My humble additions to (La)TeX mathematics*

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Abstract

This package provides a set of big delimiters, intermediate to those of the original TeX, and also much bigger. It also provides very wide accents (including two new ones: parenthesis and triangle). These symbols are included in a font provided both in Metafont and PostScript which has Don's `cmex10` as lower ASCII part.

1 Installation

This package consists of (a) a font, written in PostScript, (b) the same font written in Metafont, (c) a LaTeX style file, (d) a FD file for the OMX encoding using the new font, (e) a virtual font that uses cmex font for the lower 128 positions.

In case you obtained the package via one of the distributions, no further steps should be necessary. If you downloaded the files from CTAN, all the files have to be installed into their respective places within the TDS hierarchy.

2 Changes

2.1 Version v1.5

Fixes for the math delimiters $<$, $>$, and $/$ where incorporated, as well as the property `sfixed` removed from the font definition (GH Issues 1,2).

2.2 Version v1.4

The change in v1.2 triggered a few inconveniences due to the sudden change of behavior. This version reverts back to the behavior of v1.1 (but with a different implementation), and adds package options to switch between different sets of defined operators.

Furthermore, to support cooperation with other packages defining the same command `widering`, a package option to disable this definition in `yhmath` has been added.

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*This file is 1.5, last revised 2019/02/24.

2.3 Version v1.3

Clarify license (LPPL) and include a LICENSE file in the distribution.

2.4 Version v1.2

Yannis found that the current version conflicts with MTpro fonts due to concurrent use of the term `largesymbols`. This version only changes this to `yhlargesymbols`.

2.5 Version v1.1

Yannis first released the Metafont version of the font in 1996, and later added the PostScript version in 2002. These two packages ended up in two different directories on CTAN, creating confusion. In 2013, after a discussion on the TeX Live mailing list, we decided to merge the two packages into one.

We change the direction and generation in this release. The original dtx file created the Metafont source as `yhcmex10.mf`, which was then copied to `yrcmex10.mf`. We changed this to directly generate `yrcmex10.mf`.

Furthermore, the virtual font provided originally by Yannis had a small bug with respect to big delimiters (small empty space in the middle), which was fixed by Akira Kakuto.

Another bug concerning the DeclareFontFamily declaration was reported and fixed by Kazuhiro Okuma.

Norbert Preining merged the various sources, adapted the documentation, and uploaded the new package to CTAN.

3 Package Options

full Defines all operators that have been defined in package version up to 1.1. See the code appendix for details.

minimal Defines only those operators that were defined in the package version 1.2 and 1.3.

nowidering Do not define the macro `\widering`.

4 Availability

Don Knuth's code is included in Metafont files, so this code is under the usual TEXware ©opyright conditions. My code is postcard-ware (if you like it and find it is worth a postcard + a stamp + the mental effort of writing a word [optional!] and the physical effort of going to the nearest mailbox, then do it!).

Everything is on CTAN, and if there are upgrades you will be informed in the usual way.

5 Very big delimiters

I never liked those parentheses of matrices which become almost immediately straight. In traditional math typography, parentheses stay curved, even if they are very big. So I decided to play around with TEX's `charlist` font property, and

make some more of those big delimiters. I also did intermediate sizes (for all "big" delimiters). Here are some examples :

$$\begin{pmatrix} a & b \\ c & d \end{pmatrix} \begin{pmatrix} a & b & c \\ d & e & f \\ g & h & i \end{pmatrix} \begin{pmatrix} a & b & c & d \\ e & f & g & h \\ i & j & k & l \\ m & n & o & p \end{pmatrix} \tag{1}$$

$$\begin{pmatrix} a & b & c & d & e \\ f & g & h & i & j \\ k & l & m & n & o \\ p & q & r & s & t \\ u & v & w & x & y \end{pmatrix} \begin{pmatrix} a & b & c & d & e & f \\ g & h & i & j & k & l \\ m & n & o & p & q & r \\ s & t & u & v & w & x \\ y & z & \alpha & \beta & \gamma & \delta \end{pmatrix} \tag{2}$$

6 A new $\mathcal{AMS}$-LaTeX-like matrice-like environnement

Since I did also "very big" versions of the "left angle" and "right angle" symbols, why not making "matrices" with them as delimiters? I have never seen such a mathematical object, but perhaps was it just because this constructions wasn't available yet? (this is a chicken and egg story).

amatrix   I called this new $\mathcal{AMS}$-LaTeX-like environment `amatrix` ("a" for "angle"). I hope AMS people will just love it and include it into $\mathcal{AMS}$-LaTeX![1]

Here are the same matrices as above, with angles instead of parentheses:

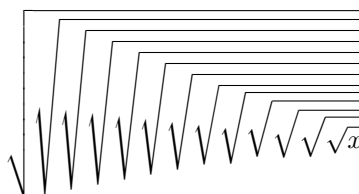$$\langle \begin{matrix} a & b \\ c & d \end{matrix} \rangle \langle \begin{matrix} a & b & c \\ d & e & f \\ g & h & i \end{matrix} \rangle \langle \begin{matrix} a & b & c & d \\ e & f & g & h \\ i & j & k & l \\ m & n & o & p \end{matrix} \rangle \tag{3}$$

$$\langle \begin{matrix} a & b & c & d & e \\ f & g & h & i & j \\ k & l & m & n & o \\ p & q & r & s & t \\ u & v & w & x & y \end{matrix} \rangle \langle \begin{matrix} a & b & c & d & e & f \\ g & h & i & j & k & l \\ m & n & o & p & q & r \\ s & t & u & v & w & x \\ y & z & \alpha & \beta & \gamma & \delta \end{matrix} \rangle \tag{4}$$

7 New roots

Roots got bigger as well, so that now the "vertical root" comes much later. Example :

$$\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{x}}}}}}}}}}}$$

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[1] Talking of $\mathcal{AMS}$-LaTeX there are a few more macros I would like to see included, see next section.

8   A few things missing from $\mathcal{A}_{\mathcal{M}}\mathcal{S}$-LaTeX v1.2

\adots   In $\mathcal{A}_{\mathcal{M}}\mathcal{S}$-LaTeX there is a \ddots command for diagonal dots. How about antidiagonal ones? There are matrices called anti-symmetric, and for them we need the notation "dots going up". I define a \adots macro, with a code symetric to \ddots, here is the result: $\cdot\cdot\cdot$.

\ring   Another thing missing in all TeX & Co. packages: the ring accent, used in topology for the interior of a space. I define a macro \ring to be used in math mode. Here is the result: if $X = [0, 1]$ then $\mathring{X} =]0, 1[$.

9   Very wide accents

\widetriangle   I added some more hats and tildes, so that you can get really wide accents now;
\wideparen   see the examples below:

$$\widehat{A}, \widehat{AB}, \widehat{ABC}, \widehat{ABCD}, \widehat{ABCDE}, \widehat{ABCDEF}, \widehat{ABCDEFG}$$

$$\widetilde{A}, \widetilde{AB}, \widetilde{ABC}, \widetilde{ABCD}, \widetilde{ABCDE}, \widetilde{ABCDEF}, \widetilde{ABCDEFG}$$

I also designed two new accents: the triangle accent \widetriangle and the parenthesis accent \wideparen:

$$\widehat{A}, \widehat{AB}, \widehat{ABC}, \widehat{ABCD}, \widehat{ABCDE}, \widehat{ABCDEF}, \widehat{ABCDEFG}$$

$$\widehat{A}, \widehat{AB}, \widehat{ABC}, \widehat{ABCD}, \widehat{ABCDE}, \widehat{ABCDEF}, \widehat{ABCDEFG}$$

The former is used (in France only??) to show that the notation ABC, where A, B, C are three points, means a triangle and not an angle. See what I mean? $\widetriangle{ABC}$ is a triangle, $\widehat{ABC}$ is an angle.

The latter is used when we want a non-expansible accent to be applied to more than one letters at once. Of course $\mathcal{A}_{\mathcal{M}}\mathcal{S}$-LaTeX has given a solution to this (place the symbols between parentheses and the accent as an exponent of the right parenthesis), by I happen not to like that solution. For example if I want to write "the interior of $[0, 1]$" I prefer to see

$$\overset{\circ}{\overparen{[0, 1]}}$$

than

$$([0, 1])^{\circ}$$

don't you?

And of course this notation is not my invention, I saw it in many French math books (ever heard of Nick Bourbaki?).

\widering   I call this macro \widering, because it plays the rôle of a wide symbol (and since the ring can't be widened, a parenthesis is used). Here are some more examples (the first one coded as \ring{A}):

$$\mathring{A}, \overset{\circ}{\overparen{AB}}, \overset{\circ}{\overparen{ABC}}, \overset{\circ}{\overparen{ABCD}}, \overset{\circ}{\overparen{ABCDE}}, \overset{\circ}{\overparen{ABCDEF}}, \overset{\circ}{\overparen{ABCDEFG}},$$

Other packages have added similar macros `\widering`. To make cooperation possible, the package option `nowidering` disables the definition of `\widering`.

