since the optimum setting is a question of document design and line width, adjusting the baseline distance is left to the user. If necessary, all you have to do is to issue the command

```
\linespread{<factor>}
```

in the preamble; as a result, the baseline distance is enlarged by the given factor. Typical values for `<factor>` are 1.04...1.05, provided that the fonts are simultaneously scaled down to 90%.

4 The Lucida text fonts

Table 1 lists all font families in the Lucida distribution³ and the available font encodings, series and shapes. For more detailed information see the file `doc/fonts/lucida/lucida.txt` in your TeX file system hierarchy.

4.1 Choice of text fonts through package options

When the package `lucimatx` is used, the roman font family of the document (`\rmdefault`) can be chosen through the package option `romanfamily`. Possible values are:

`romanfamily=bright`: Lucida Bright (default setting)

`romanfamily=bright-osf`: Lucida Bright with oldstyle figures

`romanfamily=fax`: Lucida Fax

`romanfamily=casual`: Lucida Casual

Under normal circumstances, the commands `\itshape` and `\textit` select the italic shape that belongs to the current font family. The package can optionally replace this with the Lucida Calligraphic or Lucida Handwriting font. This facility is controlled using the package option `italics`. Possible values are:

`italics=handwriting`: use *Lucida Handwriting*

³as of October 2005

encodings	family	series	shape(s)
Lucida Bright			
T1, TS1, LY1	h1h	m, b	n, it, sl, sc
Lucida Bright, oldstyle figures			
T1, TS1	h1hj	m	n, it, sc
T1, TS1	h1hj	b	n, sc
Lucida Sans			
T1, TS1, LY1	h1s	m, b, ub	n, it
Lucida Sans Typewriter			
T1, TS1, LY1	h1st	m, b	n, sl
Lucida Typewriter			
T1, TS1, LY1	h1ct	m, b	n, sl
Lucida Fax			
T1, TS1, LY1	h1x	m, b	n, it
<i>Lucida Calligraphy</i>			
T1, TS1, LY1	h1ce	m	it
Lucida Casual			
T1, TS1, LY1	h1cn	m	n, it
<i>Lucida Handwriting</i>			
T1, TS1, LY1	h1cw	m	it
<i>Lucida Blackletter</i>			
T1, TS1, LY1	h1cf	m	n

Table 1: NFSS classification of the Lucida text fonts

`italics=calligraphic`: use *Lucida Calligraphic*

`italics=default`: do not replace the italics (default setting)

Notice, however, that this affects the roman font family only. The italics of the sans-serif and typewriter families will remain unchanged.

By default, the package `lucimatx` selects `Lucida Sans Typewriter` as the typewriter font family (`\ttdefault`). To use the serified variant `Lucida Typewriter` instead, specify the boolean package option `seriftt=true`.

4.2 Encoding

The Lucida text fonts are currently available with T1/TS1 (European) and LY1 (TeX'n ANSI) encoding, whereas they are no longer made available with the obsolete OT1 encoding (which is still the default setting in L^AT_EX).

LY1 encoding is supported primarily with respect to Y&Y-TeX systems⁴ and legacy documents, and it implies a few restrictions: The font family `h1hj` is not

⁴ Using the Lucida fonts with T1/TS1 encoding requires virtual font support, which is not available on Y&Y-TeX.

available with LY1 encoding, the command `\oldstylenums` does not work properly, and Euro symbols (`\texteuro`) are not available in all font families. These restrictions do not apply with T1/TS1 encoding, which is to be preferred, if possible.

When the `lucimatx` package is loaded with OT1 encoding still being in effect, it will change the font encoding to T1 and load the package `textcomp` additionally. To use LY1 instead, or to declare additional encodings, you must load the `fontenc` package *before* `lucimatx`; in this case `textcomp` is *not* loaded automatically.

4.3 Additional usage notes

The Lucida text fonts do not include all symbols of the TS1 ('text companion') font encoding. Only those symbols are available, that belong to the ISO-Adobe 1 character set, plus the Ω (`\textohm`) and the € (`\texteuro`).

The font series `b` is actually assigned *demibold* fonts. To access Lucida Sans Bold, which is assigned to the series `ub` (ultra bold), use a declaration such as `\fontseries{ub}\sffamily`.

