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minim-math

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This package gives a simple and higly-configurable way of using unicode and OpenType mathematics with plain LuaTeX, making use of most of the latter engine's new capabilities in mathematical typesetting. Also included are proper settings and definitions for nearly all unicode mathematical characters, as well as a few shorthands and helper macros that seemed useful additions.

Load the package by saying \input minim-math.tex; this will set up luatex for using opentype mathematical fonts and unicode math input. It will not, however, select mathematical fonts for you. That you will have to do for yourself; see below for instructions.

Styles and alphabets

Value of style	Result
up/rm	ABC
it	ABC
bf	ABC
bfit	ABC
bb	$\mathbb{A}\mathbb{B}\mathbb{C}$
frak	ABC
bffrak	\mathfrak{ABC}
cal/scr	\mathcal{ABC}
bfscr	\mathcal{ABC}
	up/rm it bf bfit bb frak bffrak cal/scr

Styles without shorthand are sans/sf, sfit, sfbf, sfbfit, tt/mono and finally the special value clear for using the default style. You can use the shorthands directly in sub- and superscripts: v^s F will result in $v^{\mathcal{F}}$.

While math families are not used anymore for switching between styles (see below), you still can use \fam with the values 0, 1, 2, 4, 5, 6 or 7 for doing so. This means that plain tex's \rm, \it, \cal, \sl, \bf and \tt can still be used (at least in math mode).

Please note that \mup is not the right choice for upright multiletter symbols or operators: you should use \mord or \mop instead (see near the end of this chapter). For nonmathematical text, you should use \text instead of \mup.

The default properties of characters can be set with one of the following three commands:

```
\mathmap {character list} {style}
\mathclass {character list} {class}
\mathfam {character list} nr
```

There, style is one of the above and class is the name of a class as below. Finally, the character list should be a comma-separated list with elements of one of the following forms:

- 1. a list of characters, like abc or \partial or \mathbb{R} ;
- 2. a character range, like `A-`Z, 65-90 or "41-"5A;
- 3. one of the alphabets [L1]atin, [Gg]reek, or digits;
- 4. one of the style groups bold, boldgreek, sans, sansgreek, mono, black-board, fraktur or script;
- 5. the name of a math class: ord, op, bin, rel, fence, open, close or punct.

Note that unicode is somewhat irregular in its encoding of mathematical letters; this is taken into account when using ranges as under (2) above. Thus, `mscra-`mscrz really gives you all lowercase script characters, despite e.g. e being well outside that range.

The default style settings are \mathmap {latin, greek, Latin}{it}. Since the math family setting is not used anymore for selecting different styles, the default family of every symbol is zero. Instead, you can use \mathfam for mixing fonts (see below). The class option to \mathclass should be one of the names under 5.

Character variants

You can change the default appearance of several greek characters with \use-mathvariant {chars} or \usemathdefault {chars}, where chars is a list of normal greek characters. As in unicode but against tex's tradition, the variants are $\epsilon\vartheta\Theta\varkappa\varpi\varrho\phi$ and the defaults $\epsilon\theta\Theta\kappa\pi\rho\varphi$. The macros \usemathvariant etc. have been updated to reflect the unicode variants.

The appearance of root symbols can be set with $\colon colon color colo$

Say \unicodedots to use the unicode dots characters (...:...) and \traditionaldots to construct these characters from periods (...:..., the default). Both settings affect the meaning of both the actual characters and the \xdots macros ($x \in \{1, v, c, a, d\}$). Unlike in traditional plain tex, the traditional dots are available in script sizes, too.

Say \decimalcomma and have commas appear as 1,2 instead of 1,2 (\nodecimalcomma restores the default). The explicit \comma, like \colon, will always be punctuation.

The behaviour of limits on integral signs can be set by redefining \intlimits (the default is \let \intlimits = \nolimits).

If you want to change the meaning (inside math mode) altogether for a single character, you can use the commands $\mbox{\tt mathlet}$. For example, by default, you can use the letter \hbar for the reduced planck constant \hbar ; this has been made so with $\mbox{\tt mathlet}$ (you could also have said $\mbox{\tt mathlet}$ \hbar $\mbox{\tt hbar}$).

