xpinyin 宏包

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第 1 节　简介

xpinyin 是一个 LaTeX 宏包，提供了为汉字自动注音的功能。

第 2 节　基本用法

xpinyin 支持采用 GBK 和 UTF-8 编码的 TeX 源文件，建议总是使用 UTF-8。如果使用 LaTeX 或 pdfLaTeX 的编译方式，则根据编码的情况，xpinyin 依赖 CJK 或者 CJKutf8 宏包。如果使用 XeLaTeX，则依赖 xeCJK 宏包。如果它们没有在 xpinyin 之前被载入，xpinyin 将根据编译方式自动选择，LaTeX 或 pdfLaTeX 将使用 CJKutf8。

xpinyin 还依赖 l3kernel 和 l3packages，使用 (pdf)LaTeX 下的 GBK 编码时，还将依赖 xCJK2uni。

需要注意的是，xpinyin 缺省将拼音的字体设置为与文档的主字体（\normalfont）相同，所以为了保证声调字母的正确输出，应该选用合适的西文主字体。也可以通过将在下一节介绍的 ⟨*font*⟩ 选项来单独设置拼音的字体。

XeLaTeX 下的简单示例：

```
\documentclass{article}
\usepackage{xeCJK}
\usepackage{xpinyin}
\setmainfont{CMU Serif}
\setCJKmainfont{SimSun}

\begin{document}
\xpinyin*{汉语拼音示例}
\end{document}
```

(pdf)LaTeX 下的简单示例：

```
\documentclass{article}
\usepackage{CJKutf8}
\usepackage{xpinyin}
\usepackage[T1]{fontenc}
\usepackage{lmodern}

\begin{document}
\begin{CJK}{UTF8}{gbsn}
\xpinyin*{汉语拼音示例}
\end{CJK}
\end{document}
```

运行上述示例要求系统安装了设置的字体，源文件用 UTF-8 编码保存，使用相应的编译方式。

xpinyin 可以与 ctex 宏包或文档类共同使用，使用方式与上面类似。

*ctex-kit rev. 81bb941.

第 3 节　用户手册

pinyinscope　\begin{pinyinscope}[⟨*options*⟩]
.....
\end{pinyinscope}

为 pinyinscope 环境中的汉字自动注音。例如

```
\begin{pinyinscope}
列位看官：你道此书从何而来？说起根由，虽近荒唐，细按则深有趣味。
待在下将此来历注明，方使阅者\xpinyin{了}{liao3}然不惑。
\end{pinyinscope}
```

liè wèi kàn guān nǐ dào cǐ shū cóng hé ér lái shuō qǐ gēn yóu suī jìn huāngtáng xì àn zé shēn yǒu qù wèi dài zài xià jiǎng cǐ lái lì zhù míng
列位看官：你道此书从何而来？说起根由，虽近荒唐，细按则深有趣味。待在下将此来历注明，
fāng shǐ yuè zhě liǎo rán bù huò
方使阅者了然不惑。

可选项 ⟨*options*⟩ 用于局部设置拼音的格式，将在下面说明。

\xpinyin　\xpinyin [⟨*options*⟩] {⟨单个汉字⟩} {⟨拼音⟩}
\xpinyin* [⟨*options*⟩] {⟨文字⟩}

对于多音字，可以使用 \xpinyin 为其设置拼音；而 \xpinyin* 相当于 pinyinscope 环境的命令形式。\xpinyin 可以在 pinyinscope 环境和 \xpinyin* 中使用。例如，

cháng
长
zhēn shì yīn mènghuàn shì tōng líng
甄士隐梦幻识通灵
zhòng yào
重要

```
\xpinyin{长}{chang2}\\
\xpinyin*{甄士隐梦幻识通灵}\\
\xpinyin*{\xpinyin{重}{zhong4}要}
```

\pinyin　\pinyin [⟨*options*⟩] {⟨拼音⟩}

用于输出拼音，为了输入的方便 ü 可以用 v 代替。例如，

lǚ zi
nǚ hái zi

```
\pinyin{lv2zi}\\
\pinyin{nv3hai2zi}
```

\setpinyin　\setpinyin {⟨汉字⟩} {⟨拼音⟩}

xpinyin 宏包的拼音数据（xpinyin-database.def）来源于 Unicode 的 Unihan 数据库[1]中的 Unihan_Readings.txt 文件。对于多音字，一般来说这个文件选用的是常用读音。可以使用 \setpinyin 来设置多音字的首选读音。

\xpinyinsetup　\xpinyinsetup { ⟨key_1⟩=⟨val_1⟩, ⟨key_2⟩=⟨val_2⟩, ... }

用于在导言区或文档中，设置拼音的格式。目前可以设置的 ⟨*key*⟩ 如下介绍。

ratio　ratio = {⟨*number*⟩}

设置拼音字体大小与当前正文字体大小的比例，缺省值是 0.4。

vsep　vsep = {⟨*dimen*⟩}

设置拼音的基线与汉字基线的间距，缺省值是 1 em。

hsep　hsep = {⟨*skip*⟩}

设置注音汉字之间的间距，缺省值与 \CJKglue 的值相同。为了断行时行末的对齐，设置的 ⟨*skip*⟩ 最后有一定的弹性。例如

```
\xpinyin*[ratio={.7},hsep={.5em plus .1em},vsep={1.1em}]{贾雨村风尘怀闺秀}
```

jiǎ yǔ cūn fēng chén huái guī xiù
贾 雨 村 风 尘 怀 闺 秀

[1] http://www.unicode.org/Public/UNIDATA/Unihan.zip

pysep　pysep = {⟨*glue*⟩}

设置 \pinyin 输出的相邻两个汉语拼音的空白，缺省值是一个空格。

font　font = {⟨*font*⟩}

设置拼音的字体，缺省值是 \normalfont，即以正文西文字体相同。为了保证拼音能正确输出，最好选用收字量较大的西文字体。

format　format = {⟨*format*⟩}

设置拼音的其它格式，例如颜色等，缺省值为空。

multiple　multiple = {⟨*format*⟩}

设置多音字拼音的其它格式，缺省值为空。可以通过这个选项来提醒校正多音字的拼音。例如本文档设置多音字拼音的颜色是红色（需要载入 color 宏包）：

```
\xpinyinsetup{multiple={\color{red}}}
```

footnote　footnote = ⟨*true*|**false**⟩

New: 2014-01-12

是否对拼音环境中的脚注（\footnote）汉字加上拼音。缺省值为 false。更一般的情况，请使用 \disablepinyin。

\disablepinyin
\enablepinyin

New: 2014-01-12

\disablepinyin 用于在拼音环境（pinyinscope）中临时取消对汉字的注音，而 \enablepinyin 用于其后的恢复。

第 4 节　代码实现

```
1 ⟨*package⟩
2 ⟨@@=xpinyin⟩
3 \msg_new:nnn { xpinyin } { l3-too-old }
4   {
5     Support~package~'expl3'~too~old. \\\\
6     Please~update~an~up~to~date~version~of~the~bundles\\\\
7     'l3kernel'~and~'l3packages'\\\\
8     using~your~TeX~package~manager~or~from~CTAN.
9   }
10 \@ifpackagelater { expl3 } { 2019/03/05 } { }
11   { \msg_error:nn { xpinyin } { l3-too-old } }
12 \msg_new:nnn { xpinyin } { engine-not-supported }
13   { Engine~`\c_sys_engine_str'~is~not~yet~supported,~xpinyin~will~abort! }
14 \bool_lazy_or:nnF
15   { \sys_if_engine_xetex_p: }
16   { \sys_if_engine_pdftex_p: }
17   { \msg_critical:nn { xpinyin } { engine-not-supported } }
18 \RequirePackage { xparse }
19 \RequirePackage { l3keys2e }
```

