The design of the "A-R" ligature with Computer Modern, Times, and Palatino compatible styles: $\mathit{\!R}$

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Abstract

The "aspect ratio" symbol is used very much in aerodynamics and aeronautics to express a particular geometric property of airplane wing planforms. Very often in textbooks the quantity is simply called "A" because of typographic limitations of the typesetting system. In 1998 Claudio Beccari (CB) came up with a well designed glyph, particularly suited for use with Computer Modern fonts and its siblings. An example of use of this symbol is given by the following definition of the aspect ratio of a wing:

$$\mathit{\!R} = \frac{\text{(wing span)}^2}{\text{(wing planform area)}} = \frac{b^2}{S}$$

As it can be seen from the above formula, the glyph is a ligature between a capital A and a capital R, much as the `\AE` command produces the ligature Æ between a capital A and a capital E.

1 Package usage

The symbol $\mathit{\!R}$ is accessed in LaTeX by means of the package **ar** and is produced by the command `\AR`, in both math and text modes.

The package is loaded by the usual command:

`\usepackage[⟨`*options*`⟩]{ar}`

The available options are the following:

CM is the default setting and produces glyphs that are consistent with Computer Modern, CM-super, EC, and Latin Modern fonts;

TM or **TX** selects glyphs that are suitable with the Times, and Times eXtended fonts, but they are generally suited with other narrow fonts as, for example, the Linux Libertine ones.

PA or **PX** selects glyphs that are suitable with Palatino, Palatino eXtended, Mathpazo, and other wide fonts.

These options have been defined to allow the consistent use of the aspect ratio symbol in documents typeset with fonts other than Computer Modern and its siblings. Hopefully additional options will be roved in the future for a more comprehensive font support.

2 Package contents

The package contains several files of different types:

- This `ar.tex` and its compiled result `ar.pdf`.

- The METAFONT source files `ar⟨size⟨.mf` in order to produce the bitmapped fonts, in case the user wanted to typeset a document in DVI format and wanted to preview it with a DVI viewer. The ⟨*size*⟨ ranges from 5 to 12, in the usual sequence as any other math font in the TeX system.

- The METAFONT source files for sans serif medium and bold fonts in 10pt size and the only source file for the typewriter monospaced version of the font in 10 pt size.

- The metric files `*.tfm` for both the bitmapped and vector fonts.

- The vector font files for the Computer Modern version, `ar⟨series⟨⟨size⟨.pfb` includiong the single 10pt size sans serif and typewriter style fonts, and the vector font files for the Times and Palatino variants, `amar⟨series⟨i.pfb` and `apar⟨series⟨i.pfb`. The metaseries is either empty or equal to 'b', for medium and bold series respectively.

- The `ar.sty` extension file through which the suitable settings are made and the *Æ* symbol made available to the user.

- The `aspectratio.map` file necessary to configure your system for having the vector typesetting engines access the vector fonts.

3 Installing the package and the fonts

If the whole package is not already installed by your TeX system distribution, we suggest to create an `AspectRatio` folder under these branches of your personal (for individual usage) or local (for machine wide usage) `TEXMF` tree[1]:

- `.../doc/latex/AspectRatio/`: move this filear.pdf file to this folder;

- `.../source/latex/AspectRatio/`: move the corresponding `ar.tex` file to this folder;

- `.../tex/latex/AspectRatio/`: move the `ar.sty` to this folder;

- `.../fonts/source/public/AspectRatio/`: move all the `*.mf` files to this folder;

- `.../fonts/tfm/public/AspectRatio/`: move all the `*.tfm` files to this folder;

- `.../fonts/type1/public/AspectRatio/`: move all the `*.,pub` files to this folder;

- `.../fonts/map/AspectRatio/`: move all the `*.map` files to this folder.

If your TeX distribution requires it, refresh the file name database according to the procedure described in your system guide.

