

for all languages yet, but that will be repaired as soon as someone provides them to me.

For the Dutch language the behaviour of the active double quote has been slightly modified. It has been noted that there is a difference between "e, where a 'trema' should be produced and \"u, where we should get an 'umlaut'.<sup>1</sup> The difference between the two is that the 'trema' should disappear at a hyphenation point, whereas the 'umlaut' should not.

## References

- [1] Johannes Braams, *Babel, a multilingual style-option system for use with L<sup>A</sup>T<sub>E</sub>X's standard document styles*, TUGboat 12 (1991), no. 2, pp. 291–301.
- [2] Joachim Schrod, *International L<sup>A</sup>T<sub>E</sub>X is ready to use*, TUGboat 11 (1990), no. 1, pp. 87–90.

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## Hacker's Guide to $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts and NFSS in the Context of L<sup>A</sup>T<sub>E</sub>X

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### Abstract

The purpose of this document is to describe briefly  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts and the New Font Selection Scheme (NFSS) in the context of L<sup>A</sup>T<sub>E</sub>X. The issues addressed are as follows.

**$\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts:** What are  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts? Where to get  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts from? How to install  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts for L<sup>A</sup>T<sub>E</sub>X?

**New Font Selection Scheme:** What is the New Font Selection Scheme (NFSS)? Why to use NFSS? Where to get NFSS from? How to install NFSS? How to use NFSS to install  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts for L<sup>A</sup>T<sub>E</sub>X?

**Also:** How can NFSS and  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts be used in practice? (Examples.)

An attempt is made to answer these questions from the user's point of view as opposed to a (L<sup>A</sup>)T<sub>E</sub>Xpert's/designer's.

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## 1 $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts

This section explains what  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts are, where to get them from and how to install them.

### 1.1 What are $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts?

$\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts<sup>1</sup> is an additional set of fonts (absent in distributions of T<sub>E</sub>X and L<sup>A</sup>T<sub>E</sub>X). The most recent version, released in August 1991, is known as  $\mathcal{A}\mathcal{M}\mathcal{S}$ -Fonts Version 2.1.<sup>2</sup>  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts contains over two hundred mathematical symbols (like  $\leq$ ,  $\emptyset$ ,  $\dagger$ ,  $\cdot$ ,  $\circ$ , etc.) and also so-called Euler fonts, e.g.  $\mathfrak{E}$ ,  $\mathfrak{E}$ ,  $\mathfrak{E}$ . It also has a special alphabet (Blackboard bold) with  $\mathbb{R}$  for the real numbers,  $\mathbb{C}$  for complex numbers and so on. Finally, the Russian alphabet (including pre-1917 characters like  $\Theta$ ), or cyrillic, is available plus letters needed for Ukrainian, Serbian and Bulgarian.

It should be emphasised that, except for cyrillic, which is a text font,  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts are designed to extend the available range of symbols and alphabets for *mathematics*.

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<sup>1</sup>  $\mathcal{A}\mathcal{M}\mathcal{S}$  stands, obviously, for the American Mathematical Society.

<sup>2</sup> From now on, when talking about  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts, this will mean  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts Version 2.1.

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<sup>1</sup> Editor's note: 'Trema' (English 'diaeresis') is the " mark placed over a vowel to indicate its pronunciation in a separate syllable; 'umlaut' indicates a vowel that has undergone linguistic modification.

## 1.2 Where to get $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts from?

The original distribution site for  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts is

e-math.ams.org (130.44.1.100)

and the directory is

/ams

available via ftp.

Users having UNIX-compatible compress (uncompress) and tar (untar) utilities (versions also exist for DOS and VMS) can get the following (binary) files<sup>3</sup>

```
632033 amsfonts-sources.tar.Z
76443  tfm-files.tar.Z
2449408 amsfonts118.tar
3235840 amsfonts180.tar
3784704 amsfonts240.tar
4907008
amsfonts300.tar
6512640 amsfonts400.tar
```

from the `ams` directory, which covers the whole distribution together with documentation printable with plain  $\text{\TeX}$ . The files `amsfonts$$$tar` (where `$$$` is 118 or 180 or 240 or 300 or 400) contain `.pk` files, the number `$$$` indicating the required printer/previewer resolution in dots per inch (dpi).