\c__xpinyin_tone_prop　重音标记 \`、\' 和 \= 在 tabbing 环境中被移作他用，为避免错误，我们使用内部命令 \@tabacckludge 或 \a 来定义。

```
20 \prop_const_from_keyval:Nn \c__xpinyin_tone_prop
21   {
22     { ā } = { \@tabacckludge= a } ,
23     { á } = { \@tabacckludge' a } ,
24     { ǎ } = { \v a } ,
25     { à } = { \@tabacckludge` a } ,
26     { ō } = { \@tabacckludge= o } ,
27     { ó } = { \@tabacckludge' o } ,
```

```
    { ǒ } = { \v o } ,
    { ò } = { \@tabacckludge` o } ,
    { ē } = { \@tabacckludge= e } ,
    { é } = { \@tabacckludge' e } ,
    { ě } = { \v e } ,
    { è } = { \@tabacckludge` e } ,
    { ū } = { \@tabacckludge= u } ,
    { ú } = { \@tabacckludge' u } ,
    { ǔ } = { \v u } ,
    { ù } = { \@tabacckludge` u } ,
    { ḿ } = { \@tabacckludge' m } ,
    { ń } = { \@tabacckludge' n } ,
    { ň } = { \v n } ,
    { ǹ } = { \@tabacckludge` n } ,
    { ī } = { \@tabacckludge= { \i } } ,
    { í } = { \@tabacckludge' { \i } } ,
    { ǐ } = { \v { \i } } ,
    { ì } = { \@tabacckludge` { \i } } ,
    { ü } = { \" u } ,
    { ǖ } = { \@tabacckludge= { \" u } } ,
    { ǘ } = { \@tabacckludge' { \" u } } ,
    { ǚ } = { \v { \" u } } ,
    { ǜ } = { \@tabacckludge` { \" u } }
  }
\__xpinyin_UTF_char:nn
\cs_new_protected_nopar:Npn \__xpinyin_UTF_char:nn #1#2
  {
    \cs_if_exist:cF { u8:#1 }
      { \tl_const:cn { u8:#1 } {#2} }
  }
\__xpinyin_GBK_char:nn
\cs_new_protected_nopar:Npn \__xpinyin_GBK_char:nn #1#2
  {
    \__xpinyin_UTF_char:nn {#1} {#2}
    \exp_args:Nx \__xpinyin_GBK_char_aux:nn { \tl_head:n {#1} } {#1}
  }
\cs_new_protected_nopar:Npn \__xpinyin_GBK_char_aux:nn #1#2
  { \exp_args:Nf \__xpinyin_GBK_char_aux:nnn { \int_eval:n { `#1 } } {#1} {#2} }
\cs_new_protected_nopar:Npn \__xpinyin_GBK_char_aux:nnn #1#2#3
  {
    \cs_if_exist:cF { __xpinyin_UTF_ #1 :w }
      {
        \exp_args:Nf \__xpinyin_GBK_char_def:nnn
          {
            \int_case:nn { \tl_count:n {#3} }
              {
                { 2 } { ##1 }
                { 3 } { ##1##2 }
                { 4 } { ##1##2##3 }
              }
          }
          {#1} {#2}
        \exp_args:Nc \__xpinyin_save_UTF_cs:Nn { __xpinyin_UTF_ #1 :w } {#1}
        \tl_gput_right:Nx \c__xpinyin_reset_UTF_catcode_tl
          { \char_set_catcode:nn {#1} { \char_value_catcode:n {#1} } }
        \char_set_catcode_active:n {#1}
      }
  }
\cs_new_protected_nopar:Npn \__xpinyin_GBK_char_def:nnn #1#2#3
  {
    \cs_new_protected_nopar:cpn { __xpinyin_UTF_ #2 :w } #1
      { \use:c { u8: \tl_to_str:n { #3#1 } } }
  }
\tl_new:N \c__xpinyin_reset_UTF_catcode_tl
\__xpinyin_save_UTF_cs:Nn
\group_begin:
\char_set_catcode_active:n { 126 }
\cs_new_protected_nopar:Npn \__xpinyin_save_UTF_cs:Nn #1#2
```

```
  {
    \group_begin:
    \char_set_lccode:nn { 126 } {#2}
    \tex_lowercase:D
      {
        \group_end:
        \tl_gput_right:Nn \c__xpinyin_reset_UTF_cs_tl { \cs_set_eq:NN ~ #1 }
      }
  }
\group_end:
\tl_new:N \c__xpinyin_reset_UTF_cs_tl

\bool_new:N \g__xpinyin_GBK_bool
\@ifpackageloaded { xeCJK }
  { \AtEndOfPackage { \__xpinyin_adjust_xeCJK_hook: } }
  {
    \@ifpackageloaded { CJKutf8 }
      {
        \prop_map_function:NN \c__xpinyin_tone_prop \__xpinyin_UTF_char:nn
        \AtEndOfPackage { \__xpinyin_adjust_CJK_hook: }
      }
      {
        \@ifpackageloaded { CJK }
          {
            \RequirePackage { xCJK2uni }
            \prop_map_function:NN \c__xpinyin_tone_prop \__xpinyin_GBK_char:nn
            \AtEndOfPackage
              {
                \tl_put_right:Nn \l__xpinyin_pinyin_box_hook_tl
                  { \c__xpinyin_reset_UTF_cs_tl }
                \__xpinyin_adjust_CJK_hook:
                \tl_use:N \c__xpinyin_reset_UTF_catcode_tl
              }
            \bool_gset_true:N \g__xpinyin_GBK_bool
          }
          {
            \sys_if_engine_xetex:TF
              {
                \RequirePackage { xeCJK }
                \AtEndOfPackage { \__xpinyin_adjust_xeCJK_hook: }
              }
              {
                \RequirePackage { CJKutf8 }
                \prop_map_function:NN \c__xpinyin_tone_prop \__xpinyin_UTF_char:nn
                \AtEndOfPackage { \__xpinyin_adjust_CJK_hook: }
              }
          }
      }
  }
```

\l__xpinyin_tmpa_box
\l__xpinyin_tmpb_box

```
\box_new:N \l__xpinyin_tmpa_box
\box_new:N \l__xpinyin_tmpb_box
```

__xpinyin_width:Nn

```
\cs_new_protected:Npn \__xpinyin_width:Nn #1#2
  {
    \hbox_set:Nn \l__xpinyin_tmpa_box {#2}
    #1 = \box_wd:N \l__xpinyin_tmpa_box
  }
```