Oldstyle numerals are available in the font family `h1hj`, where they constitute the default numerals, and in the family `h1h`, where they can be accessed through `\oldstylenums`. The latter way requires the use of a recent version of the `textcomp` package, as shipped with L^AT_EX from the 2003/12/01 release on.

The blackletter font is primarily intended to be used in math. When used as a text font with T1 or LY1 encoding, no 'long s' is made available, while there are many accented or special characters that actually do not make much sense with this typeface. Consequently, no package option or 'user level' command is provided to select Lucida Blackletter for text, but you can access it through the declaration `\fontfamily{h1cf}\selectfont`.

5 Using Lucida New Math with 'foreign' text fonts

Instead of changing both text and math fonts of the document to Lucida, it is possible to make the package change only the math fonts; to do so, specify the boolean option `onlymath=true`. Thus, the Lucida New Math fonts can be used with 'foreign' text fonts. Notice that the default font families used for the text must be selected *before* loading `lucimatx`; for instance, to use Lucida New Math with Charter as the default roman typeface:

```
\usepackage{charter}
\usepackage[onlymath=true,scale=.9,...]{lucimatx}
```

The text font encoding, too, must be chosen *before* the loading of `lucimatx`, unless you are staying with OT1.

The options described in the above section 4.1 have no effect, when `onlymath` is selected.

6 Math typesetting

6.1 Choice of math italics

Lucida New Math includes two italic math alphabets with different shapes of the lower-case Latin letters:

Lucida New Math Italic: $a, b \dots m, n, o, p, q, r \dots z$
Lucida New Math Alternate Italic: $a, b \dots m, n, o, p, q, r \dots z$

Despite its name, the ‘Alternate’ variant is the one that is used by default for variables in formulas. To use the ‘standard’ one instead, load `lucimatx` with the package option `stdmathitalics=true`.

6.2 Upright vs. italic letters in math mode

With \TeX or \LaTeX , uppercase Greek letters in math mode are usually typeset as upright, even though they are usually meant to designate variables. This violates the International Standards ISO31-0:1992 to ISO31-13:1992. Loading the package with the option `math-style=iso` will result in slanted uppercase Greek letters Γ , Δ etc.

Upright lowercase and uppercase Greek letters are available with command names such as `\upa`, `\upbeta`, `\upGamma`, `\upDelta`, etc. They are always upright, regardless of the value of the `math-style` option.

The package supports also the French tradition of typesetting all Greek variables (both uppercase and lowercase) upright, and ditto the uppercase roman variables. This behavior is selected by specifying the option `math-style=french`.

The following table is to clarify the differences between \TeX ’s default behavior and the options `math-style=iso` and `french`:

default:	$M \in \Gamma \Leftrightarrow OM = x\rho$
ISO :	$M \in \Gamma \Leftrightarrow OM = x\rho$
French :	$M \in \Gamma \Leftrightarrow OM = x\rho$

6.3 Using bold math fonts

All Lucida math fonts, except for the extensible operator symbols, are available in a normal and a bold version. The appropriate way to use the bold math fonts depends on the particular purpose:

- ▷ The declaration `\boldmath` will embolden all formulas within its scope. Use it, for instance, to emphasize complete formulas or to make sure that mathematical expressions within bold section titles also appear in bold type. The declaration `\boldmath` can, however, *not* be issued when you are already in math mode. Thus it is not a suitable means to embolden single letters, e.g., if you want to designate vectors with bold type.
- ▷ The ‘canonical’ way to embolden single letters or symbols is to use the macro package `bm`. It defines the command `\bm`, which can embolden almost anything—provided that the required font exists. The package `bm` belongs to the `tools` collection, which is part of every \LaTeX system. Make sure to load the package only *after* `lucimatx`.

