Typesetting ancient Greek using Ibycus-encoded fonts with the Babel system

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v3.0 – 2005/11/23

1 Overview

The present document describes a new interface for Greek fonts with the so-called 'Ibycus' encoding, to use them in conjunction with the Babel system for multilanguage typesetting. It constitutes an alternative to the well-known macro packages `ibycus4.sty` and `psibycus.sty`, which are distributed together with Pierre A. MacKay's original Ibycus fonts. The main advantage over these packages is that automatic hyphenation is provided for the Greek language. Notice, however, that a TeX program with the so-called ε-TeX extensions is required. The implementation is available for LaTeX 2_ε only; there are no corresponding macro files for plain TeX or LaTeX 2.09.

2 Why ε-TeX?

With 'ordinary' TeX, hyphenation of Greek words will not work properly, if the end of a mixed Greek and Latin-alphabet paragraph does not coincide with the end of the Greek. This is due to a misfeature in TeX: Only one set of so-called lccodes is used throughout the length of a paragraph – only those which are valid at its end. These codes must be adjusted for the Ibycus notation in order to tell TeX that accents and breathings a part of the words, rather than punctuation. So if you have reverted back to a Latin-written language at the end of the paragraph, the wrong codes for Greek hyphenation are in effect, and the diacritics in Greek words are wrongly considered as punctuation. The problem does, however, *not* occur with an ε-TeX program; i.e., a TeX program with certain extended capabilites. In fact, you are probably already using ε-TeX, even if you did not realize it. All up-to-date LaTeX systems are now built upon an ε-TeX typesetting engine, rather than on the classical TeX program.

3 Basic usage

The Greek fonts are assigned a (pseudo-)language named `ibycus`, which can be used (almost) like any other language supported by Babel. To enable the use of this language in your document, specify it as an option to the Babel package just

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as you would do for any other language. For instance, to write a document in German with some Greek passages:

```
\usepackage[ibycus,ngerman]{babel}
```

A few caveats: Do not declare `ibycus` as the default language of the document; it is not suitable for this purpose! In other words, `ibycus` must never be the last option for Babel. And, of course, do not use it together with the packages `ibycus4` or `psibycus`.

The language `ibycus` should be selected only *locally*. Either use the `ibycus` environment to typeset larger passages of Greek text:

```
\begin{ibycus}
  (Hrodo'tou Qouri'ou i(stori'hs a)po'decis h('de,
  ...
  h(`n ai)ti'hn e)pole'mhsan a)llh'loisi.
\end{ibycus}
```

or use the command `\ibygr`, which is more appropriate for short pieces of Greek within Latin-written text:

```
... Latin, \ibygr{a)rxai=a gra'mmata} and Latin again
```

In fact, the environment `ibycus` is nothing but an abbreviation for Babel's `otherlanguage` environment with the option `ibycus`, and `\ibygr{...}` is the same as `\foreignlanguage{ibycus}{...}`.

Within the environment `ibycus` or the argument of `\ibygr`, the Ibycus-specific input notation is to be used to enter Greek. This notation is described in the documentation that comes with the Ibycus fonts.

Notice a particular difference between `ibycus` and other languages of the Babel system: Switching to the language `ibycus` selects both a particular font encoding (`LGI`) and a particular font family (by default `fib`), regardless of the font family that was active before.

Greek fonts and the related input notation can also be selected without changing the hyphenation tables; to do so, use the declaration `\ibycustext` or the text-generating command `\textibycus{...}`. These macros exist more or less only as a side-effect of the implementation; they should normally not be needed.

To switch temporarily back to the Latin alphabet within a piece of Greek text (without, however, changing the hyphenation table), use the declaration `\latintext` or the text-generating macro `\textlatin{...}`. When Babel is loaded with the option `ibycus`, these commands not only switch back to the default Latin font encoding as usual; they also select the default font family of the document.

Ibycus-encoded fonts provide a few traditional text-editor symbols for critical editions:

`\braceleft`	left curly brace
`\braceright`	right curly brace
`\bracketleftbt`	left half square bracket
`\bracketrightbt`	right half square bracket
`\sdagger`	single dagger
`\dbldagger`	double dagger

Use of these symbols is not restricted to Greek passages. **Caution:** In the Ibycus4 package the single dagger carries the name `\dagger`. However, this macro belongs to the LaTeX kernel and should not be redefined, so the name `\sdagger` is now used for the Ibycus-specific symbol.