10 The code

```
1 ⟨∗package⟩
```

We require that the amsmath package is loaded:

```
2 \RequirePackage{amsmath}
```

`\widering` is also defined in other packages (fourier, newtx, newpx etc) but they do the definition in AtBeginDocument without checking for the existence, so loading this package (yhmath) with others defining widering will create problems - use option nowidering to undef it. First define the macro, and clear it if the respective package option is given. Here is a (clumsy) definition of `\widering`, that is a ring over an horizontal parenthesis.

```
3 \newcommand{\widering}[1]{\overset{\smash{\lower1.333ex\hbox{$%
4 \displaystyle\ring{}$}}}{\wideparen{#1}}}
```

10.1 Option handling

Three options are supported: `minimal` which defines only those operators that are defined in version 1.2 and 1.3 of yhmath; `full` which defines the full set as used up to version 1.1; and `nowidering` which prevents the definition of the `\widering` macro.

```
5 \newif\if@yh@full
6 \DeclareOption{minimal}{%
7   \@yh@fullfalse%
8 }%
9 \DeclareOption{full}{%
10   \@yh@fulltrue%
11 }%
12 \DeclareOption{nowidering}{%
13   \let\widering\@undefined%
14 }
```

As default we revert back to the status of package version till 1.1

```
15 \ExecuteOptions{full}%
16 \ProcessOptions\relax
```

First of all we have to ask LaTeX to use our brand new font for "large symbols"

```
17 \DeclareSymbolFont{yhlargesymbols}{OMX}{yhex}{m}{n}
```

Next, the four "wide" accents are defined, in a way similar to LaTeX and not to $\mathcal{A}\mathcal{M}\mathcal{S}$-LaTeX, so yhmath must be loaded after amsmath!
Declaration that remain after YH updated to v1.2 in 2018

```
18 \DeclareMathAccent{\widetilde}{\mathord}{yhlargesymbols}{"65}
19 \DeclareMathAccent{\widehat}{\mathord}{yhlargesymbols}{"62}
20 \DeclareMathAccent{\widetriangle}{\mathord}{yhlargesymbols}{"E6}
21 \DeclareMathAccent{\wideparen}{\mathord}{yhlargesymbols}{"F3}
```