Note that `amsfonts$$$tar` are *not* compressed using UNIX's compress facility.

Users not having the UNIX-compatible utilities will have to pull the files from subdirectories

```
/ams/amsfonts
/ams/amsfonts/doc
/ams/amsfonts/pk-files
/ams/amsfonts/sources
/ams/amsfonts/sources/cyrillic
/ams/amsfonts/sources/euler
/ams/amsfonts/sources/extracm
/ams/amsfonts/sources/symbols
/ams/tfm-files
```

Subdirectory `ams/amsfonts/pk-files` contains `.pk` files, organised in directories according to the required printer (previewer) resolution, i.e.

```
/ams/amsfonts/pk-files/118dpi
/ams/amsfonts/pk-files/180dpi
/ams/amsfonts/pk-files/240dpi
/ams/amsfonts/pk-files/300dpi
/ams/amsfonts/pk-files/400dpi
```

Files of the  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts distribution are rather big, even in the compressed form (as seen from the above listings). It is recommended to pull only the relevant files (especially the `.pk` ones). For example, files necessary for a 300dpi installation requiring

```
632033 amsfonts-sources.tar.Z
```

```
4907008 amsfonts300.tar
```

```
76443  tfm-files.tar.Z
```

occupy *ca.* eight megabytes in uncompressed form.

### 1.2.1 Documentation

Documentation (the  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts *Version 2.1 User's Guide*) can be found in

```
/ams/amsfonts/doc
```

under the name

```
userdoc.tex
```

To compile it you need to have the following files

```
amssym.def
amssym.tex
cyracc.def
userdoc.cyr
userdoc.def
userdoc.ins
userdoc.fnt
```

and also `.tfm` (from `tfm-files.tar.Z`) and `.pk` files (from `amsfonts300.tar` or whatever resolution is appropriate). The subdirectory `amsfonts/doc` contains by default all `userdoc.*` files but you can find the first three (i.e. `amssym.def`, `amssym.tex`, `cyracc.def`) in the directory `amsfonts`. Once all files are gathered, type

```
prompt> tex userdoc
```

This should compile smoothly and produce `userdoc.dvi` (41 pages). Provided you put  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts' `.pk` files in the place where your previewer (printer) looks for it, you should be able to see (print) it.

Read `userdoc` or at least have a glance at the provided font tables to get an idea what you can expect from it.

## 1.3 How to install $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts for $\text{\LaTeX}$ ?

It is assumed here that you already have all the files of  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts. Also, you should have a copy of the  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts User's Guide printed out.

The User's Guide says almost nothing about installation of  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts for  $\text{\LaTeX}$  (see the bottom of page 11), but you should have a copy of it for reference. It gives the command names of additional math symbols, among others.

To use  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts smoothly under  $\text{\LaTeX}$  you need to get and install the New Font Selection Scheme (NFSS). This is described below.

<sup>3</sup> Numbers indicate sizes (in bytes) of the files.

## 2 New Font Selection Scheme (NFSS) for L<sup>A</sup>T<sub>E</sub>X

This section explains what the New Font Selection Scheme is, why to use it, how to install it and, finally, how to use it together with  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts.