4 Using alternative typefaces

By default, Pierre A. MacKay's original Ibycus font family is used to typeset the Greek passages. From version 3.0 on the Ibucus-Babel interface supports also other font families with the same encoding.

To select the Greek font family manually, issue the command

`\renewcommand{\ibycusdefault}{`⟨*family*⟩`}`

after loading of Babel—provided, of course, that the indicated font family is indeed available with the Ibycus encoding LGI. Macro packages to support alternative font familes in general may already include this action; see the related documentation.

If you intend to write a class or package which is to change the font family used by the Ibycus-Babel interface, or if you want to implement a font family with Ibycus encoding, see the documentation of the source code, particularly the last section.

5 Scaling the Greek fonts

It may sometimes be useful to typeset the Greek fonts a little bit larger or smaller (as compared with their 'natural' size), to make them blend better with the typeface used for Latin. This can be accomplished through the macro `\setgreekfontscale`. For instance, `\setgreekfontscale{1.05}` will enlarge the Greek fonts by 5%. The command can be issued in the preamble only.

6 The hyphenation patterns

The hyphenation patterns for the Ibycus encoding were generated by running the Perl script `ibyhyph.pl` on Dimitrios Filippou's `GRAhyph4.tex`, which can be found in the CTAN directory `language/hyphenation/elhyphen`. This is an improved set of hyphenation patterns for ancient Greek with LGR encoding; Babel does not currently use it by default. With version 3 of the Ibycus-Babel interface, additional manual patches were applied to the patterns, in order to fix a bug regarding the use of 'lunate sigmas'.

Dimitrios Filippou's improved hyphenation patterns discover far more hyphenation points than the default Babel patterns, and are more accurate, especially for compound words. You will notice that there are more hyphenation points right after the first letter of words beginning with a vowel + consonant + vowel. Some may find such hyphenations surprising, but they are legal, according to the rules for hyphenation of Greek, ancient and modern; see the account by Yannis Haralambous: 'From Unicode to Typography, a Case Study: the Greek Script' `<http://omega.enstb.org/yannis/pdf/boston99.pdf>`, pp 18f. If you find these hyphenation points ugly, issue the command

```
\def\ibycushyphenmins{2 2}
```

after loading of Babel in order to suppress them.

Filippou's patterns also include legal hyphenation points immediately before the last letter of a word. However, the Ibycus-Babel interface suppresses them, since they are not only ugly but also of little practical use.

Please contact Peter Heslin if you come across any words that Ibycus hyphenates differently from the corresponding LGR-encoded patterns (except for the suppressed hyphenation before the last letter of a word).

7 Problems and deficiencies

- Globally changing the language to `ibycus`, i.e., a sequence such as

  ```
  \selectlanguage{ibycus}
  Greek text...
  \selectlanguage{anything}
  ```

  may have unwanted effects, for instance on the font selection. This can be avoided by selecting the language `ibycus` only within a group or environment, or by using the commands `\ibygr` or `\foreignlanguage`.

- The behavior of the existing commands `\textlatin` and `\latintext` is altered: They will switch to the the default font family of the document, rather than leaving the current font family untouched.

- The command `\setgreekfontscale` has no effect when the Ibycus fonts are already in use; this situation is, however, rather unlikely in the preamble.

8 Incompatible changes over version 1.5

The names of several commands and environments have changed:

Version 1.5:	Version 2.4 and later
`\gk`	`\ibygr`
`greek` (environment)	`ibycus`
`\ibylatintext`	`\latintext`
`\dagger`	`\sdagger`

Furthermore, hyphenation before the last letter of a word is now suppressed by default.