6.4 Math alphabets

- ▷ The standard math alphabets `\mathrm`, `\mathsf` and `\mathtt` are mapped to the roman, sans-serif and typewriter text fonts, as expected.
- ▷ Correspondingly, `\mathbf` uses the bold variant of the roman text font.
- ▷ `\mbf` is similar, but uses the upright LucidaNewMath-Demibold font. with the spacing and the letter shapes adapted to math typesetting. Thus `\mbf` is appropriate to typeset single variables, while `\mathbf` can be used, e.g., to emphasize an operator name.
- ▷ `\mathcal` uses the calligraphic alphabet of the Lucida New Math Symbol font; notice that only upper-case Latin letters are available: $\mathcal{A}, \mathcal{B}, \dots, \mathcal{Z}$
- ▷ `\mathbb` uses the doublestroke alphabet in the Lucida New Math fonts; again, only upper-case letters are available: $\mathbb{A}, \mathbb{B}, \dots, \mathbb{Z}$
- ▷ `\mathfrak` points to the Lucida Blackletter font: $\mathfrak{a}, \mathfrak{b}, \dots, \mathfrak{z}, \mathfrak{A}, \mathfrak{B}, \dots, \mathfrak{Z}$

The ‘Blackboard bold’ and fraktur alphabets are provided by the `lucimatx` package; do *not* load the packages `amsfonts` or `amssymb` for this purpose!

The symbols `\Re` and `\Im` are, by default, not exactly the same as the corresponding letters from these `\mathfrak` alphabets. If you would prefer to have `\Re` and `\Im` use the `\mathfrak` alphabet, just redefine these macros appropriately:

```
\renewcommand{\Re}{\mathfrak{R}}
\renewcommand{\Im}{\mathfrak{I}}
```

6.5 Digits in math mode

Digits in formulas are normally taken from the default roman text font family of the document, i.e., `\rmdefault`. This may not always meet your expectations, for instance, if this font family has oldstyle digits. The option `stdmathdigits=true` forces the macro package to use always the Lucida lining figures in math mode, regardless of the text fonts.

6.6 AMS symbols

The Lucida New Math fonts contain the so-called ‘AMS symbols’ described, for instance, in [1], section 8.9. With Computer Modern the symbols are made available by loading the package `amssymb`; with Lucida, in contrast, no additional package is needed beside `lucimatx`. Do *not* load `amssymb` or `amsfonts`; all features usually provided by these packages are already built into `lucimatx`.

Notice that the mathematical symbols `\digamma` and `\yen` are not available with the Lucida fonts.

6.7 Additional symbols not available with standard L^AT_EX

6.7.1 Integrals

A surface integral symbol $\int\!\!\int$ is available under the name `\surfint`.

6.7.2 Negated relation symbols

Lucida New Math includes a number of ready-made negated relation symbols, which are normally built from pieces. For instance, with `lucimatx` you should write `\notequiv` instead of `\not\equiv`. For most of these symbols an alternative name is indicated, which follows the naming scheme of the `amssymb` package:

\neq	<code>\notequiv, \nequiv</code>	$\not\approx$	<code>\notapprox, \napprox</code>
$\not\subset$	<code>\notsubset, \nsubset</code>	$\not\supset$	<code>\notsupset, \nsupset</code>
$\not\subseteq$	<code>\notsubseteq, \nsubseteq</code>	$\not\supseteq$	<code>\notsupseteq, \nsupseteq</code>
$\not\sim$	<code>\notsim, \nsim</code>	$\not\approx$	<code>\notsimeq, \nsimeq</code>
$\not\sqsubseteq$	<code>\notsqsubseteq, \nsqsubseteq</code>	$\not\sqsupseteq$	<code>\notsqsupseteq, \nsqsupseteq</code>
$\not\asymp$	<code>\notasymp, \nasymp</code>	$\not\cong$	<code>\notcong, \ncong</code>
$\not\ni$	<code>\notni</code>		

6.7.3 Miscellaneous symbols

Further extra symbols, too, are not defined with standard \LaTeX . These are relations, except for the lightning and the dashed arrows, which are of type ‘ordinary’, and the open face brackets, which are delimiters:

$\stackrel{\text{def}}{=}$	<code>\defineeq, \defineequal</code>	$\hat{=}$	<code>\hateq</code>
$:=$	<code>\coloneq</code>	$=:$	<code>\eqcolon</code>
$\circ\circ$	<code>\image</code>	$\circ\circ$	<code>\original</code>
$\bullet\circ$	<code>\longimage</code>	$\circ\bullet$	<code>\longoriginal</code>
\updownarrow	<code>\updownarrows</code>	\downuparrow	<code>\downuparrows</code>
\rightsquigarrow	<code>\leadsfrom</code>	\lightning	<code>\lightning</code>
\dashrightarrow	<code>\dashuparrow</code>	\dashrightarrow	<code>\dashdownarrow</code>
\llbracket	<code>\ldbrack</code>	\rrbracket	<code>\rdbrack</code>

6.8 Compatibility with `amsmath`

In contrast to its predecessors `lucidabr` and `lucbmath`, the package `lucimatx` should be fully compatible with `amsmath`, and it should not matter which package is loaded first.⁵ Also, it should work together with the `chemarr` package, which constitutes an extension to `amsmath`.