Setting up fonts

The minimum you need do to set up a mathematical font is this:

Note that you only have to set up the font for a single family: opentype mathematical fonts typically contain all necessary variants of all mathematical characters. Therefore, the \fam setting has been made a no-op (use \setfam if you really need the old primitive) and the default family of all symbols has been set to zero.

As mentioned above, you can still change the family number of specific characters and this allows you to mix mathematical fonts. For instance, if you dislike the current blackboard bold characters, just assign a second font to family 1 and say \mathfam {blackboard} 1. Less useful are the parameters \accentfam, \radicalfam and \extensiblefam that control the family of all accents, radicals and extensibles.

Shorthands and additions

You can use \text for adding nonmathematical text to your equations. It will behave well in sub- and superscripts: \text{word}^\\text{word} gives word word. By default, the font used is the normal mathematical font. You can change this by setting the \textfam parameter to some nonzero value and assigning a different font to that family (see above). You probably want to do this, since most commonly-used mathematical fonts do not include a normal kerning table.

All the usual arrows can be made extensible by prefacing them with an x, including $\mbox{xmapsfrom}$. Alternatively, you can use $\mbox{$\rightarrow$}$ etc. as shorthands. Additionally, you can use the following:

Shorthand	Result
\bra x, \ket y	$\langle x , y\rangle$
\braket x y	$\langle x y\rangle$
\norm x, \Norm x	$\left\vert x\right\vert ,\left\Vert x\right\Vert$
x \stackrel ?= y	$x \stackrel{?}{=} y$
x \stackbin a+ y	$x \overset{a}{+} y$
f\inv	f^{-1} (cf. f^{-1})
a \xrightarrow[down]{up} b	$a \xrightarrow[down]{up} b$
a \xeq[down]{up} b	$a \stackrel{up}{= down} b$
\frac12, \tfrac12, \dfrac12	$\frac{1}{2}, \frac{1}{2}, \frac{1}{2}$

Also new are the operators \Tr, \tr, \Span, \GL, \SU, \U, \SO, \O, \Sp, \im, \End, \Aut, \Dom and \Codom. You can define new operators with \newmathop and \newlargemathop: \newmathop{op} will define the new operator \op. For single use of an upright symbol, operator or large operator you can use \mord, \mop and \mlop. The difference between \mord and \mup is that \mord also applies the correct symbol spacing.

The accents \overbrace, \underbracket etc. allow a label between square brackets: $\$ \underbrace[=1]{(x^2+y^2)}\$\$ gives

$$(\underbrace{x^2+y^2}_{=1}).$$

Best practices

The following remarks on mathematical typesetting have no relation to the contents of this package; I have included them because I find them hard to remember.

- 1. \eqalign gives a vertically centered box and can occur many times in an equation, while \eqalignno and \leqalignno span whole lines (put the equation numbers in the third column). All assume the relation (or operator) appears at the right hand side of the ampsersand.
- 2. The command \displaylines can only have one column that spans the whole line (and you will have to add the equation number by hand).
- 3. Further alignment commands are \cases, \matrix, \pmatrix (with parentheses) and \bordermatrix (includes labels for lines and columns).
- 4. Finetuning alignments can be done with \smash, \phantom, \hphantom and \vphantom.
- 5. Small matrices like $\binom{1}{3} \binom{1}{4}$ can be made by misusing \choose or \atop.
- 6. If you start a line with a binary operator, put a {} before it: this way, tex recognises it as such.
- 7. Thin spaces $(\,)$ should be inserted: before dx, before units, after factorials and after $\$ dots if those are followed by a closing parenthesis.
- 8. Whether the differential operator should be set upright or not is as of yet an open question in mathematics.
- 9. You should prefer \bigr and \bigl etc. over \big, \Big, \bigg and \Bigg.
- 10. An overview of mathematical symbols, with control sequences and their availability in different fonts, can be found in unimath-symbols.pdf, which is part of the unicode-math package.

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