9 The Implementation

9.1 The `.ldf` file for use with babel

When the TeX engine used is not an ε-TeX, we issue an appropriate warning:

```
1 ⟨*ibycus⟩
2 \ifx\eTeXversion\@undefined
3   \PackageError{ibycus-babel}{%
4     The TeX engine used by LaTeX \MessageBreak
5     does not provide the the eTeX extensions.\MessageBreak
```

```
    This may cause wrong hyphenation\MessageBreak
    in mixed Latin/Greek paragraphs}
    {Proceed, with fingers crossed...}
\fi
```

The macro `\LdfInit` takes care of preventing that this file is loaded more than once:

```
\LdfInit{ibycus}{captionsibycus}
```

When this file is read as an option, i.e., by the `\usepackage` command, `ibycus` could be an 'unknown' language in which case we have to make it known. So we check for the existence of `\l@ibycus` to see whether we have to do something here:

```
\ifx\undefined\l@ibycus
  \@nopatterns{Ibycus}
  \adddialect\l@ibycus0\fi
```

We are going to load the file providing the definition of the LGI encoding, see section 9.2. The error handling has been adopted from Babel's (LGR) Greek module, in order to ensure consistent behavior:

```
\InputIfFileExists{lgienc.def}{%
  \message{Loading the definitions for the Greek font encoding LGI}}{%
  \errhelp{I can't find the lgienc.def file for the Greek fonts}%
  \errmessage{Since I do not know what the LGI encoding means^^J
    I can't typeset Greek.^^J
    I stop here, while you get a suitable lgienc.def file}\@@end
}
```

The font family to be used for Greek passages is initialized to `fib`, unless it has been defined already by a preceding package:

```
\providecommand{\ibycusdefault}{fib}
```

We declare a command `\ibygr` and an environment `ibycus` to make entering of Greek text easier, as compared with Babel's macros:

```
\DeclareRobustCommand{\ibygr}[1]{\foreignlanguage{ibycus}{#1}}
\newenvironment{ibycus}%
  {\begin{otherlanguage}{ibycus}}{\end{otherlanguage}}%
```

A command is provided to set a scaling factor for the Ibycus fonts. When the fonts are already in use, the command has no effect. We make sure that it can be used only in the preamble, even though this does not really make sure that the fonts have not yet been loaded.

```
\newcommand*{\setgreekfontscale}[1]{%
  \def\ibycus@scale{#1}}
\@onlypreamble\setgreekfontscale
```

The macro `\ibycus@scale`, which is defined here, will be evaluated in the font definition files of LGI-encoded fonts; see `lgifib.fd` below.

All text-editor symbols of the old package `ibycus4` are provided. However, `\dagger` is named `\sdagger` now.

```
\newcommand{\braceleft}{%
  {\fontencoding{LGI}\fontfamily{\ibycusdefault}\selectfont\char'333}}
\newcommand{\braceright}{%
  {\fontencoding{LGI}\fontfamily{\ibycusdefault}\selectfont\char'337}}
\newcommand{\bracketleftbt}{%
  {\fontencoding{LGI}\fontfamily{\ibycusdefault}\selectfont\char'363}}
\newcommand{\bracketrightbt}{%
```

```
  {\fontencoding{LGI}\fontfamily{\ibycusdefault}\selectfont\char'367}}
\newcommand{\sdagger}{%
  {\fontencoding{LGI}\fontfamily{\ibycusdefault}\selectfont\char'375}}
\newcommand{\dbldagger}{%
  {\fontencoding{LGI}\fontfamily{\ibycusdefault}\selectfont\char'376}}
```

Finally, the code to integrate the pseudo-language Ibycus into Babel. We start with the default values of `\lefthyphenmin` and `\righthyphenmin`.

```
\providehyphenmins{ibycus}{\@ne\tw@}
\def\captionsibycus{}
\def\dateibycus{}
```

`\latintext` needs to be extended, as compared with the default definition provided by the Babel kernel. The macro must not only switch to the default Latin font *encoding*; in addition to that, it must also switch to an appropriate font *family*, because the family is always changed to `\ibycusdefault` within the Greek passages. While v2.0 would select `\rmdefault`, this has been changed to `\familydefault` now. Since `\latintext` is a protected command, we extend actually the 'unprotected' command `\latintext␣`:

```
\expandafter\let\expandafter\iby@latintext\csname latintext \endcsname
\@namedef{latintext }{\fontfamily{\familydefault}\iby@latintext}
```