In order to use the Type 1 fonts, you must follow the instructions that came with your TeX system distribution; the idea with all distributions is to let the configuration file `updmap.cfg` know about the new map file; you have to execute a TeX system command in order to regenerate the map file suitable for the pdftex, dvips, and dvipdfm programs; after the operation is completed the LaTeX engine will use the bitmapped fonts in the DVI output file, while the other vector font oriented engines will use the vector fonts in Type 1 format.

4 Author guide

The symbol *Æ*, as a means for indicating the aspect ratio, is meaningful only in mathematics, so that only the "italic" shape makes sense. As an isolated symbol the *Æ* ligature might be used also in text mode outside a math expression.

Keeping in mind that only the "italic" shape is available, with the Computer Modern and the Times or Palatino variants, the ligature produced by `\AR` is sensitive to the text series declarations or commands. In math mode the bold symbol is available only through the explicit command `\ARb`.

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[1]Here we use the UNIX folder separator `/`; change `/` with `\` on Windows platforms. Moreover we do not specify the full path from the disk root, but we show only the end branches preceded by an ellipsis.

Table 1: Symbols and commands in both math and text modes

Description	Math symbol	Math command	Text symbol	Text command
Medium ligature	Æ	\AR	Æ	\AR
Bold ligature	**Æ**	\ARb	**Æ**	\textbf{\AR}
Medium sans serif ligature			Æ	\ARss
Bold sans serif ligature			**Æ**	\textbf{\ARss}
Monospaced ligature			Æ	\ARtt

By means of the specified options it is possible to get the corresponding glyphs in Times or Palatino. Remember, though, that both Times and Palatino have only the proportional serifed medium and bold fonts, so there is no possibility of using the sans serif or the monospaced version. Avoid using the Computer Modern monospaced version; it is available, but certainly the complex ligature does not fit well into the narrow character width of the monospaced fonts.

This asymmetry arises in order to avoid defining yet another math font group with an alphabet for medium math and a variant for bold math. Remember that when typesetting math, the various typesetting engines can handle a maximum of 16 alphabets; it does not happen very often, but while testing this very package with different fonts we eventually exceeded this maxim number and we produced an immediate fatal error. Therefore we decided that for just one glyph it was totally useless to define a new math group and we went around this problem with a \mathcoice work-around that allows us to actually typeset in the proper math size within a box to be used in math mode; apparently complicated, but actually very simple. This, on the other side, forbids us to use the regular math font switching commands to adapt the font family to the requested one.

Table 1 shows the various ways to produce the Æ symbol in math and in text mode with the various families available with the Computer Modern compliant Æ symbol. With Times and Palatino there is only one family available, the serifed one, and the variant commands resort to the italic shape.

If you get the source file of this documentation (`ar.tex` and comment out certain lines in the preamble, while uncommenting certain other lines (clearly marked in the preamble itself) you can typeset again this same file with the Times o Palatino fonts and you can verify the outcome of the various commands in the above mentioned table and in the following examples.

Here we show the various series, shapes, and sizes available with the package; with the CM fonts and their siblings you get the various families produce the proper variations; with the Times and Platino variants you get only the italics medium and bold variations always in serifed italics.

(CM Regular)   Æ Æ Æ Æ Æ Æ Æ Æ Æ Æ

(CM Bold)   **Æ Æ Æ Æ Æ Æ Æ Æ Æ Æ**

(CM Sans serif regular)   Æ Æ Æ Æ Æ Æ Æ Æ Æ Æ

(CM Sans serif bold)   **Æ Æ Æ Æ Æ Æ Æ Æ Æ Æ**

(CM Monospaced regular)   Æ Æ Æ Æ Æ Æ Æ Æ Æ Æ

5 Legal issues

This work is distributed under the LaTeX Project Public Licence, version 1.3 or later; the Licence text is distributed with any distribution of the TEX system.

This package is temporarily maintained by Claudio Beccari `claudio dot beccari at gmail dot com`.