My humble additions to (La)TEX mathematics*

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January 4, 1996 (YH); February 24, 2019 (NP)

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 in-
cluded 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.

*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 \texttt{largesymbols}. This version only changes this to \texttt{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 \texttt{yhcmex10.mf}, which was then copied to \texttt{yrcmex10.mf}. We changed this to directly generate \texttt{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

\begin{itemize}
  \item \texttt{full} \hspace{1em} Defines all operators that have been defined in package version up to 1.1. See the code appendix for details.
  \item \texttt{minimal} \hspace{1em} Defines only those operators that were defined in the package version 1.2 and 1.3.
  \item \texttt{nowidering} \hspace{1em} Do not define the macro \texttt{\textbackslash widering}.
\end{itemize}

4 Availability

Don Knuth’s code is included in Metafont files, so this code is under the usual \TeX{}ware \copyright{} 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 \texttt{charlist} font property, and
make some more of those big delimiters. I also did intermediate sizes (for all “big” delimiters). Here are some examples:

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

\[(1)\]

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

\[(2)\]

6 A new \texttt{AMS-L\TeX}-like matrice-like environment

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).

\texttt{amatrix} I called this new \texttt{AMS-L\TeX}-like environment \texttt{amatrix} (“a” for “angle”). I hope AMS people will just love it and include it into \texttt{AMS-L\TeX}!

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

\[
\langle a & b \\
  c & d \rangle
\langle a & b & c \\
  d & e & f \\
  g & h & i \rangle
\langle a & b & c & d \\
  e & f & g & h \\
  i & j & k & l \\
  m & n & o & p \rangle
\]

\[(3)\]

\[
\langle a & b & c & d & e \\
  f & g & h & i & j \\
  k & l & m & n & o \\
  p & q & r & s & t \\
  u & v & w & x & y \rangle
\langle a & b & c & d & e \\
  g & h & i & j & k & l \\
  m & n & o & p & q & r \\
  s & t & u & v & w & x \\
  y & z & \alpha & \beta & \gamma & \delta \rangle
\]

\[(4)\]

7 New roots

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

\[
\sqrt[\cdots]{\sqrt{\sqrt{\sqrt{x}}}}
\]

\[1\textsuperscript{t} \text{Talking of } \texttt{AMS-L\TeX} \text{ there are a few more macros I would like to see included, see next section.}\]
8 A few things missing from $\LaTeX$ v1.2

\ddots In $\LaTeX$ 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 symmetric to \ddots, here is the result: ....

\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 $\ring X = \interior [0, 1]$.

9 Very wide accents

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

$\hat{A}, \hat{AB}, \hat{ABC}, \hat{ABCD}, \hat{ABCDE}, \hat{ABCDEF}, \hat{ABCDEF}$

$\hat{A}, \hat{AB}, \hat{ABC}, \hat{ABCD}, \hat{ABCDE}, \hat{ABCDEF}, \hat{ABCDEF}$

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

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

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

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? $\overline{ABC}$ is a triangle, $\overline{ABC}$ 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 $\LaTeX$ 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

$\interior [0, 1]$ than

$([0, 1])$

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)):

$\widehat{A}, \widehat{AB}, \widehat{ABC}, \widehat{ABCD}, \widehat{ABCDE}, \widehat{ABCDEF}, \widehat{ABCDEF}$,
Other packages have added similar macros \texttt{\textbackslash widering}. To make cooperation possible, the package option \texttt{nowidering} disables the definition of \texttt{\textbackslash widering}.

## 10 The code

1 (\ast package)

We require that the \texttt{amsmath} package is loaded:

\begin{verbatim}
\RequirePackage{amsmath}
\end{verbatim}

\texttt{\textbackslash 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 \texttt{\textbackslash widering}, that is a ring over an horizontal parenthesis.

\begin{verbatim}
\newcommand{\widering}[1]{\overset{\smash{\lower1.333ex\hbox{$\displaystyle\ring{}$}}}{\wideparen{#1}}}
\end{verbatim}

### 10.1 Option handling

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

\begin{verbatim}
\newif{\@yh@full}
\DeclareOption{minimal}{\@yh@false}
\DeclareOption{full}{\@yh@true}
\DeclareOption{nowidering}{\let\widering\@undefined}
\end{verbatim}

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

\begin{verbatim}
\ExecuteOptions{full}
\ProcessOptions\relax
\end{verbatim}

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

\begin{verbatim}
\DeclareSymbolFont{yhlargesymbols}{OMX}{yhex}{m}{n}
\end{verbatim}

Next, the four “wide” accents are defined, in a way similar to \LaTeX and not to AMSTeX, so \texttt{yhmath} must be loaded after \texttt{amsmath}!