### 2.1 What is the New Font Selection Scheme (NFSS)?

The New Font Selection Scheme (NFSS) is a new version of `lfonts.tex` file written by L<sup>A</sup>T<sub>E</sub>Xperts Frank Mittelbach and Rainer Schöpf. When an old `lfonts.tex` is replaced by the new one and you recompile your L<sup>A</sup>T<sub>E</sub>X with the *new* `lfonts.tex`, you have at your disposal all the commands and properties of NFSS. These allow you to load any nonstandard (and standard, i.e. those coming with a distribution of T<sub>E</sub>X and L<sup>A</sup>T<sub>E</sub>X) L<sup>A</sup>T<sub>E</sub>X fonts on demand (i.e. when you really want them without memory-consuming preloading) *both* in text *and* math mode. It is much better than the standard L<sup>A</sup>T<sub>E</sub>X solution (see p. 116 and p. 200 of Leslie Lamport's *L<sup>A</sup>T<sub>E</sub>X User's Guide*, Addison-Wesley, Reading, Mass., 1985, ISBN 0-201-15790-X).

Thus, the name NFSS means a set of rules for loading fonts that are available to a user who replaced his/her old `lfonts.tex` L<sup>A</sup>T<sub>E</sub>X file with the new one coming with the distribution of NFSS. Also, NFSS has a backward compatibility option. In actual fact `lfonts.new` consists of NFSS + L<sup>A</sup>T<sub>E</sub>X adaptations. NFSS is by no means restricted to L<sup>A</sup>T<sub>E</sub>X; it works equally well with plain T<sub>E</sub>X, but needs another set of interface macros. This will not be addressed here, since this document deals with L<sup>A</sup>T<sub>E</sub>X only.

NFSS is a serious enhancement of L<sup>A</sup>T<sub>E</sub>X offering a swift, simple and uniform method for using nonstandard (and standard) L<sup>A</sup>T<sub>E</sub>X fonts. It is the *only* practicable method of using  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts and PostScript fonts with L<sup>A</sup>T<sub>E</sub>X. When installed it also allows you to use the old font selection scheme.

### 2.2 Where to get NFSS from?

The original distributing ftp site<sup>4</sup> for NFSS is

129.69.1.12

Note that the node has two *equivalent* names: either

ftp.uni-stuttgart.de (129.69.1.12)

or

<sup>4</sup> The archive at Stuttgart is accessible by electronic mail as well, under the address `mail-server@rus.uni-stuttgart.de`

`rusmv1.rus.uni-stuttgart.de` (129.69.1.12)

and the directory is

`/pub/soft/tex/macros/latex/styles/base/NFSS`

Communication with this machine may be not too fast, so be patient.

Directory

`/pub/soft/tex/macros/latex/styles/base/NFSS`

contains the following (ASCII text) files

12718	<code>array.sty</code>
4027	<code>basefont.tex</code>
11888	<code>concrete.doc</code>
10760	<code>dclfont.sty</code>
8951	<code>euscript.doc</code>
8172	<code>exscale.doc</code>
22563	<code>fontdef.dc</code>
27992	<code>fontdef.max</code>
15338	<code>fontdef.ori</code>
6405	<code>install.mz3</code>
36907	<code>lfonts.new</code>
2837	<code>margid.sty</code>
4831	<code>newfont.sty</code>
	SUBDIRECTORY
	<code>{\NFSS}-addons</code>
12881	<code>{\NFSS}.bug</code>
40893	<code>{\NFSS}.tex</code>
10224	<code>{\NFSS}inst.tex</code>
9442	<code>{\NFSS}prob.tex</code>
2869	<code>nomargid.sty</code>
4989	<code>oldfont.sty</code>
4692	<code>preload.dc</code>
4570	<code>preload.min</code>
4646	<code>preload.ori</code>
4125	<code>preload.xpt</code>
	SUBDIRECTORY
	<code>ps{\NFSS}</code>
5381	<code>readme.mz</code>
3993	<code>readme.mz3</code>
5550	<code>scripts.doc</code>
4399	<code>syntonly.sty</code>
6650	<code>tracefnt.sty</code>

The file to replace `lfonts.tex` is `lfonts.new` which loads `fontdef.tex` and one of `preload.*`.<sup>5</sup> The files in subdirectories `NFSS-addons` and `psNFSS`

<sup>5</sup> To install L<sup>A</sup>T<sub>E</sub>X, IniT<sub>E</sub>X should be run. When IniT<sub>E</sub>X is run with `lplain.tex` as the input file a point is reached when T<sub>E</sub>X wants to read in `lfonts.tex`. Here `lfonts.new` should be specified instead. At some point in processing `lfonts.new` IniT<sub>E</sub>X will ask for `xxxfont.sty`, which does not exist. The appearance of the name `xxxfont.sty` in the source of `lfonts.new` is a convenient stop to allow the choosing one of

do not belong to the proper distribution of NFSS and will not be described here.