Instead of redefining the `largesymbols` math alphabet we explicitely redefine the operators that are provided by the font.
Declaration that were there up to version 1.1 (1996-2018)

```
22 \if@yh@full
```

```
23 \DeclareMathDelimiter{(}{\mathopen} {operators}{"28}{yhlargesymbols}{"00}
24 \DeclareMathDelimiter{)}{\mathclose}{operators}{"29}{yhlargesymbols}{"01}
25 \DeclareMathDelimiter{[}{\mathopen} {operators}{"5B}{yhlargesymbols}{"02}
26 \DeclareMathDelimiter{]}{\mathclose}{operators}{"5D}{yhlargesymbols}{"03}
27 \DeclareMathDelimiter{<}{\mathopen}{symbols}{"68}{yhlargesymbols}{"0A}
28 \DeclareMathDelimiter{>}{\mathclose}{symbols}{"69}{yhlargesymbols}{"0B}
29 \DeclareMathSymbol{<}{\mathrel}{letters}{"3C}
30 \DeclareMathSymbol{>}{\mathrel}{letters}{"3E}
31 \DeclareMathDelimiter{/}{\mathord}{operators}{"2F}{yhlargesymbols}{"0E}
32 \DeclareMathSymbol{/}{\mathord}{letters}{"3D}
33 \DeclareMathDelimiter{|}{\mathord}{symbols}{"6A}{yhlargesymbols}{"0C}
34 \DeclareMathRadical{\sqrtsign}{symbols}{"70}{yhlargesymbols}{"70}
35 \DeclareMathSymbol{\braceld}{\mathord}{yhlargesymbols}{"7A}
36 \DeclareMathSymbol{\bracerd}{\mathord}{yhlargesymbols}{"7B}
37 \DeclareMathSymbol{\bracelu}{\mathord}{yhlargesymbols}{"7C}
38 \DeclareMathSymbol{\braceru}{\mathord}{yhlargesymbols}{"7D}
39 \DeclareMathDelimiter{\lmoustache}   % top from (, bottom from )
40    {\mathopen}{yhlargesymbols}{"7A}{yhlargesymbols}{"40}
41 \DeclareMathDelimiter{\rmoustache}   % top from ), bottom from (
42    {\mathclose}{yhlargesymbols}{"7B}{yhlargesymbols}{"41}
43 \DeclareMathDelimiter{\arrowvert}    % arrow without arrowheads
44    {\mathord}{symbols}{"6A}{yhlargesymbols}{"3C}
45 \DeclareMathDelimiter{\Arrowvert}    % double arrow without arrowheads
46    {\mathord}{symbols}{"6B}{yhlargesymbols}{"3D}
47 \DeclareMathDelimiter{\Vert}
48    {\mathord}{symbols}{"6B}{yhlargesymbols}{"0D}
49 \DeclareMathDelimiter{\vert}
50    {\mathord}{symbols}{"6A}{yhlargesymbols}{"0C}
51 \DeclareMathDelimiter{\uparrow}
52    {\mathrel}{symbols}{"22}{yhlargesymbols}{"78}
53 \DeclareMathDelimiter{\downarrow}
54    {\mathrel}{symbols}{"23}{yhlargesymbols}{"79}
55 \DeclareMathDelimiter{\updownarrow}
56    {\mathrel}{symbols}{"6C}{yhlargesymbols}{"3F}
57 \DeclareMathDelimiter{\Uparrow}
58    {\mathrel}{symbols}{"2A}{yhlargesymbols}{"7E}
59 \DeclareMathDelimiter{\Downarrow}
60    {\mathrel}{symbols}{"2B}{yhlargesymbols}{"7F}
61 \DeclareMathDelimiter{\Updownarrow}
62    {\mathrel}{symbols}{"6D}{yhlargesymbols}{"77}
63 \expandafter\DeclareMathDelimiter\@backslashchar
64                    {\mathord}{symbols}{"6E}{yhlargesymbols}{"0F}
65 \DeclareMathDelimiter{\backslash}    % for double coset G\backslash H
66    {\mathord}{symbols}{"6E}{yhlargesymbols}{"0F}
67 \DeclareMathDelimiter{\rangle}
68    {\mathclose}{symbols}{"69}{yhlargesymbols}{"0B}
69 \DeclareMathDelimiter{\langle}
70    {\mathopen}{symbols}{"68}{yhlargesymbols}{"0A}
71 \DeclareMathDelimiter{\rbrace}
72    {\mathclose}{symbols}{"67}{yhlargesymbols}{"09}
73 \DeclareMathDelimiter{\lbrace}
74    {\mathopen}{symbols}{"66}{yhlargesymbols}{"08}
75 \DeclareMathDelimiter{\rceil}
76    {\mathclose}{symbols}{"65}{yhlargesymbols}{"07}
```

```
77 \DeclareMathDelimiter{\lceil}
78     {\mathopen}{symbols}{"64}{yhlargesymbols}{"06}
79 \DeclareMathDelimiter{\rfloor}
80     {\mathclose}{symbols}{"63}{yhlargesymbols}{"05}
81 \DeclareMathDelimiter{\lfloor}
82     {\mathopen}{symbols}{"62}{yhlargesymbols}{"04}
83 \DeclareMathDelimiter{\lgroup} % extensible ( with sharper tips
84        {\mathopen}{yhlargesymbols}{"3A}{yhlargesymbols}{"3A}
85 \DeclareMathDelimiter{\rgroup} % extensible ) with sharper tips
86        {\mathclose}{yhlargesymbols}{"3B}{yhlargesymbols}{"3B}
87 \DeclareMathDelimiter{\bracevert} % the vertical bar that extends braces
88        {\mathord}{yhlargesymbols}{"3E}{yhlargesymbols}{"3E}
89 \fi
```

The `amatrix` environment is defined

```
90 \newenvironment{amatrix}{\left\langle\begin{matrix}}{\end{matrix}\right\rangle}
```

And now the `\adots` macro for anti-diagonal dots. This is just the `\ddots` command, mirrored

```
91 \def\adots{\mathinner{\mkern2mu\raise\p@\hbox{.}
92 \mkern2mu\raise4\p@\hbox{.}\mkern1mu
93 \raise7\p@\vbox{\kern7\p@\hbox{.}}\mkern1mu}}
```

Following the way $\mathcal{A}_{\mathcal{M}}\mathcal{S}$-LaTeX defines math accents, here is the definition of `\ring`. family.

```
94 \edef\@tempa#1#2{\def#1{\mathaccent\string"\noexpand\accentclass@#2 }}
95 \@tempa\ring{017}
```

```
96 ⟨/package⟩
```

```
97 ⟨*fdfile⟩
```

Follows the FD file. Here we define the `yhex` family, at least for the OMX (Old Math Extensible symbols) encoding. We use the virtual font yhcmex10 to make sure that the lower 128 code points are filled, too. Up to version 1.4 the font was defined with the `sfixed` attribute. This was changed to better support scaling, see `https://github.com/TeX-Live/yhmath/issues/2` for discussion.

```
98 \ProvidesFile{OMXyhex.fd}
99              [2013/07/03 v1.1 YH's humble contribution to TeX maths (NP)]
100 \DeclareFontFamily{OMX}{yhex}{}
101 \DeclareFontShape{OMX}{yhex}{m}{n}{
102     <-> yhcmex10
103     }{}
104 ⟨/fdfile⟩
```