1 Introduction

The package \texttt{amsbsy}, first written in 1989, implements a few commands for producing \texttt{bold} characters in the ‘normal’ \texttt{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 \texttt{pmb} 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{poor man’s bold}) 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{boldsymbol} 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’ \texttt{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 ($\infty$) first with \texttt{pmb} and then with \texttt{boldsymbol}.

\[
\infty = \infty \, ?
\]

Standard package info.

\texttt{\NeedsTeXFormat{LaTeX2e}\LaTeX{} 2.09 can’t be used (nor non-LaTeX)}
[1994/12/01]\LaTeX{} date must December 1994 or later
\texttt{\ProvidesPackage{amsbsy}[1999/11/29 v1.2d Bold Symbols]}

1
2 The implementation
We need some functions from the amsgen package.
\RequirePackage{amsgen}

\boldsymbol In implementing \texttt{\textbackslash 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{\textbackslash hbox}; inside that \texttt{\textbackslash 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{\textbackslash hbox} (display, text, script or scriptscript) we have to use \texttt{\textbackslash mathchoice}. Since \texttt{\textbackslash mathversion\{bold\}} has a lot of overhead, and \texttt{\textbackslash mathchoice} typesets the argument text four times, we would rather not put the \texttt{\textbackslash mathversion} command inside each \texttt{\textbackslash hbox} in the \texttt{\textbackslash mathchoice}; on the other hand, \texttt{\textbackslash mathversion} gives an error message if it’s used in math mode. Therefore if we want to execute \texttt{\textbackslash mathversion\{bold\}} before starting the \texttt{\textbackslash mathchoice} we have to temporarily disable the \texttt{\textbackslash @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.)
\DeclareRobustCommand{\boldsymbol}{% Start a group to localize the change of \texttt{\textbackslash @nomath}:
\begingroup
Disable \texttt{\textbackslash @nomath} so that we don’t have to leave math mode before executing \texttt{\textbackslash mathversion}:
\let\@nomath\@gobble \texttt{\textbackslash mathversion\{bold\}}\%
\math@atom is a test macro which looks at its argument and produces a math atom of the proper class.
\math@atom{#1}-%
Although it is tempting to use \texttt{\textbackslash text} here, to save some main memory, that caused a bug in the past due to some internal interactions with \texttt{\textbackslash mathversion}.
\mathchoice%
\left\{
\begin{align*}
&\hbox{$\m@th\displaystyle#1$}&
&\hbox{$\m@th\textstyle#1$}
\end{align*}
\right\}
\math@atom The macro \texttt{\math@atom} looks at its argument and produce a correct math atom, i.e. a primitive like \texttt{\textbackslash mathopen}. Until the day we have a real implementation for
all cases we use the \texttt{\binrel@} command from \texttt{AMSTeX} which can distinguish between binary, relation and ord atoms.

\begin{verbatim}
\def\math@atom#1#2{\binrel@{#1}\binrel@@{#2}}
\end{verbatim}

\texttt{\pmb} Poor man's bold command, works by typesetting multiple copies of the given argument with small offsets.

\begin{verbatim}
\DeclareRobustCommand{\pmb}{\ifmmode\else\expandafter\pmb@@\fi\mathpalette\pmb@}
\end{verbatim}

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

\begin{verbatim}
\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@}
\end{verbatim}

\texttt{\newdimen\pmbraise@}

Note: because of the use of \texttt{\mathpalette}, if \texttt{\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 $\mathcal{T}_1$.

\begin{verbatim}
\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 }}
\end{verbatim}

\texttt{\def\binrel@#1{\begingroup\setboxz@h{\thinmuskip0mu\medmuskip\m@ne \thickmuskip\@ne \setbox8\hbox{$\m@th#1$}\kern-\wd8 \setbox\tw@\hbox{\$\m@th\@th#1\$}\kern-\wd\tw@ \$\m@th#1\$}}}

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

\begin{verbatim}
\edef@tempa{\endgroup\let\noexpand\binrel@@
\ifdim\wdz@<\z@ \mathbin
\else\ifdim\wdz@>\z@ \mathrel
\else \relax\fi\fi}
@tempa
\end{verbatim}

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

\begin{verbatim}
\let\binrel@@\relax
\end{verbatim}
The usual \texttt{\textbackslash endinput} to ensure that random garbage at the end of the file doesn’t get copied by \texttt{docstrip}.

\texttt{\textbackslash endinput}