### 2.2.1 Documentation of NFSS

Documentation of the New Font Selection Scheme (NFSS) is composed of three parts: `NFSS.tex`, a copy of the original article, published in *TUGboat*, by Mittelbach and Schöpf; `NFSSinst.tex`, installation guide; `NFSSprob.tex`, possible problems (and fixes) that may occur during installation.

These are ordinary L<sup>A</sup>T<sub>E</sub>X files (requiring a L<sup>A</sup>T<sub>E</sub>X version not older than the Dec. 91 release<sup>6</sup>), but `NFSS.tex` makes use of `array.sty` (provided with the NFSS distribution) and `twocolum.sty` (provided with recent L<sup>A</sup>T<sub>E</sub>X distributions; note the name of the file: without 'n'). You should be able to print out the documentation (see below), but read `readme.mz3` first.

To compile `NFSS.tex` many varieties of Computer Modern Sans Serif font are required, so it is advisable to have the appropriate `.tfm` and `.pk` files ready before typing:

```
prompt> latex {\NFSS}
```

It will report errors unless a recent version of L<sup>A</sup>T<sub>E</sub>X is used or when sans serif fonts are missing. The first type of error is fatal; the second can be overcome by pressing <return> enough times. However, the output will be poor and may lead to misinformation (slanted, etc., shapes are used in important examples). If the compilation was error-free, the file can be previewed/printed. Then type

```
prompt> latex {\NFSS}inst
```

```
prompt> latex {\NFSS}prob
```

These should compile smoothly, since the files use Computer Modern Roman only.

Installation is described in detail in the file `NFSSinst.tex`, and in case of problems consult `NFSSprob.tex`.

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the three options: `oldfont.sty`, `newfont.sty`, `basefont.tex`. For details read `NFSSinst.tex`.

<sup>6</sup> The most recent version <25 March 1992> is available from archive in Stuttgart (129.69.1.12) from directory `/pub/soft/tex/macros/latex`; also archive Niord.SHSU.edu offers it via ftp (read `[.LATEX]OOOOREADME.FTP_USERS`) or by mail (send a message to `FILESERV@SHSU.edu` with the body `SENDME LaTeX`).

### 2.2.2 A<sub>M</sub>S-L<sup>A</sup>T<sub>E</sub>X

It is not essential, but helpful (especially for future use), to get a copy of the A<sub>M</sub>S-L<sup>A</sup>T<sub>E</sub>X manual, whose Part II (pages 4–17) describes in detail the usage and principles of NFSS. It also gives valuable clues about using A<sub>M</sub>SFonts via NFSS. To get this ftp to

```
e-math.ams.org (130.44.1.100)
```

and get the (binary) file

```
588389 amslatex.tar.Z
```

from directory

```
/ams
```

or pull files from directory

```
/ams/amslatex
```

and its subdirectories

```
/ams/amslatex/doc
```

```
/ams/amslatex/fontsel
```

```
/ams/amslatex/inputs
```

```
/ams/amslatex/latex
```

These will give the *whole* distribution of A<sub>M</sub>S-L<sup>A</sup>T<sub>E</sub>X, which is not needed to print out the A<sub>M</sub>S-L<sup>A</sup>T<sub>E</sub>X manual. To get this go to subdirectory `/ams/amslatex/doc` to find file `amslatex.tex`. This document can be processed using *ordinary* L<sup>A</sup>T<sub>E</sub>X. To generate it type

```
prompt> latex amslatex
```

Everything should go smoothly resulting in an `amslatex.dvi` file (69 pages long).