Declaration that remain after YH updated to v1.2 in 2018

\begin{verbatim}
\DeclareMathAccent{\widetilde}{\mathord}{yhlargesymbols}{"65}
\DeclareMathAccent{\widehat}{\mathord}{yhlargesymbols}{"62}
\DeclareMathAccent{\widetriangle}{\mathord}{yhlargesymbols}{"E6}
\DeclareMathAccent{\wideparen}{\mathord}{yhlargesymbols}{"F3}
\end{verbatim}

Instead of redefining the \texttt{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)

\begin{verbatim}
\if@yh@full
\fi
\end{verbatim}
\DeclareMathDelimiter{(}{\mathopen}{operators}{"28}{yhlargesymbols}{"00}
\DeclareMathDelimiter{)}{\mathclose}{operators}{"29}{yhlargesymbols}{"01}
\DeclareMathDelimiter{[}{\mathopen}{operators}{"5B}{yhlargesymbols}{"02}
\DeclareMathDelimiter{]}{\mathclose}{operators}{"5D}{yhlargesymbols}{"03}
\DeclareMathDelimiter{<}{\mathopen}{symbols}{"68}{yhlargesymbols}{"0A}
\DeclareMathDelimiter{>}{\mathopen}{operators}{"69}{yhlargesymbols}{"0B}
\DeclareMathSymbol{<}{\mathrel}{letters}{"3C}
\DeclareMathSymbol{>}{\mathrel}{letters}{"3E}
\DeclareMathDelimiter{/}{\mathord}{operators}{"2F}{yhlargesymbols}{"0E}
\DeclareMathSymbol{/}{\mathord}{letters}{"3D}
\DeclareMathDelimiter{|}{\mathord}{symbols}{"6A}{yhlargesymbols}{"0C}
\DeclareMathSymbol{|}{\mathord}{yhlargesymbols}{"7A}
\DeclareMathSymbol{\braceld}{\mathord}{yhlargesymbols}{"7B}
\DeclareMathSymbol{\bracerd}{\mathord}{yhlargesymbols}{"7C}
\DeclareMathSymbol{\bracelu}{\mathord}{yhlargesymbols}{"7D}
\DeclareMathSymbol{\braceru}{\mathord}{yhlargesymbols}{"7E}
\DeclareMathDelimiter{\lmoustache}{\mathopen}{yhlargesymbols}{"7A}
\DeclareMathDelimiter{\rmoustache}{\mathclose}{yhlargesymbols}{"40}
\DeclareMathDelimiter{\arrowvert}{\mathord}{symbols}{"3C}
\DeclareMathDelimiter{\Arrowvert}{\mathord}{symbols}{"3D}
\DeclareMathDelimiter{\Vert}{\mathord}{symbols}{"0D}
\DeclareMathDelimiter{\vert}{\mathord}{symbols}{"0C}
\DeclareMathDelimiter{\uparrow}{\mathrel}{symbols}{"78}
\DeclareMathDelimiter{\downarrow}{\mathrel}{symbols}{"79}
\DeclareMathDelimiter{\updownarrow}{\mathrel}{symbols}{"77}
\DeclareMathDelimiter{\Uparrow}{\mathrel}{symbols}{"7E}
\DeclareMathDelimiter{\Downarrow}{\mathrel}{symbols}{"7F}
\DeclareMathDelimiter{\Updownarrow}{\mathrel}{symbols}{"0F}
\DeclareMathDelimiter{\backslash}{\mathord}{yhlargesymbols}{"0F}
\DeclareMathDelimiter{\rangle}{\mathord}{yhlargesymbols}{"0B}
\DeclareMathDelimiter{\langle}{\mathord}{yhlargesymbols}{"0A}
\DeclareMathDelimiter{\brace}{\mathord}{yhlargesymbols}{"09}
\DeclareMathDelimiter{\brace}{\mathord}{yhlargesymbols}{"08}
\DeclareMathDelimiter{\bracks}{\mathord}{yhlargesymbols}{"07}
\begin{amatrix}
\left\langle \begin{matrix}
\end{matrix} \right\rangle
\end{amatrix}
\def\adots{\mathinner{\mkern2mu\raise\p@\hbox{.}\mkern2mu\raise4\p@\hbox{.}\mkern1mu\raise7\p@\vbox{\kern7\p@\hbox{.}}\mkern1mu}}
\edef\@tempa#1#2{\def#1{\mathaccent\string"\noexpand\accentclass@#2}}
\@tempa\ring{017}
\ProvidesFile{OMXyhex.fd}
\[2013/07/03\ v1.1\ YH’s\ humble\ contribution\ to\ TeX\ maths\ (NP)]
\DeclareFontFamily{OMX}{yhex}{}\
\DeclareFontShape{OMX}{yhex}{m}{n}{<-> yhcmex10}{}
\ProvidesFile{OMXyhex.fd}
[2013/07/03 v1.1 YH’s humble contribution to TeX maths (NP)]
\DeclareFontFamily{OMX}{yhex}{}
\DeclareFontShape{OMX}{yhex}{m}{n}{<-> yhcmex10}
\endinput