The only exception affects the commands `\leftroot` and `\uproot` provided by `amsmath`. They have no effect, when the Lucida math fonts are used, because `lucimatx` has a method of its own to optimize the placement of root indices without interaction of the user.

7 Diagnostic output

`lucimatx` applies a large number of changes to the default font settings of the \LaTeX program, which would normally result in lots of warnings on the terminal (console). To avoid this, the package makes any font warnings appear in the log file only. Optionally you can suppress font warnings in the log file, too, by

⁵ This holds for `amsmath` version 2.13. Later versions may behave differently; in case you experience any problems, please let us know!

issuing the package option `nofontinfo=true`. Finer control over the diagnostic output can be achieved by using the package `tracefmt`, which is to be loaded after `lucimatx`.

8 Option summary

The following table lists all options (keys) of the `lucimatx` package. Values that correspond to the default behavior of the package are marked by an asterisk and need normally not to be specified.

key	values	see section...
<code>italics</code>	<code>default*</code> , <code>handwriting</code> , <code>calligraphic</code>	4.1
<code>lucidascale</code>	<code>true</code> , <code>false*</code>	3
<code>lucidasmallscale</code>	<code>true</code> , <code>false*</code>	3
<code>onlymath</code>	<code>true</code> , <code>false*</code>	5
<code>math-style</code>	<code>tex*</code> , <code>iso</code> , <code>french</code>	6.2
<code>nofontinfo</code>	<code>true</code> , <code>false*</code>	7
<code>romanfamily</code>	<code>bright*</code> , <code>bright-osf</code> , <code>fax</code> , <code>casual</code>	4.1
<code>scale</code>	$\langle factor \rangle$	3
<code>serifft</code>	<code>true</code> , <code>false*</code>	4.1
<code>stdmathdigits</code>	<code>true</code> , <code>false*</code>	6.5
<code>stdmathitalics</code>	<code>true</code> , <code>false*</code>	6.1

9 Migrating from `lucidabr v4.2` to `lucimatx`

Almost all documented features of the packages `lucidabr` and `lucbmath` (version 4.2) are available with `lucimatx`, too. Exceptions affect mainly the facilities to choose between italic and upright letters in math mode, i.e., the former package options `mathitalics3`, `slantedgreek`, `uprightgreek` and `vargreek`: A completely different behavior has been implemented now, which is—to our opinion—much more useful and complies with de-facto standards implemented already in other packages; see section 6.2.

Most other options are still available through the key-value syntax; a few are no longer needed:

`expert`, `noexpert`: These options don't exist any more, since the Lucida fonts are always distributed as a whole now.

`noLucidascale`, `lucidascale`, `lucidasmallscale`: The latter two options exist still (see section 3), but the **default** behavior is now **not to apply any scaling**.

`mathitalic1`, `mathitalic2`: The former option corresponds to the default behavior, the latter corresponds to `stdmathitalics=true`.

`OT1`, `T1`, `LY1`: These options are no longer needed; `lucimatx` works with any of `OT1`, `T1` or `LY1` and will auto-detect the encoding that is in use when package is loaded.

`serifft`: See section 4.1.

`fax`, `casual`: Use the corresponding values of the option `romanfamily` instead.

`handwriting, calligraphic`: Use the corresponding values of the option `italics` instead.

`noamssymbols`: The option is no longer provided, because contemporary TeX systems have sufficient memory.

`errorshow, warnshow, nofontinfo`: `lucimatx` provides only the latter option. Finer control over font-related infos and warnings can be achieved by loading the package `tracefnt` after `lucimatx`.

`altbullet`: The option is no longer provided. Instead of patching the font definitions, redefine `\labelitemi` appropriately, if you don't like the shape of the default item label `\textbullet`.

References

- [1] Frank Mittelbach and Michel Goosens: *The LaTeX Companion*. Addison Wesley, 2nd ed., 2004.