A<sub>M</sub>S-L<sup>A</sup>T<sub>E</sub>X includes *by default* NFSS (see files in `/ams/amslatex/fontsel`), so you may want to install A<sub>M</sub>S-L<sup>A</sup>T<sub>E</sub>X altogether and use it for the purposes of NFSS. If you don't, retain the following `.sty` files (for use under ordinary L<sup>A</sup>T<sub>E</sub>X)

```
amsbsy.sty
```

```
amsfonts.sty
```

```
amssymb.sty
```

which can be found in

```
/ams/amslatex/inputs
```

and are very handy for swift use of A<sub>M</sub>SFonts for L<sup>A</sup>T<sub>E</sub>X.

## 2.3 How to install NFSS?

The best answer to this question is contained in the file `NFSSinst.tex`, which comes with the distribution of NFSS. See also footnote 5.

### 3 How can NFSS and $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts be used in practice?

Here several examples are provided grouped in two sections. To compile them NFSS was installed together with  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts. The `fontdef` option, chosen when installing NFSS, was `fontdef.max`.

#### 3.1 $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts and NFSS in Math Mode

This section shows examples of defining fonts for use in math mode using NFSS. The fonts employed are those provided with the package  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts. These are

- Euler fraktur,
- Euler roman,
- Euler script,
- University of Washington cyrillic,

and also Blackboard bold. It is shown here how to use all the fonts both in normal and bold versions (except for Blackboard bold, which doesn't have a bold version).

The following commands are defined

- `\eufm` for Euler fraktur medium (as opposed to bold),
- `\eurm` for Euler roman medium,
- `\eusm` for Euler script medium,
- `\cyr` for University of Washington cyrillic medium.

There is also a predefined one: `\Bbb` (see **Example 4**). Their effective definitions are shown at the end of this section. To make use of the above-mentioned fonts the following style files should be loaded

```
amsbsy.sty
amstext.sty
cyracc.def
```

This document also makes use of `amssymb.sty` and `amsfonts.sty` to take full advantage of the extended math symbols set provided by  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts. The use of an extra symbol is marked by  $\checkmark$ , itself a (non-mathematical) symbol from  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts.

##### 3.1.1 Examples

This section shows four simple examples of usage of the commands in *math mode*.

###### Example 1

[Here Euler script is used for the capital O, through a `\eusm` command, and the symbol for the empty set `\varnothing` is used from the extra math symbols B font (file `msbm`).]

DEFINITION. Let  $X$  be a non-empty set. Then the pair  $(X, \mathcal{O})$  is called a *topological space* iff

1.  $X$  is open,
2.  $\emptyset \checkmark$  is open,
3.  $\mathcal{O}$  is an open family of subsets of  $X$ , i.e.
  - (a)  $\forall \mathcal{O}_i \in \mathcal{O}$  the intersection of a finite number of members of  $\mathcal{O}$ , i.e.  $\bigcap_{i=1}^n \mathcal{O}_i$ , is open,
  - (b)  $\forall \mathcal{O}_i \in \mathcal{O}$  the union (finite or infinite) of members of  $\mathcal{O}$ , i.e.  $\bigcup_{i=1}^{\infty} \mathcal{O}_i$ , is open.

The family  $\mathcal{O}$  is called a *topology on  $X$* .  $\square$

###### Example 2

[Here Euler fraktur `\eufm` is used for the capital A, Euler roman `\eurm` for the capital J; the symbol of (non-strict) precedence `\preccurlyeq` comes from the extra math symbols A font (file `msam`).]

