Blackboard Bold

Robert Messer

Albion College

Mathematicians require distinctive notation to denote the natural numbers, the integers, the rational, real, and complex number systems. The standard convention calls for bold face characters to denote the underlying sets. The blackboard technique of indicating bold face by doubling one of the strokes of the character has in turn influenced the printed form of these symbols. Upper case letters in the blackboard bold style are available in $\mathcal{A}\mathcal{M}\mathcal{S}$-TeX (see page 126 of *TUGboat*, Vol. 6, No. 3), but they are not among the Computer Modern fonts.

Donald Knuth produced the entry $\mathbb{R}$ in the index of *The TeXbook* with $\rm I\!R$, where \! is the plain.tex macro for a negative thinspace (an mskip of -3 mu, equivalent to approximately $-.17$ em). This trick yields reasonable blackboard bold characters for letters with a vertical stroke on the left side. For other letters, judiciously chosen vertical rules work nearly as well.

Dimensions for kerning and vertical rules have been empirically determined for the set of blackboard bold uppercase letters illustrated and defined below. These are based on the Computer Modern Roman 10 point font (cmr10) at \magstephalf. Adjustments are necessary for other fonts and at large magnifications.

These constructions are not a perfect substitute for a blackboard bold font. At a resolution of 300 dots per inch, discretization errors result in noticeable differences in the relative positions of the various parts of the characters. Fortunately, occurrences of these symbols are seldom near enough together to invite close comparison.

AAA	BBB	CCC	DDD	EEE
FFF	GGG	HHH	III	JJJ
KKK	LLL	MMM	NNN	OOO
PPP	QQQ	RRR	SSS	TTT
UUU	VVV	WWW	XXX	YYY

ZZZ

```
% Poor person's blackboard bold
% January 6, 1988

% Robert Messer
% Department of Mathematics
% Albion College
% Albion, MI 49224
% Bitnet: RAM@ALBION

\def\A{{\rm\kern.22em
    \vrule width.02em
        height0.5ex depth 0ex
    \kern-.24em A}}
\def\B{{\rm I\kern-.25em B}}
\def\C{{\rm\kern.24em
    \vrule width.02em
        height1.4ex depth-.05ex
    \kern-.26em C}}
\def\D{{\rm I\kern-.25em D}}
\def\E{{\rm I\kern-.25em E}}
\def\F{{\rm I\kern-.25em F}}
\def\G{{\rm\kern.24em
    \vrule width.02em
        height1.4ex depth-.05ex
    \kern-.26em G}}
\def\H{{\rm I\kern-.25em H}}
\def\I{{\rm I\kern-.25em I}}
\def\J{{\rm\kern.19em
    \vrule width.02em
        height1.47ex depth 0ex
    \kern-.21em J}}
\def\K{{\rm I\kern-.25em K}}
\def\L{{\rm I\kern-.25em L}}
\def\M{{\rm I\kern-.23em M}}
\def\N{{\rm I\kern-.23em N}}
\def\O{{\rm\kern.24em
    \vrule width.02em
        height1.4ex depth-.05ex
    \kern-.26em O}}
\def\P{{\rm I\kern-.25em P}}
\def\Q{{\rm\kern.24em
    \vrule width.02em
        height1.4ex depth-.05ex
    \kern-.26em Q}}
\def\R{{\rm I\kern-.25em R}}
\def\S{{\rm\kern.18em
    \vrule width.02em
        height1.47ex depth-.9ex
    \kern.12em
    \vrule width.02em
        height0.7ex depth 0ex
    \kern-.34em S}}
```

```
\def\T{{\rm\kern.45em
   \vrule width.02em
       height1.47ex depth 0ex
   \kern-.47em T}}
\def\U{{\rm\kern.30em
   \vrule width.02em
       height1.47ex depth-.05ex
   \kern-.32em U}}
\def\V{{\rm\kern.27em
   \vrule width.02em
       height1.47ex depth-.8ex
   \kern-.29em V}}
\def\W{{\rm\kern.25em
   \vrule width.02em
       height1.47ex depth-.9ex
   \kern.34em
   \vrule width.02em
       height1.47ex depth-.9ex
   \kern-.63em W}}
\def\X{{\rm\kern.30em
   \vrule width.02em
       height1.47ex depth-1ex
   \kern.12em
   \vrule width.02em
       height0.4ex depth 0ex
   \kern-.46em X}}
\def\Y{{\rm\kern.25em
   \vrule width.02em
       height1.0ex depth 0ex
   \kern-.27em Y}}
\def\Z{{\rm\kern.26em
   \vrule width.02em
       height0.5ex depth 0ex
   \kern.04em
   \vrule width.02em
       height1.47ex depth-1ex
   \kern-.34em Z}}

% Some dimensions will require
% adjustments at large magnifications.

% Test print
\nopagenumbers
\tabskip=0pt plus1fil
\halign to18.75pc{&\setbox0=\hbox{#}%
   \hfil\copy0\copy0\box0\hfil\cr\cr
\A&\B&\C&\D&\E\cr\cr
\F&\G&\H&\I&\J\cr\cr
\K&\L&\M&\N&\O\cr\cr
\P&\Q&\R&\S&\T\cr\cr
\U&\V&\W&\X&\Y\cr\cr
   &  &\Z\cr\cr}
```

Using Greek Fonts with TeX

Silvio Levy
Princeton University

In this document I hope to show that typesetting Greek in TeX using the gr family of fonts can be as easy as typesetting English text, and leads to equally good results. This is meant to be a tutorial, not an exhaustive discussion; some TeXnical remarks that should be useful after the reader has acquired some familiarity with the fonts are printed in fine print.

The Alphabet

In order to typeset Greek text, you need to go into "Greek mode." This is achieved by typing \begingreek anywhere in your document; Greek mode will remain in effect until you type a matching \endgreek. While in Greek mode, the letters 'a' to 'z' and 'A' to 'Z' come out as Greek letters, according to the following code:

```
α β γ δ ε ζ η θ ι κ λ μ ν ξ ο π ρ σ τ υ φ χ ψ ω
a b g d e z h j i k l m n x o p r s t u f q y w
```

There is no digamma yet. The same character 's' will print as 'σ' or 'ς', depending on its position in a word.

The system does this by accessing a ligature of 's' with any other letter that follows it. If, for some reason, you want to print an initial/medial sigma by itself (as in the table above), or at the end of a word, you should type 'c'.

Try to typeset some simple text now. Create a file containing the following lines:

```
\input greekmacros % where \begingreek and
%                  % other commands are defined
This is English text.
\begingreek
This is Greek text.
\endgreek
```

When you TeX this file, you get the following gibberish:

This is English text. Τηις ις Γοεεκ τεξτ.

If you say \greekdelims near the top of your file, the character $ can be used in place of both \begingreek and \endgreek. The control sequence \math takes on the former meaning of $.

Editor's note: Thanks to Doug Henderson for METAFONTing the typesetter fonts from Silvio Levy's .MF source files. Doug was also responsible for the typesetter renditions of the APL fonts in TUGboat 8#3.