__xpinyin_make_pinyin_box:nnn

```
\cs_new_protected_nopar:Npn \__xpinyin_make_pinyin_box:nnn #1#2#3
  {
    \__xpinyin_leavevmode:
    \hbox_overlap_right:n
      {
        \hbox_set:Nn \l__xpinyin_tmpa_box
          { \__xpinyin_CJKsymbol_hook: \__xpinyin_save_CJKsymbol:n {#2} }
        \hbox_set:Nn \l__xpinyin_tmpb_box
          {
```

```
            \color_group_begin: \color_ensure_current:
            \l__xpinyin_pinyin_box_hook_tl
            \__xpinyin_select_font:
            \clist_if_exist:cTF { c__xpinyin_multiple_ #1 _clist }
              { \l__xpinyin_multiple_tl \l__xpinyin_format_tl }
              { \l__xpinyin_format_tl }
            {#3}
            \color_group_end:
          }
        \dim_compare:nNnT
          { \box_wd:N \l__xpinyin_tmpb_box } >
          { \box_wd:N \l__xpinyin_tmpa_box + \l__xpinyin_CJKglue_dim }
          {
            \box_resize_to_wd_and_ht:Nnn \l__xpinyin_tmpb_box
              { \box_wd:N \l__xpinyin_tmpa_box + \l__xpinyin_CJKglue_dim }
              { \box_ht:N \l__xpinyin_tmpb_box }
          }
        \box_move_up:nn { \l__xpinyin_vsep_tl }
          {
            \hbox_to_wd:nn { \box_wd:N \l__xpinyin_tmpa_box }
              { \tex_hss:D \box_use_drop:N \l__xpinyin_tmpb_box \tex_hss:D }
          }
      }
  }
\tl_new:N \l__xpinyin_pinyin_box_hook_tl
\sys_if_engine_pdftex:T
  {
    \tl_put_right:Nn \l__xpinyin_pinyin_box_hook_tl
      { \cs_set_eq:NN \CJK@plane \tex_undefined:D }
  }
\cs_generate_variant:Nn \__xpinyin_make_pinyin_box:nnn { x }
```

__xpinyin_CJKsymbol:n

```
\cs_new_protected_nopar:Npn \__xpinyin_CJKsymbol:n #1
  { \__xpinyin_CJKsymbol:xn { \__xpinyin_to_unicode:n {#1} } {#1} }
\cs_new_protected_nopar:Npn \__xpinyin_CJKsymbol:nn #1#2
  {
    \__xpinyin_make_pinyin_box:nnn {#1} {#2} { \use:c { c__xpinyin_ #1 _tl } }
    \__xpinyin_save_CJKsymbol:n {#2}
  }
\cs_generate_variant:Nn \__xpinyin_CJKsymbol:nn { x }
```

pinyinscope

```
\NewDocumentEnvironment { pinyinscope } { O { } }
  {
    \keys_set:nn { xpinyin } {#1}
    \enablepinyin
  }
  { }
```