PROPOSITION. Let  $(A, \preccurlyeq) \checkmark$  be a well-ordered set. Then the family  $\mathfrak{A}$  of all initial segments of  $A$ , i.e.  $\mathfrak{A} = \{J \subset A \mid \forall x, y \in A ((y \in J) \wedge (x \preccurlyeq y)) \Rightarrow (x \in J)\}$ , together with the relation  $\subseteq$  is also a well-ordered set.  $\square$

###### Example 3

[Here University of Washington cyrillic `\cyr` is used (for the Russian 'Sh' letter) and the solid Halmos' symbol `\blacksquare` comes from the extra math symbols A font (file `msam`).]

NOTATION. We shall denote by  $\text{III}$  the Shafarevich group and we shall use  $\text{III}_1, \dots, \text{III}_n$  for its subgroups.  $\blacksquare \checkmark$

###### Example 4

[Here the use of the bold mode of Euler roman `\eurm` is shown via the `\boldsymbol` command, e.g. `\boldsymbol{\eurm{x}}` to get  $\mathbf{x}$ . Also the Blackboard bold font `\Bbb`, defined in `amsfonts.sty`, is used to denote the set of real numbers. Finally, two extra symbols are displayed: `\blacktriangleright` and `\bigstar`, both from the extra math symbols A font (file `msam`).]

$\blacktriangleright \checkmark$  EXERCISE. Let  $f(\mathbf{x}, \mathbf{y}) = 0$  be given with  $\mathbf{x} \in \mathbb{R}^n$  and  $\mathbf{y} \in \mathbb{R}^m$ . State a sufficient condition for the existence of  $\mathbf{g}: \mathbb{R}^n \rightarrow \mathbb{R}^m$ , such that  $\mathbf{y} = \mathbf{g}(\mathbf{x})$  (The Implicit Function Theorem).  $\star \checkmark$

##### 3.1.2 Commands' definitions

The command `\Bbb` is defined in the file `amsfonts.sty`. Also a counterpart of `\eufm` is predefined in `amsfonts.sty` as `\frak`.

The verbatim definitions used in this document look as follows.

% The following commands should produce  
% proper results. To understand how to

% type Russian when using cyracc.def see  
 % the {\AMS}Fonts user's guide  
 % (section 'Cyrillic input', pp. 15--16).

```
\newmathalphabet{\eufm}
\addtoversion{normal} % Euler
  {\eufm}{euf}{m}{n} % fraktur.
\addtoversion{bold} % Euler
  {\eufm}{euf}{b}{n} % fraktur bold.
% Define command \eufm as Euler fraktur
% font to be used in math mode.
% It is already defined in
% amsfonts.sty as \frac.
```

```
\newmathalphabet{\eurm}
\addtoversion{normal} % Euler
  {\eurm}{eur}{m}{n} % roman.
\addtoversion{bold} % Euler
  {\eurm}{eur}{b}{n} % roman bold.
% Define command \eurm as Euler roman
% font to be used in math mode.
```

```
\newmathalphabet{\eusm}
\addtoversion{normal} % Euler
  {\eusm}{eus}{m}{n} % script.
\addtoversion{bold} % Euler
  {\eusm}{eus}{b}{n} % script bold.
% Define command \eusm as Euler script
% font to be used in math mode.
```

```
\input{cyracc.def} % This file is needed
                    % for cyrillic fonts.
```

```
\newmathalphabet{\cyr}
\addtoversion{normal} % UW
  {\cyr}{UWCyr}{m}{n} % cyrillic
\addtoversion{bold} % UW
  {\cyr}{UWCyr}{b}{n} % cyrillic bold
% Define command \cyr as
% University of Washington (UW) Cyrillic
% to be used in math mode.
```

```
% To get bold in math use command
% \boldsymbol{} provided by amsbsy.sty
% file. See examples in text.
```

### 3.2 Examples of application of NFSS to Text Mode

This section shows examples of defining fonts for use in *text mode* using NFSS. The fonts employed are

those provided with the  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts package.<sup>7</sup> These are

- Euler fraktur,
- Euler roman,
- Euler script,
- Blackboard bold,
- University of Washington cyrillic.

It is shown here how to use all (but Blackboard bold) the fonts in both normal and bold versions.