`\ibycustext` is modelled after Babel's original `\greektext`. However, we do not alter `\encodingdefault` any longer, since doing so has turned out to be wrong. (See the LaTeX bug babel/3796.) As long as `ibycus` is never used as the default language of a document, there is no need to touch `\encodingdefault` at all.

```
\DeclareRobustCommand{\ibycustext}{%
  \fontencoding{LGI}\fontfamily{\ibycusdefault}\selectfont}
\DeclareRobustCommand{\textibycus}[1]{\leavevmode{\ibycustext #1}}
\addto\extrasibycus{\ibycustext}
\addto\extrasibycus{%
  \babel@savevariable{\lccode`\(}\lccode`\(=`\(%
  \babel@savevariable{\lccode`\)}\lccode`\)=`\)%
  \babel@savevariable{\lccode`\=}\lccode`\==`\=%
  \babel@savevariable{\lccode`\|}\lccode`\|=`\|%
  \babel@savevariable{\lccode`\`}\lccode`\`=`\`%
  \babel@savevariable{\lccode`\'}\lccode`\'=`\'%
  \babel@savevariable{\lccode`\+}\lccode`\+=`\+}
```

At the end of a Greek passage, we are going to issue the new command `\noibycustext`. In contrast to `\latintext`, it does not alter `\encodingdefault`.

```
\DeclareRobustCommand{\noibycustext}{%
  \fontencoding{\latinencoding}\fontfamily{\familydefault}\selectfont}
\addto\noextrasibycus{\noibycustext}
\ldf@finish{ibycus}
```

⟨/ibycus⟩

Should we save and restore the actual family name, instead of simply forcing `\familydefault`?

9.2 The encoding definition file `lgienc.def`

From v3.0 on, the Ibycus-encoded fonts are assigned the encoding LGI, even though there are currently no encoding-specific commands declared. Rationale:

Future alternative font families with Ibycus encoding are using U already for other purposes such as non-alphabetic symbols. As usual, the encoding is declared in an external file.

```
⟨*lgienc⟩
\DeclareFontEncoding{LGI}{}{}
\DeclareFontSubstitution{LGI}{fib}{m}{n}
\DeclareErrorFont{LGI}{fib}{m}{n}{10}
⟨/lgienc⟩
```

9.3 The font definition file `lgifib.fd`

We provide a correct `fd` file of our own for the Ibycus font family, instead of relying on the weird file from the Ibycus4 collection, and we use only those fonts, that exist also in Postscript format.

```
⟨*lgifib⟩
\ifx\aliasfont\@undefined\else\ifx\aliasfont\relax\else
```

This piece of code is executed with VTeX only. It enables the use of the artificially slanted font.

```
  \begingroup
    \catcode32=10 %
    \aliasfont fibo84 = fibr84 slant 167 %
  \endgroup
\fi\fi
```

Now let's evaluate `\ibycus@scale` to determine the optional scaling parameter `\ibycus@@scale`, which will be applied in the font shape declarations:

```
\expandafter\ifx\csname ibycus@scale\endcsname\relax
 \let\ibycus@@scale\@empty
\else
 \edef\ibycus@@scale{s*[\csname ibycus@scale\endcsname]}%
\fi
\DeclareFontFamily{LGI}{fib}{}
\DeclareFontShape{LGI}{fib}{m}{n}{<-> \ibycus@@scale fibr84}{}
\DeclareFontShape{LGI}{fib}{m}{sl}{<-> \ibycus@@scale fibo84}{}
\DeclareFontShape{LGI}{fib}{b}{n}{<-> \ibycus@@scale fibb84}{}
\DeclareFontShape{LGI}{fib}{m}{it}{<-> ssub * fib/m/sl}{}
\DeclareFontShape{LGI}{fib}{bx}{n}{<-> ssub * fib/b/n}{}
⟨/lgifib⟩
```

9.4 Notes for class and package writers

To change the font family used for Greek passages, redefine the macro `\ibycusdefault` accordingly. Macro packages should use `\def` rather than `\renewcommand`; thus, they can be loaded before as well as after `ibycus.ldf`.

To make the command `\setgreekfontscale` work, font definition files for LGI-encoded font families must evaluate the macro `\ibycus@scale` in the same way as the above `lgifib.fd`.