\xpinyin

```
\NewDocumentCommand \xpinyin { s O { } m }
  {
    \mode_leave_vertical:
    \IfBooleanTF {#1}
      {
        \group_begin:
          \keys_set:nn { xpinyin } {#2}
          \enablepinyin
          #3
        \group_end:
      }
      {
        \group_begin:
          \keys_set:nn { xpinyin } {#2}
          \bool_if:NF \l__xpinyin_enable_bool
            { \__xpinyin_width:Nn \l__xpinyin_CJKglue_dim { \CJKglue } }
          \__xpinyin_single_aux:nn {#3}
      }
  }
```

```
\l__xpinyin_enable_bool
\bool_new:N \l__xpinyin_enable_bool

\__xpinyin_CJKglue:
\cs_new_protected_nopar:Npn \__xpinyin_CJKglue:
  { \skip_horizontal:n { \l__xpinyin_hsep_tl } }

\enablepinyin
\NewDocumentCommand \enablepinyin { }
  {
    \bool_if:NF \l__xpinyin_enable_bool
      {
        \tl_if_empty:NF \l__xpinyin_hsep_tl
          {
            \cs_set_eq:NN \__xpinyin_save_CJKglue: \CJKglue
            \cs_set_eq:NN \CJKglue \__xpinyin_CJKglue:
          }
        \__xpinyin_width:Nn \l__xpinyin_CJKglue_dim { \CJKglue }
        \__xpinyin_replace_CJKsymbol:
        \__xpinyin_restore_footnote:
        \bool_set_true:N \l__xpinyin_enable_bool
      }
  }

\disablepinyin
\NewDocumentCommand \disablepinyin { }
  {
    \bool_if:NT \l__xpinyin_enable_bool
      {
        \cs_if_eq:NNT \CJKglue \__xpinyin_CJKglue:
          { \cs_set_eq:NN \CJKglue \__xpinyin_save_CJKglue: }
        \__xpinyin_restore_CJKsymbol:
        \bool_set_false:N \l__xpinyin_enable_bool
      }
  }

\__xpinyin_restore_footnote:
\cs_new_protected_nopar:Npn \__xpinyin_restore_footnote:
  {
    \bool_if:NF \l__xpinyin_footnote_bool
      { \tl_put_left:Nn \@parboxrestore { \l__xpinyin_restore_footnote_tl } }
  }

\l__xpinyin_restore_footnote_tl
\tl_new:N \l__xpinyin_restore_footnote_tl
\tl_set:Nn \l__xpinyin_restore_footnote_tl
  {
    \int_compare:nNnT \tex_currentgrouptype:D = { 11 }
      { \disablepinyin }
  }

\l__xpinyin_CJKglue_dim
\dim_new:N \l__xpinyin_CJKglue_dim

\__xpinyin_single_aux:nn
\cs_new_protected_nopar:Npn \__xpinyin_single_aux:nn #1#2
  {
      \__xpinyin_replace_CJKsymbol_single:n {#2}
      #1
    \group_end:
  }
\cs_new_protected_nopar:Npn \__xpinyin_replace_CJKsymbol_single_aux:n #1
  {
    \bool_if:NF \l__xpinyin_enable_bool { \__xpinyin_replace_CJKsymbol: }
    \cs_set_protected_nopar:Npn \CJKsymbol ##1
      { \__xpinyin_single_CJKsymbol:nn {##1} {#1} }
  }
\cs_new_protected_nopar:Npn \__xpinyin_single_CJKsymbol:nn #1#2
  {
    \__xpinyin_make_pinyin_box:xnn
      { \__xpinyin_to_unicode:n {#1} } {#1} { \__xpinyin_pinyin:n {#2} }
    \__xpinyin_save_CJKsymbol:n {#1}
  }

\__xpinyin_replace_CJKsymbol_aux:
\cs_new_protected_nopar:Npn \__xpinyin_replace_CJKsymbol_aux:
  {
    \cs_set_eq:NN \__xpinyin_save_CJKsymbol:n \CJKsymbol
```

```
282     \cs_set_eq:NN \CJKsymbol \__xpinyin_CJKsymbol:n
283   }
\__xpinyin_restore_CJKsymbol_aux:
284 \cs_new_protected_nopar:Npn \__xpinyin_restore_CJKsymbol_aux:
285   { \cs_set_eq:NN \CJKsymbol \__xpinyin_save_CJKsymbol:n }
\__xpinyin_select_font_xetex:
286 \cs_new_protected_nopar:Npn \__xpinyin_select_font_xetex:
287   {
288     \cs_if_exist_use:cF { \l__xpinyin_coor_tl }
289       {
290         \tl_set:Nx \l__xpinyin_current_coor_tl { \l__xpinyin_coor_tl }
291         \__xpinyin_select_font_aux:
292         \int_compare:nNnF { \tex_XeTeXfonttype:D \tex_font:D } = \c_zero_int
293           {
294             \exp_last_unbraced:NNV
295             \cs_gset_eq:cN \l__xpinyin_current_coor_tl \tex_font:D
296           }
297       }
298   }
\__xpinyin_select_font_aux:
299 \cs_new_protected_nopar:Npn \__xpinyin_select_font_aux:
300   {
301     \fontsize
302       { \l__xpinyin_ratio_tl \tex_dimexpr:D \f@size pt \scan_stop: }
303       { \f@baselineskip }
304     \normalfont
305     \l__xpinyin_font_tl
306     \selectfont
307   }
\__xpinyin_to_unicode_xetex:n
308 \cs_new_nopar:Npn \__xpinyin_to_unicode_xetex:n #1
309   { \int_to_arabic:n { `#1 } }
\__xpinyin_UTF_to_unicode:n
\__xpinyin_UTFchar_to_unicode:n
310 \cs_new_nopar:Npn \__xpinyin_UTF_to_unicode:n #1
311   {
312     \int_to_arabic:n
313       { \exp_args:No \int_from_hex:n { \CJK@plane } * "100 + #1 }
314   }
315 \cs_new_nopar:Npn \__xpinyin_UTFchar_to_unicode:n #1
316   { \int_to_arabic:n { \__xpinyin_UTF_viii_to_unicode:NNNw #1 \q_stop } }
317 \cs_new_nopar:Npn \__xpinyin_UTF_viii_to_unicode:NNNw #1#2#3#4 \q_stop
318   {
319     \tl_if_empty:nTF {#4}
320       { ( `#1 - "E0 ) * "1000 + ( `#2 - "80 ) * "40 + ( `#3 - "80 ) }
321      { ( `#1 - "F0 ) * "4000 + ( `#2 - "80 ) * "1000 + ( `#3 - "80 ) * "40 + ( `#4 - "80 ) }
322   }
\__xpinyin_GBK_to_unicode:n
\__xpinyin_GBKchar_to_unicode:n
323 \cs_new_nopar:Npn \__xpinyin_GBK_to_unicode:n #1
324   { \int_to_arabic:n { " \CJKtu_sfd_map:nn { \CJK@plane } {#1} } }
325 \cs_new_nopar:Npn \__xpinyin_GBKchar_to_unicode:n #1
326   { \int_to_arabic:n { " \CJKchartouni {#1} } }
\__xpinyin_adjust_xeCJK_hook:
327 \cs_new_protected_nopar:Npn \__xpinyin_adjust_xeCJK_hook:
328   {
329     \cs_new_eq:NN \__xpinyin_select_font:       \__xpinyin_select_font_xetex:
330     \cs_new_eq:NN \__xpinyin_to_unicode:n       \__xpinyin_to_unicode_xetex:n
331     \cs_new_eq:NN \__xpinyin_char_to_unicode:n  \__xpinyin_to_unicode:n
332     \cs_new_eq:NN \__xpinyin_restore_CJKsymbol: \__xpinyin_restore_CJKsymbol_aux:
333     \cs_new_eq:NN \__xpinyin_replace_CJKsymbol: \__xpinyin_replace_CJKsymbol_aux:
334     \cs_new_eq:NN \__xpinyin_replace_CJKsymbol_single:n
335                   \__xpinyin_replace_CJKsymbol_single_aux:n
336     \tl_if_exist:NTF \l_xeCJK_current_font_tl
337       {
338         \tl_set:Nn \l__xpinyin_coor_tl
339           {
340             ( \tl_to_str:N \l__xpinyin_font_tl ) /
341             \l_xeCJK_current_font_tl/\l__xpinyin_ratio_tl
342           }
343       }
```

```
      {
        \tl_set:Nn \l__xpinyin_coor_tl
          {
            ( \tl_to_str:N \l__xpinyin_font_tl ) /
            \xeCJK@family/\f@series/\f@shape/\f@size/\l__xpinyin_ratio_tl
          }
      }
    \cs_new_eq:NN \__xpinyin_leavevmode: \prg_do_nothing:
    \cs_new_protected_nopar:Npx \__xpinyin_CJKsymbol_hook:
      {
        \exp_not:N \makexeCJKinactive
        \cs_if_exist_use:NF \xeCJK_select_font:
          { \exp_not:N \xeCJK@setfont }
      }
  }
\__xpinyin_adjust_CJK_hook:
\cs_new_protected_nopar:Npn \__xpinyin_adjust_CJK_hook:
  {
    \bool_if:NTF \g__xpinyin_GBK_bool
      {
        \cs_new_eq:NN \__xpinyin_to_unicode:n      \__xpinyin_GBK_to_unicode:n
        \cs_new_eq:NN \__xpinyin_char_to_unicode:n \__xpinyin_GBKchar_to_unicode:n
      }
      {
        \cs_new_eq:NN \__xpinyin_to_unicode:n      \__xpinyin_UTF_to_unicode:n
        \cs_new_eq:NN \__xpinyin_char_to_unicode:n \__xpinyin_UTFchar_to_unicode:n
      }
    \cs_new_eq:NN \__xpinyin_select_font:    \__xpinyin_select_font_aux:
    \cs_new_eq:NN \__xpinyin_leavevmode:     \mode_leave_vertical:
    \cs_new_eq:NN \__xpinyin_CJKsymbol_hook: \prg_do_nothing:
    \@ifpackageloaded { CJKpunct }
      { \__xpinyin_adjust_CJKpunct_hook: }
      {
        \cs_new_eq:NN \__xpinyin_restore_CJKsymbol: \__xpinyin_restore_CJKsymbol_aux:
        \cs_new_eq:NN \__xpinyin_replace_CJKsymbol: \__xpinyin_replace_CJKsymbol_aux:
        \cs_new_eq:NN \__xpinyin_replace_CJKsymbol_single:n
                      \__xpinyin_replace_CJKsymbol_single_aux:n
        \AtBeginDocument
          {
            \@ifpackageloaded { CJKpunct }
              {
                \cs_undefine:N \__xpinyin_restore_CJKsymbol:
                \cs_undefine:N \__xpinyin_replace_CJKsymbol:
                \cs_undefine:N \__xpinyin_replace_CJKsymbol_single:n
                \__xpinyin_adjust_CJKpunct_hook:
              } { }
          }
      }
  }
\__xpinyin_adjust_CJKpunct_hook:
\cs_new_protected_nopar:Npn \__xpinyin_adjust_CJKpunct_hook:
  {
    \cs_new_protected_nopar:Npn \__xpinyin_restore_CJKsymbol:
      {
        \int_compare:nNnTF { \CJKpunct@punctstyle } = { \CJKpunct@ps@plain }
          { \__xpinyin_restore_CJKsymbol_aux: }
          { \cs_set_eq:NN \CJKosymbol \__xpinyin_save_CJKsymbol:n }
      }
    \cs_new_protected_nopar:Npn \__xpinyin_replace_CJKsymbol:
      {
        \int_compare:nNnTF { \CJKpunct@punctstyle } = { \CJKpunct@ps@plain }
          { \__xpinyin_replace_CJKsymbol_aux: }
          {
            \cs_set_eq:NN \__xpinyin_save_CJKsymbol:n \CJKosymbol
            \cs_set_eq:NN \CJKosymbol \__xpinyin_CJKsymbol:n
          }
      }
    \cs_new_protected_nopar:Npn \__xpinyin_replace_CJKsymbol_single:n ##1
```

```
      {
        \int_compare:nNnTF { \CJKpunct@punctstyle } = { \CJKpunct@ps@plain }
          { \__xpinyin_replace_CJKsymbol_single_aux:n { ##1 } }
          {
            \bool_if:NF \l__xpinyin_enable_bool
              { \cs_set_eq:NN \__xpinyin_save_CJKsymbol:n \CJKosymbol }
            \cs_set_protected_nopar:Npn \CJKosymbol ####1
              { \__xpinyin_single_CJKsymbol:nn { ####1 } { ##1 } }
          }
      }
  }
\pinyin
\NewDocumentCommand \pinyin { O { } m }
  {
    \group_begin:
    \keys_set:nn { xpinyin } {#1}
    \l__xpinyin_font_tl
    \l__xpinyin_format_tl { }
    \selectfont
    \c__xpinyin_reset_UTF_cs_tl
    \__xpinyin_pinyin:n {#2}
    \group_end:
  }
\__xpinyin_pinyin:n
\cs_new_protected_nopar:Npn \__xpinyin_pinyin:n #1
  {
    \__xpinyin_pinyin_init:
    \bool_set_true:N \l__xpinyin_first_bool
    \tl_set:Nn \l__xpinyin_save_tl {#1}
    \__xpinyin_pinyin_aux:n #1 \q_recursion_tail \q_recursion_stop
  }
\__xpinyin_pinyin_aux:n
\cs_new_protected_nopar:Npn \__xpinyin_pinyin_aux:n #1
  {
    \quark_if_recursion_tail_stop_do:nn {#1}
      {
        \bool_if:NTF \l__xpinyin_first_bool { \l__xpinyin_save_tl }
       { \tl_if_empty:NF \l__xpinyin_item_tl { \l__xpinyin_pysep_tl \l__xpinyin_item_tl } }
      }
    \__xpinyin_if_number:nTF {#1}
      {
        \bool_if:NTF \l__xpinyin_first_bool
          { \bool_set_false:N \l__xpinyin_first_bool }
          { \l__xpinyin_pysep_tl }
        \l__xpinyin_pre_tl
        \__xpinyin_tone:Vn \l__xpinyin_tone_tl {#1}
        \l__xpinyin_post_tl
        \__xpinyin_pinyin_init:
      }
      {
        \int_compare:nNnTF
        { 0 \cs_if_exist_use:c { c__xpinyin_ \tl_to_str:N \l__xpinyin_tone_tl _tl } } >
          { 0 \cs_if_exist_use:c { c__xpinyin_ \tl_to_str:n {#1} _tl } }
          { \tl_put_right:Nn \l__xpinyin_post_tl {#1} }
          {
            \tl_set:Nn \l__xpinyin_tone_tl {#1}
            \tl_set_eq:NN \l__xpinyin_pre_tl \l__xpinyin_item_tl
            \tl_clear:N \l__xpinyin_post_tl
          }
        \tl_put_right:Nx \l__xpinyin_item_tl { \__xpinyin_replace_v:n {#1} }
      }
    \__xpinyin_pinyin_aux:n
  }
\__xpinyin_tone:nn
\cs_new_protected_nopar:Npn \__xpinyin_tone:nn #1#2
  { \use:c { __xpinyin_num_to_tone_ #1 :Nn } {#1} {#2} }
\cs_generate_variant:Nn \__xpinyin_tone:nn { V }
```

```
\__xpinyin_replace_v:n
\cs_new_nopar:Npn \__xpinyin_replace_v:n #1
  {
    \str_if_eq:nnTF {#1} { v }
      {
        \str_case:onTF { \l__xpinyin_item_tl }
          { { l } { } { n } { } { L } { } { N } { } }
          { \exp_not:n { ü } } { u }
      }
      { \exp_not:n {#1} }
  }

\__xpinyin_pinyin_init:
\cs_new_nopar:Npn \__xpinyin_pinyin_init:
  {
    \tl_clear:N \l__xpinyin_pre_tl   \tl_clear:N \l__xpinyin_post_tl
    \tl_clear:N \l__xpinyin_item_tl  \tl_clear:N \l__xpinyin_tone_tl
  }

\__xpinyin_if_number:nTF
\prg_new_conditional:Npnn \__xpinyin_if_number:n #1 { TF }
  {
    \if_int_compare:w \c_one_int < 1 \tl_to_str:n {#1} \exp_stop_f:
      \prg_return_true: \else: \prg_return_false: \fi:
  }

\l__xpinyin_first_bool
\bool_new:N \l__xpinyin_first_bool

\c__xpinyin_a_tl
\c__xpinyin_o_tl
\c__xpinyin_e_tl
\c__xpinyin_i_tl
\c__xpinyin_u_tl
\c__xpinyin_v_tl
\tl_const:Nn \c__xpinyin_a_tl { 3 }
\tl_const:Nn \c__xpinyin_o_tl { 2 }
\tl_const:Nn \c__xpinyin_e_tl { 2 }
\tl_const:Nn \c__xpinyin_i_tl { 1 }
\tl_const:Nn \c__xpinyin_u_tl { 1 }
\tl_const:Nn \c__xpinyin_v_tl { 1 }

\__xpinyin_num_to_tone:Nn
\cs_new_protected_nopar:Npn \__xpinyin_num_to_tone:Nn #1#2
  {
    \if_case:w \int_eval:n { #2 - 1 } \exp_stop_f:
      \= {#1}  \or: \'{#1}  \or: \v {#1}  \or: \` {#1}  \else: #1 \fi:
  }
\tl_map_inline:nn { a o e u }
  { \cs_new_eq:cN { __xpinyin_num_to_tone_ #1 :Nn } \__xpinyin_num_to_tone:Nn }
\cs_new_nopar:Npn \__xpinyin_num_to_tone_i:Nn #1#2
  {
    \if_case:w \int_eval:n { #2 - 1 } \exp_stop_f:
      ī  \or: í  \or: ǐ  \or: ì \else: i \fi:
  }
\cs_new_protected_nopar:Npn \__xpinyin_num_to_tone_v:Nn #1#2
  {
    \str_case:onTF { \l__xpinyin_pre_tl }
      { { l } { }  { n } { }  { L } { } { N } { } }
      {
        \if_case:w \int_eval:n { #2 - 1 } \exp_stop_f:
          ǖ  \or: ǘ  \or: ǚ  \or: ǜ \else: ü \fi:
      }
      { \__xpinyin_num_to_tone:Nn u {#2} }
  }

\xpinyinsetup
\NewDocumentCommand \xpinyinsetup { m } { \keys_set:nn { xpinyin } {#1} }

ratio
vsep
hsep
pysep
font
format
multiple
footnote
\clist_map_inline:nn
  { ratio , vsep , hsep , pysep , font , format , multiple }
  { \keys_define:nn { xpinyin } { #1 .tl_set:c = { l__xpinyin_ #1 _tl } } }
\keys_define:nn { xpinyin }
  { footnote .bool_set:N = \l__xpinyin_footnote_bool }
\keys_set:nn { xpinyin }
  {
    ratio   = .4 ,
    vsep    = 1 em ,
    pysep   = \c_space_tl ,
    font    = \normalfont ,
  }
```

```
\xpinyin_customary:nnn
\xpinyin_multiple:nnn
```

```
\cs_new_protected_nopar:Npn \xpinyin_customary:nnn #1#2#3
  { \cs_gset_nopar:cpn { c__xpinyin_ #2 _tl } {#3} }
\cs_new_protected_nopar:Npn \xpinyin_multiple:nnn #1#2#3
  { \cs_gset_nopar:cpn { c__xpinyin_multiple_ #2 _clist } {#3} }

\group_begin:
  \cs_set_eq:NN \XPYU  \xpinyin_customary:nnn
  \cs_set_eq:NN \XPYUM \xpinyin_multiple:nnn
  \file_input:n { xpinyin-database.def }
\group_end:
```

```
\setpinyin
```

```
\NewDocumentCommand \setpinyin { m m }
  {
    \tl_set:cn
      { c__xpinyin_ \__xpinyin_char_to_unicode:n {#1} _tl }
      { \__xpinyin_pinyin:n {#2} }
  }

\ProcessKeysOptions { xpinyin }
```