The following commands are defined for Euler fonts

- `\teufm` for Euler fraktur normal,
- `\teufb` for Euler fraktur bold,
- `\teurm` for Euler roman normal,
- `\teurb` for Euler roman bold,
- `\teusm` for Euler script normal,
- `\teusb` for Euler script bold,

and also `\tBbb` for Blackboard bold. Also a set of commands is introduced for University of Washington cyrillic

- `\tcyrm` for Univ. of Washington cyrillic normal,
- `\tcyrb` for Univ. of Washington cyrillic bold,
- `\tcyrit` for Univ. of Washington cyrillic italic,
- `\tcyrsc` for Univ. of Washington cyrillic small caps.

Their effective definitions are shown at the end of this document. To make use of the cyrillic fonts the file `cyracc.def` is needed.

#### 3.2.1 Examples of Euler fonts and Blackboard Bold

This section shows simple examples of usage of Euler fonts and Blackboard bold in text mode.

The string 'JOHN SMITH is my name.' (with a dot at the end) will be generated using the relevant commands defined above.

1. Euler fraktur normal; command `\teufm`  
 $\text{JOHN SMITH is my name.}$
2. Euler fraktur bold; command `\teufb`  
 $\text{JOHN SMITH is my name.}$
3. Euler roman normal; command `\teurm`  
 $\text{JOHN SMITH is my name}$

<sup>7</sup> It should be emphasised that  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts, other than cyrillic, are meant for *math mode* only, i.e. they do *not* have punctuation, numbers, ligatures, etc. However, *any* font intended for text use will give nice results with NFSS. The examples here serve as a 'template' for user-defined font-loading commands and  $\mathcal{A}\mathcal{M}\mathcal{S}$ Fonts as an illustration of fonts (mis)use.

4. Euler roman bold; command `\teurb`  
JOHN SMITH is my name
5. Euler script normal; command `\teusm`  
JOHN SMITH \
6. Euler script bold; command `\teusb`  
JOHN SMITH \
7. Blackboard bold; command `\tBbb`  
JOHN SMITH  $\sim > \sim \times \partial >$

The reason for this strange output will become clear after looking at the font tables provided by *User's Guide to AMSFonts Version 2.1* on pp. 35–37.

### 3.2.2 Examples of University of Washington (UW) Cyrillic

This section shows simple examples of usage of University of Washington cyrillic fonts in text mode.

The string 'Mikhail Gorbachëv.' (with a dot at the end) will be generated using the relevant commands defined above

1. UW cyrillic normal; command `\tcyrm`  
Михаил Горбачёв.  
Alternatively:  
`{\tcyr Mikhail Gorbach\"ev.}`
2. UW cyrillic bold; command `\tcyrb`  
Михаил Горбачёв.  
Alternatively:  
`\renewcommand{\bfdefault}{b}`  
`{\bf\tcyr Mikhail Gorbach\"ev.}`
3. UW cyrillic italic; command `\tcyrit`  
Михаил Горбачёв.  
Alternatively:  
`{\it\tcyr Mikhail Gorbach\"ev.}`
4. UW cyrillic small caps; command `\tcyrsc`  
МИХАИЛ ГОРБАЧЁВ.  
Alternatively:  
`{\sc\tcyr Mikhail Gorbach\"ev.}`

To obtain the special cyrillic characters ё, е, і, іі, ѣ, њ, к, ѣ, ц, ъ, љ, њ, s the command `\cy racc`, defined in `cy racc.def` is needed (see *User's Guide to AMSFonts Version 2.1* pp. 14–16). The best strategy is to include `\cy racc` in the definitions of the cyrillic font commands, as shown below in the definitions of `\tcyr`, `\tcyrm`, `\tcyrb`, `\tcyrit`, and `\tcyrsc`.

