The \texttt{amsbsy} package

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Version 1.2d, 1999/11/29

1 Introduction

The package \texttt{amsbsy}, first written in 1989, implements a few commands for producing \textbf{bold} characters in the ‘normal’ \textit{math version}.

\textit{Note: It is recommended nowadays to use the \texttt{bm} package, which became available in 1997.}

If we have bold fonts which contain the character in question then we will use these fonts to produce the wanted character. But sometimes math fonts are only available in a certain weight (e.g. the AMS symbol fonts). For these cases we provide a command which is called \texttt{\pmb} (an acronym for \texttt{p}oor \texttt{m}an’s \texttt{b}old) with one argument. The bolder weight is achieved by copying the argument three times in slightly different positions which is better than nothing but no match for a real bold font.

\texttt{\pmb}

There also exists the \texttt{\boldsymbol} command which is better in all cases where bold fonts exists. This command will internally switch to the corresponding ‘bold’ \textit{math version} typeset its argument in this version.

Both commands will preserve the nature of their arguments, i.e. if they get a relational atom their result will again be a relation as far as \TeX’s mathspacing is concerned.

Since it is good policy to make at least a small test we try to typeset the infinity sign (∞) first with \texttt{\pmb} and then with \texttt{\boldsymbol}.

\[ \infty = \infty \ ? \]

2 The implementation

We need some functions from the \texttt{amsgen} package.

\texttt{\RequirePackage{amsgen}}
\textbf{boldsymbol} In implementing \texttt{boldsymbol}, we must take into account \TeX’s limitation of only 16 mathgroups (math families, in Knuth’s terminology). If we wanted to maintain mathgroups for both the bold and non-bold version of each math font, it would not take long to run out of mathgroups. Therefore what we do instead for a bold symbol is embed it in an \texttt{hbox}; inside that \texttt{hbox}, when we start another math formula, we can change all the mathgroups to their bold equivalents.

However, to get the correct math style inside the \texttt{hbox} (display, text, script or scriptscript) we have to use \texttt{mathchoice}. Since \texttt{mathversion{bold}} has a lot of overhead, and \texttt{mathchoice} typesets the argument text four times, we would rather not put the \texttt{mathversion} command inside each \texttt{hbox} in the \texttt{mathchoice}; on the other hand, \texttt{mathversion} gives an error message if it’s used in math mode. Therefore if we want to execute \texttt{mathversion{bold}} before starting the \texttt{mathchoice} we have to temporarily disable the \texttt{@nomath} error. (The error message is intended to keep people from accidentally emboldening a preceding part of a math formula, since only the mathgroups defined at the end of a math formula will determine the fonts used in that formula; but we are going to typeset our bold symbol not in the current formula but in an embedded formula, so that this danger doesn’t apply here.)

\begin{verbatim}
\DeclareRobustCommand{\boldsymbol}[1]{{%
Start a group to localize the change of \@nomath:
\begingroup
Disable \@nomath so that we don’t have to leave math mode before executing \texttt{mathversion}:
\let\@nomath\@gobble \texttt{mathversion{bold}}%
\texttt{math@atom} is a test macro which looks at its argument and produces a math atom of the proper class.
\texttt{math@atom}{#1}{%}
Although it is tempting to use \texttt{text} here, to save some main memory, that caused a bug in the past due to some internal interactions with \texttt{mathversion}.
\texttt{mathchoice}{%}
\{\texttt{hbox}\{$\m@th\text{displaystyle}\#1\$}\}\%
\{\texttt{hbox}\{$\m@th\text{textstyle}\#1\$}\}\%
\{\texttt{hbox}\{$\m@th\text{scriptstyle}\#1\$}\}\%
\{\texttt{hbox}\{$\m@th\text{scriptscriptstyle}\#1\$}\}\%
End the group we started earlier.
\endgroup}
\end{verbatim}

\texttt{math@atom} The macro \texttt{math@atom} looks at its argument and produce a correct math atom, i.e. a primitive like \texttt{mathopen}. Until the day we have a real implementation for all cases we use the \texttt{\binrel@} command from \AMS-\TeX which can distinguish between binary, relation and ord atoms.

\begin{verbatim}
\def\math@atom#1#2{%
  \binrel@{#1}\binrel@@{#2}}
\end{verbatim}
Poor man's bold command, works by typesetting multiple copies of the given argument with small offsets.

\DeclareRobustCommand{\pmb}{% 
    \ifmmode\else \expandafter\pmb@@\fi\mathpalette\pmb@}

\pmb@@ is called by \pmb in the non-math-mode case. Discard the first two arguments which are for the math-mode case.

\def\pmb@@#1#2#3{\leavevmode\setboxz@h{#3}% 
    \dimen@-\wdz@ \kern-.5\ex@\copy\z@ \kern\dimen@ \kern.25\ex@\raise.4\ex@\copy\z@ \kern\dimen@ \kern.25\ex@\box\z@ }

\newdimen\pmbraise@

Note: because of the use of \mathpalette, if \pmb is applied to a single math italic character (or a single character from some other slanted math font), the italic correction will be added. This will cause subscripts to fall too far away from the character in some cases, e.g., $T_1$ or $T_1$.

\def\pmb@#1#2{\setbox8\hbox{$\m@th#1{#2}$} \setboxz@h{$\m@th#1\mkern.5mu$} \pmbraise@\wdz@ \binrel@{#2} \dimen@-\wd8 % \binrel@@{\mkern-.8mu\copy8 % \kern\dimen@ \mkern.4mu\raise\pmbraise@\copy8 % \kern\dimen@ \mkern.4mu\box8 }%

\def\binrel@#1{\begingroup \setboxz@h{\thinmuskip0mu \medmuskip-\thickmuskip\setbox\tw@h{$#1\m@th$}\kern-\wd\tw@ $\m@th$}{#1\m@th}$ \endgroup\let
\binrel@@\mathbin \ifdim\wdz@<\z@ \mathbin \else\ifdim\wdz@>\z@ \mathrel \else \relax\fi\fi\%}

The \noexpand here should be unnecessary, but just in case . . .

\edef@tempa{\endgroup\let\noexpand\binrel@@ \relax\@tempa }

For completeness, assign a default value for \binrel@@.

\let\binrel@@\relax

The usual \endinput to ensure that random garbage at the end of the file doesn’t get copied by docstrip.

\endinput