⟨/package⟩

第 5 节 xpinyin.lua

⟨*lua⟩

```
xpinyin       = xpinyin or { }
local xpinyin = xpinyin
```

计算时区[2]。

```
xpinyin.tzoffset = "+0000"
do
  -- Compute the difference in seconds between local time and UTC.
  local function get_timezone()
    local now = os.time()
    return os.difftime(now, os.time(os.date("!*t", now)))
  end
  -- Return a timezone string in ISO 8601:2000 standard form (+hhmm or -hhmm)
  local function get_tzoffset(timezone)
    local h, m = math.modf(timezone / 3600)
    return string.format("%+.4d", 100 * h + 60 * m)
  end
  xpinyin.tzoffset = get_tzoffset(get_timezone())
end
xpinyin = {
  uchar    = unicode.utf8.char,
  readings = { },
  fixreadings = {
```

为汉字“〇”增加拼音。

```
    {"U+3007", "Mandarin", "líng"}
  },
  database = {
    source  = "http://www.unicode.org/Public/UNIDATA/Unihan.zip",
    file    = "Unihan_Readings.txt",
    date    = "Date: 2014-05-09 18:17:02 GMT [JHJ]",
    version = "Unicode version: 7.0.0",
    dbfile  = "xpinyin.db"
  },
  preamble = [[
%<<COMMENT
%%
%%  Do not edit this file!
%%  Created from Unihan database:
%%
%%    $file
```

[2] http://lua-users.org/wiki/TimeZone

```
%%    $date
%%    $version
%%
%%  by "texlua xpinyin.lua" on ]]
            .. os.date("%Y-%m-%d %X ") .. xpinyin.tzoffset
            .. "\n%%"
%COMMENT
}
local http_request = require("socket.http").request
local ltn12_sink_file = require("ltn12").sink.file
local zip_open = require("zip").open
```

将 Unihan_Readings.txt[3] 保存到一张表里面。

```
function xpinyin.maketable (txt)
  local f = io.open(txt or xpinyin.database.file, "r")
  if not f then
    local source = xpinyin.database.source
    local zfilename = source:match("[^/]+$")
    local zfile = zip_open(zfilename)
    if not zfile then
      xpinyin.download(source, zfilename)
      zfile = assert(zip_open(zfilename))
    end
    f = assert(zfile:open(xpinyin.database.file))
    zfile:close()
  end
  local s, prop
  for line in f:lines() do
    s = line:explode("\t")
    if #s == 3 then
      prop = s[2]:sub(2)
      if prop == "Mandarin" or
         prop == "HanyuPinyin" or
         prop == "XHC1983" or
         prop == "HanyuPinlu" then
        xpinyin.insert(s[1], prop, s[3])
      end
    elseif line:find("Date") then
      xpinyin.database.date = line:match("^[#%s]*(.*)")
    elseif line:find("Unicode version:") then
      xpinyin.database.version = line:match("^[#%s]*(.*)")
    end
  end
  f:close()
  if xpinyin.fixreadings then
    for _, s in pairs(xpinyin.fixreadings) do
      xpinyin.insert(s[1], s[2], s[3])
    end
  end
end
```

下载 Unihan.zip。

```
function xpinyin.download (source, zip)
  print("\nRetrieving Unihan Database from\n", source)
  local status, err = http_request{
    url  = source,
    sink = ltn12_sink_file(io.open(zip, "wb")) }
  if not status then
    error([[Download ']] .. zip .. [[' failed because of ]] .. err .. ".")
  end
end
```

往拼音表中加入项目。

```
function xpinyin.insert (unicode, prop, value)
  local index = tonumber(unicode:match("%x+$"), 16)
  if not xpinyin.readings[index] then
```

[3] http://http://www.unicode.org/reports/tr38/。

```
649     xpinyin.readings[index] = { }
650   end
651   xpinyin.readings[index][prop] = value
652 end
```

输出需要的格式文件。

```
653 function xpinyin.output (db)
654   local f = assert(io.open(db or xpinyin.database.dbfile, "w"))
655   local preamble = xpinyin.preamble:gsub("%$(%w+)", xpinyin.database)
656   f:write(preamble, "\n")
657   local hanzi, pinyin
658   local mt = { }
659   for index, pyt in xpinyin.pairsByKeys(xpinyin.readings) do
660     pinyin = assert(xpinyin.grep(pyt))
661     hanzi = xpinyin.uchar(index)
662     f:write("\\XPYU{", hanzi, "}{", index, "}{", pinyin, "}\n")
663     pinyin = xpinyin.multiple(pyt)
664     if pinyin then
665       mt[#mt + 1] = "\\XPYUM{" .. hanzi .. "}{" .. index .. "}{" .. pinyin .."}"
666     end
667   end
668   f:write(table.concat(mt, "\n"), "\n")
669   f:close()
670 end
```

将表按照索引排序，代码来源于 *Programming in Lua*。

```
671 function xpinyin.pairsByKeys (t, f)
672   local a = { }
673   for n in pairs(t) do a[#a + 1] = n end
674   table.sort(a, f)
675   local i = 0 -- iterator variable
676   return function () -- iterator function
677     i = i + 1
678     return a[i], t[a[i]]
679   end
680 end
```

按照 Mandarin、XHC1983、HanyuPinyin 的顺序选择最常用的拼音。HanyuPinlu 的质量较差，不采用。

```
681 function xpinyin.grep (pyt)
682   if pyt.Mandarin then
683     return pyt.Mandarin:match("%S+"), "Mandarin"
684   elseif pyt.XHC1983 then
685     return pyt.XHC1983:match(":(%S+)"), "XHC1983"
686   elseif pyt.HanyuPinyin then
687     return pyt.HanyuPinyin:match(":([^,%s]+)"), "HanyuPinyin"
688   end
689 end
```