### 3.2.3 Commands' definitions

The commands involving University of Washington cyrillic rely heavily on the file `cy racc.def`. Note that `\cy racc` command was added at the end of each definition to allow smooth use of the accented characters of the cyrillic font. The addition is relevant to this *AMS* font *only* and is not necessary

for any others. This means that in any other case a definition should terminate with `\selectfont`.

```
% The following commands
% (with the exception of Cyrillic fonts)
% can produce imperfect output due to
% the lack of punctuation, numbers,
% ligatures etc. in the source files
% defining them.
```

```
%%% Euler fonts in text mode. %%%
```

```
\newcommand{\teufm}{\fontfamily{euf}%
\fontseries{m}\fontshape{n}\selectfont}
% Define command \teufm as Euler fraktur
% font to be used in text mode.
```

```
\newcommand{\teufb}{\fontfamily{euf}%
\fontseries{b}\fontshape{n}\selectfont}
% Define command \teufb as bold Euler
% fraktur font to be used in text mode.
% This can also be achieved by
% typing \bf\teufm.
```

```
\newcommand{\teurm}{\fontfamily{eur}%
\fontseries{m}\fontshape{n}\selectfont}
% Define command \teurm as Euler roman
% font to be used in text mode.
```

```
\newcommand{\teurb}{\fontfamily{eur}%
\fontseries{b}\fontshape{n}\selectfont}
% Define command \teurb as bold Euler
% roman font to be used in text mode.
% This can also be achieved by
% typing \bf\teurm.
```

```
\newcommand{\teusm}{\fontfamily{eus}%
\fontseries{m}\fontshape{n}\selectfont}
% Define command \teusm as Euler script
% font to be used in text mode.
```

```
\newcommand{\teusb}{\fontfamily{eus}%
\fontseries{b}\fontshape{n}\selectfont}
% Define command \teusb as bold Euler
% script font to be used in text mode.
% This can also be achieved by
% typing \bf\teusm.
```

```
\newcommand{\tBbb}{\fontfamily{msb}%
\fontseries{m}\fontshape{n}\selectfont}
% Define command \tBbb as Blackboard bold
% to be used in text mode. Math mode is
% defined in file amssymb.sty.
```

```
%%% Cyrillic in text mode. %%%
```

```

\input{cyracc.def} % This file is needed
                   % for cyrillic fonts.

\newcommand{\tcyr}{\fontfamily{UWCyr}%
  \selectfont\cyracc}
% Define font family only. Fontshape must
% be switched using \it or \sc commands.

\newcommand{\tcyrm}{\fontfamily{UWCyr}%
  \fontseries{m}%
  \fontshape{n}\selectfont\cyracc}
% Define command \tcyrm as Univ. of
% Washington cyrillic to be used in
% text mode. This can also be achieved
% by typing \tcyr.

\newcommand{\tcyrb}{\fontfamily{UWCyr}%
  \fontseries{b}%
  \fontshape{n}\selectfont\cyracc}
% Define command \tcyrb as bold Univ. of
% Washington cyrillic to be used in text
% mode. This can also be achieved by
% typing \bf\tcyr, provided \bfdefault is
% changed (see ‘‘{\AmS}-{\LaTeX} Version
% 1.1 User’s Guide’’, Section 5.6,
% pp. 7--8 and Table 5, p. 14).
% {\AmS}Fonts give only wncyb (‘b’ for
% ‘bold’) and *not* wncybx (‘bx’ for
% ‘bold extended’).

\newcommand{\tcyrit}{\fontfamily{UWCyr}%
  \fontseries{m}%
  \fontshape{it}\selectfont\cyracc}
% Define command \tcyrit as italic Univ.
% of Washington Cyrillic to be used in
% text mode. This can also be achieved
% by typing \it\tcyr.

\newcommand{\tcyrsc}{\fontfamily{UWCyr}%
  \fontseries{m}%
  \fontshape{sc}\selectfont\cyracc}
% Define command \tcyrsc as small caps
% Univ. of Washington Cyrillic to be
% used in text mode. This can also be
% achieved by typing \sc\tcyr.

```

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