根据 XHC1983 和 HanyuPinyin 选出多音字。

```
690 function xpinyin.multiple (pyt)
691   if pyt.XHC1983 then
692     local s = pyt.XHC1983:explode()
693     if s[2] then
694       local t = { }
695       for i, v in ipairs(s) do
696         t[#t + 1] = v:explode(":")[2]
697       end
698       return xpinyin.unique(t), "XHC1983"
699     end
700   elseif pyt.HanyuPinyin and pyt.HanyuPinyin:find("%D,") then
701     local t = { }
702     for _, v in ipairs(pyt.HanyuPinyin:explode()) do
703       for _, py in ipairs(v:explode(":")[2]:explode(",")) do
704         t[#t + 1] = py
705       end
706     end
707     return xpinyin.unique(t), "HanyuPinyin"
```

```
  end
end
```

删除掉数组中的重复元素。

```
function xpinyin.unique (t)
  local rt = xpinyin.remove_duplicate(t)
  if #rt > 1 then
    return table.concat(rt, ",")
  end
end
function xpinyin.remove_duplicate (t)
  local ht = { }
  local nt = { }
  for i, v in ipairs(t) do
    if not ht[v] then
      nt[#nt + 1] = v
      ht[v] = true
    end
  end
  return nt
end
xpinyin.maketable()
xpinyin.output()
```

⟨/lua⟩

代码索引

意大利体的数字表示描述对应索引项的页码；带下划线的数字表示定义对应索引项的代码行号；罗马字体的数字表示使用对应索引项的代码行号。

Symbols

\" 46, 47, 48, 49, 50
\' 503
\\ 5, 6, 7, 662, 665
\` 503

A

\AtBeginDocument 380
\AtEndOfPackage 106, 111, 118, 131, 136

B

bool commands:
\bool_gset_true:N 125
\bool_if:NTF . . 216, 226, 241, 251, 269, 361, 414, 443, 448
\bool_lazy_or:nnTF 14
\bool_new:N 104, 221, 493
\bool_set_false:N 246, 449
\bool_set_true:N 236, 435
box commands:
\box_ht:N 172
\box_move_up:nn 174
\box_new:N 141, 142
\box_resize_to_wd_and_ht:Nnn 170
\box_use_drop:N 177
\box_wd:N 146, 167, 168, 171, 176

C

char commands:
\char_set_catcode:nn 80
\char_set_catcode_active:n 81, 91
\char_set_lccode:nn 95
\char_value_catcode:n 80
\CJKchartouni 326
\CJKglue 217, 230, 231, 233, 243, 244
\CJKosymbol 398, 405, 406, 415, 416
\CJKsymbol 270, 281, 282, 285
CJKtu commands:
\CJKtu_sfd_map:nn 324
clist commands:
\clist_if_exist:NTF 160
\clist_map_inline:nn 523
color commands:
\color_ensure_current: 157
\color_group_begin: 157
\color_group_end: 164
cs commands:
\cs_generate_variant:Nn 187, 195, 472
\cs_gset_eq:NN 295
\cs_gset_nopar:Npn 536, 538
\cs_if_eq:NNTF 243
\cs_if_exist:NTF 54, 66
\cs_if_exist_use:N 458, 459
\cs_if_exist_use:NTF 288, 355
\cs_new_eq:NN 329, 330, 331, 332, 333, 334, 351, 363, 364, 367, 368, 370, 371, 372, 376, 377, 378, 506
\cs_new_nopar:Npn 308, 310, 315, 317, 323, 325, 473, 483, 507
\cs_new_protected:Npn 143
\cs_new_protected_nopar:Npn 52, 57, 62, 64, 84, 86, 92, 148, 188, 190, 222, 249, 261, 267, 273, 279, 284, 286, 299, 327, 359, 392, 394, 400, 409, 432, 439, 470, 500, 512, 535, 537
\cs_new_protected_nopar:Npx 352
\cs_set_eq:NN 99, 185, 230, 231, 244, 281, 282, 285, 398, 405, 406, 415, 540, 541
\cs_set_protected_nopar:Npn 270, 416
\cs_undefine:N 384, 385, 386

D

dim commands:
\dim_compare:nNnTF 166
\dim_new:N 260
\disablepinyin 3, 239, 258

E

else commands:
\else: 491, 503, 510, 518
\enablepinyin 3, 199, 209, 224
exp commands:
\exp_args:Nc 78
\exp_args:Nf 63, 68
\exp_args:No 313
\exp_args:Nx 60
\exp_last_unbraced:NNn 294
\exp_not:N 354, 356
\exp_not:n 479, 481
\exp_stop_f: 490, 502, 509, 517

F

fi commands:
\fi: 491, 503, 510, 518
file commands:
\file_input:n 542
font 3, 523
\fontsize 301
footnote 3, 523
format 3, 523

G

group commands:
\group_begin: 90, 94, 207, 214, 423, 539
\group_end: 98, 102, 211, 265, 430, 543

H

hbox commands:
\hbox_overlap_right:n 151
\hbox_set:Nn 145, 153, 155
\hbox_to_wd:nn 176
hsep 2, 523

I

\i 42, 43, 44, 45
if commands:
\if_case:w 502, 509, 517
\if_int_compare:w 490
\IfBooleanTF 205
int commands:
\int_case:nn 70
\int_compare:nNnTF 257, 292, 396, 402, 411, 457
\int_eval:n 63, 502, 509, 517
\int_from_hex:n 313
\int_to_arabic:n 309, 312, 316, 324, 326
\c_one_int 490
\c_zero_int 292

K

keys commands:
\keys_define:nn 525, 526
\keys_set:nn 198, 208, 215, 424, 522, 528

M

\makexeCJKinactive 354
mode commands:
\mode_leave_vertical: 204, 371
msg commands:
\msg_critical:nn 17
\msg_error:nn 11
\msg_new:nnn 3, 12
multiple 3, 523

N

\n 594, 638, 656, 662, 668
\NewDocumentCommand 202, 224, 239, 421, 522, 544
\NewDocumentEnvironment 196
\normalfont 304, 533
\nRetrieving 638

O

or commands:
\or: 503, 510, 518

P

\pinyin 2, 421
pinyinscope 2, 196
prg commands:
\prg_do_nothing: 351, 372
\prg_new_conditional:Npnn 488
\prg_return_false: 491
\prg_return_true: 491
\ProcessKeysOptions 550
prop commands:
\prop_const_from_keyval:Nn 20
\prop_map_function:NN 110, 117, 135
pysep 3, 523

Q

quark commands:
\quark_if_recursion_tail_stop_do:nn 441
\q_recursion_stop 437
\q_recursion_tail 437
\q_stop 316, 317

R

ratio 2, 523
\RequirePackage 18, 19, 116, 130, 134

S

scan commands:
\scan_stop: 302
\selectfont 306, 427
\setpinyin 2, 544
skip commands:
\skip_horizontal:n 223
str commands:
\str_case:nnTF 477, 514
\str_if_eq:nnTF 475
sys commands:
\c_sys_engine_str 13
\sys_if_engine_pdftex:TF 182
\sys_if_engine_pdftex_p: 16
\sys_if_engine_xetex:TF 128
\sys_if_engine_xetex_p: 15

T

\t 615
TEX and LATEX 2ε commands:
\@ifpackagelater 10
\@ifpackageloaded 105, 108, 114, 373, 382
\@parboxrestore 252
\@tabacckludge 3, 22, 23, 25, 26, 27, 29, 30, 31, 33, 34, 35, 37, 38, 39, 41, 42, 43, 45, 47, 48, 50
\a 3
\begin 2
\CJK@plane 185, 313, 324
\CJKglue 2
\CJKpunct@ps@plain 396, 402, 411
\CJKpunct@punctstyle 396, 402, 411
\disablepinyin 3, 3
\enablepinyin 3
\end 2
\f@baselineskip 303
\f@series 348
\f@shape 348
\f@size 302, 348
\footnote 3
\normalfont 1, 3
\pinyin 2, 3

\setpinyin 2
\xeCJK@family 348
\xeCJK@setfont 356
\xpinyin 2
\xpinyin* 2
\xpinyinsetup 2
tex commands:
\tex_currentgrouptype:D 257
\tex_dimexpr:D 302
\tex_font:D 292, 295
\tex_hss:D 177
\tex_lowercase:D 96
\tex_undefined:D 185
\tex_XeTeXfonttype:D 292
tl commands:
\c_space_tl 532
\tl_clear:N 464, 485, 486
\tl_const:Nn 55, 494, 495, 496, 497, 498, 499
\tl_count:n 70
\tl_gput_right:Nn 79, 99
\tl_head:n 60
\tl_if_empty:NTF 228, 444
\tl_if_empty:nTF 319
\tl_if_exist:NTF 336
\tl_map_inline:nn 505
\tl_new:N 89, 103, 181, 254
\tl_put_left:Nn 252
\tl_put_right:Nn 120, 184, 460, 466
\tl_set:Nn 255, 290, 338, 345, 436, 462, 546
\tl_set_eq:NN 463
\tl_to_str:N 340, 347, 458
\tl_to_str:n 87, 459, 490
\tl_use:N 123

U

use commands:
\use:N 87, 192, 471

V

\v 24, 28, 32, 36, 40, 44, 49, 503
vsep 2, 523

X

xeCJK commands:
\l_xeCJK_current_font_tl 336, 341
\xeCJK_select_font: 355
\xpinyin 2, 202
xpinyin commands:
\xpinyin_customary:nnn 535, 540
\xpinyin_multiple:nnn 535, 541
xpinyin internal commands:
\c__xpinyin_a_tl 494
__xpinyin_adjust_CJK_hook: 111, 122, 136, 359
__xpinyin_adjust_CJKpunct_hook: 374, 387, 392
__xpinyin_adjust_xeCJK_hook: 106, 131, 327
__xpinyin_char_to_unicode:n 331, 364, 368, 547
__xpinyin_CJKglue: 222, 231, 243
\l__xpinyin_CJKglue_dim 168, 171, 217, 233, 260
__xpinyin_CJKsymbol:n 188, 282, 406
__xpinyin_CJKsymbol:nn 189, 190, 195
__xpinyin_CJKsymbol_hook: 154, 352, 372
\l__xpinyin_coor_tl 288, 290, 338, 345
\l__xpinyin_current_coor_tl 290, 295
\c__xpinyin_e_tl 494
\l__xpinyin_enable_bool 216, 221, 226, 236, 241, 246, 269, 414
\l__xpinyin_first_bool 435, 443, 448, 449, 493
\l__xpinyin_font_tl 305, 340, 347, 425
\l__xpinyin_footnote_bool 251, 527
\l__xpinyin_format_tl 161, 162, 426
\g__xpinyin_GBK_bool 104, 125, 361
__xpinyin_GBK_char:nn 57, 117
__xpinyin_GBK_char_aux:nn 60, 62
__xpinyin_GBK_char_aux:nnn 63, 64
__xpinyin_GBK_char_def:nnn 68, 84
__xpinyin_GBK_to_unicode:n 323, 363
__xpinyin_GBKchar_to_unicode:n 323, 364
\l__xpinyin_hsep_tl 223, 228
\c__xpinyin_i_tl 494
__xpinyin_if_number:n 488
__xpinyin_if_number:nTF 446, 488
\l__xpinyin_item_tl 444, 463, 466, 477, 486
__xpinyin_leavevmode: 150, 351, 371
__xpinyin_make_pinyin_box:nnn 148, 192, 275
\l__xpinyin_multiple_tl 161
__xpinyin_num_to_tone:Nn 500
__xpinyin_num_to_tone_i:Nn 507
__xpinyin_num_to_tone_v:Nn 512
\c__xpinyin_o_tl 494
__xpinyin_pinyin:n 276, 429, 432, 548
__xpinyin_pinyin_aux:n 437, 439
\l__xpinyin_pinyin_box_hook_tl . . . 120, 158, 181, 184
__xpinyin_pinyin_init: 434, 454, 483
\l__xpinyin_post_tl 453, 460, 464, 485
\l__xpinyin_pre_tl 451, 463, 485, 514
\l__xpinyin_pysep_tl 444, 450
\l__xpinyin_ratio_tl 302, 341, 348
__xpinyin_replace_CJKsymbol: 234, 269, 333, 377, 385, 400
__xpinyin_replace_CJKsymbol_aux: 279, 333, 377, 403
__xpinyin_replace_CJKsymbol_single:n 263, 334, 378, 386, 409
__xpinyin_replace_CJKsymbol_single_aux:n 267, 335, 379, 412
__xpinyin_replace_v:n 466, 473
\c__xpinyin_reset_UTF_catcode_tl 79, 89, 123
\c__xpinyin_reset_UTF_cs_tl 99, 103, 121, 428
__xpinyin_restore_CJKsymbol: . 245, 332, 376, 384, 394
__xpinyin_restore_CJKsymbol_aux: 284, 332, 376, 397
__xpinyin_restore_footnote: 235, 249
\l__xpinyin_restore_footnote_tl 252, 254
__xpinyin_save_CJKglue: 230, 244

__xpinyin_save_CJKsymbol:n 154, 193, 277, 281, 285, 398, 405, 415
\l__xpinyin_save_tl 436, 443
__xpinyin_save_UTF_cs:Nn 78, 90
__xpinyin_select_font: 159, 329, 370
__xpinyin_select_font_aux: 291, 299, 370
__xpinyin_select_font_xetex: 286, 329
__xpinyin_single_aux:nn 218, 261
__xpinyin_single_CJKsymbol:nn 271, 273, 417
\l__xpinyin_tmpa_box .. 141, 145, 146, 153, 168, 171, 176
\l__xpinyin_tmpb_box 141, 155, 167, 170, 172, 177
__xpinyin_to_unicode:n .. 189, 276, 330, 331, 363, 367
__xpinyin_to_unicode_xetex:n 308, 330
__xpinyin_tone:nn 452, 470
\c__xpinyin_tone_prop 20, 110, 117, 135
\l__xpinyin_tone_tl 452, 458, 462, 486
\c__xpinyin_u_tl 494
__xpinyin_UTF_char:nn 52, 59, 110, 135
__xpinyin_UTF_to_unicode:n 310, 367
__xpinyin_UTF_viii_to_unicode:NNNw 316, 317
__xpinyin_UTFchar_to_unicode:n 310, 368
\c__xpinyin_v_tl 494
\l__xpinyin_vsep_tl 174
__xpinyin_width:Nn 143, 217, 233
\xpinyinsetup 2, 522
\XPYU 540
\XPYUM 541