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. e088f7d.

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

```
1 \begin{pinyinscope}
2 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。
3 待在下将此来历注明，方使阅者\xpinyin{了}{liao3}然不惑。
4 \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 jiāng 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，

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

```
1 \xpinyin{长}{chang2}\\
2 \xpinyin*{甄士隐梦幻识通灵}\\
3 \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，

lǘ zi
nǚ hái zi

```
1 \pinyin{lv2zi}\\
2 \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 { ⟨key1⟩=⟨val1⟩, ⟨key2⟩=⟨val2⟩, ... }
```

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

```
1 \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 } { 2015/09/24 } { }
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_if:nF
15   {
16     \sys_if_engine_xetex_p: ||
17     \sys_if_engine_pdftex_p:
18   }
19   { \msg_critical:nn { xpinyin } { engine-not-supported } }
20 \RequirePackage { xparse }
21 \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。

```
22 \prop_new:N \c__xpinyin_tone_prop
23 \clist_map_inline:nn
24   {
25     { ā }{ \@tabacckludge= a } ,          { á }{ \@tabacckludge' a } ,
26     { ǎ }{ \v a } ,                       { à }{ \@tabacckludge` a } ,
```

```
    { ō }{ \@tabacckludge= o } ,          { 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 } } ,
    { ǔ }{ \v { \" u } } ,                { ǜ }{ \@tabacckludge` { \" u } }
  }
  { \prop_gput:Nnn \c__xpinyin_tone_prop #1 }
```

(*End definition for* `\c__xpinyin_tone_prop`.)

`\__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} }
  }
```

(*End definition for* `\__xpinyin_UTF_char:nn`.)

`\__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} }
              {
                { \c_two   } { ##1 }
                { \c_three } { ##1##2 }
                { \c_four  } { ##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
```

(*End definition for* `\__xpinyin_GBK_char:nn`.)

`\__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
```

(*End definition for* `\__xpinyin_save_UTF_cs:Nn`.)

```
\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
```

(*End definition for* `\l__xpinyin_tmpa_box` *and* `\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
  }
```

(*End definition for* `\__xpinyin_width:Nn`.)

`\__xpinyin_leave_vmode:`

```
\cs_if_exist:NTF \pdftex_quitvmode:D
  { \cs_new_eq:NN \__xpinyin_quit_vmode: \pdftex_quitvmode:D }
  {
    \cs_new_protected_nopar:Npn \__xpinyin_quit_vmode:
      {
        \if_mode_vertical:
          \exp_after:wN \tex_indent:D
        \fi:
      }
  }
```

(*End definition for* `\__xpinyin_leave_vmode:`.)

__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:Nnn \l__xpinyin_tmpb_box
              { \box_wd:N \l__xpinyin_tmpa_box + \l__xpinyin_CJKglue_dim }
              { \box_ht:N \l__xpinyin_tmpb_box + \box_dp: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_clear: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 }
```

(*End definition for* `\__xpinyin_make_pinyin_box:nnn`.)

__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 }
```

(*End definition for* `\__xpinyin_CJKsymbol:n`.)

pinyinscope

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

(*End definition for* `pinyinscope`. *This function is documented on page* 2.)

\xpinyin

```
\NewDocumentCommand \xpinyin { s O { } m }
  {
    \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_quit_vmode:
      \__xpinyin_single_aux:nn {#3}
    }
}
```

(*End definition for* `\xpinyin`. *This function is documented on page 2.*)

`\l__xpinyin_enable_bool`

```
\bool_new:N \l__xpinyin_enable_bool
```

(*End definition for* `\l__xpinyin_enable_bool`.)

`\__xpinyin_CJKglue:`

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

(*End definition for* `\__xpinyin_CJKglue:`.)

`\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
      }
  }
```

(*End definition for* `\enablepinyin`. *This function is documented on page 3.*)

`\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
      }
  }
```

(*End definition for* `\disablepinyin`. *This function is documented on page 3.*)

`__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 } }
  }
```

(*End definition for* `\__xpinyin_restore_footnote:`.)

`\l__xpinyin_restore_footnote_tl`

```
\tl_new:N \l__xpinyin_restore_footnote_tl
\tl_set:Nn \l__xpinyin_restore_footnote_tl
  {
    \int_compare:nNnT \etex_currentgrouptype:D = \c_eleven
      { \disablepinyin }
  }
```

(*End definition for* `\l__xpinyin_restore_footnote_tl`.)

`\l__xpinyin_CJKglue_dim`

```
\dim_new:N \l__xpinyin_CJKglue_dim
```

(*End definition for* `\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}
  }
```

(*End definition for* __xpinyin_single_aux:nn.)

__xpinyin_replace_CJKsymbol_aux:

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

(*End definition for* __xpinyin_replace_CJKsymbol_aux:.)

__xpinyin_restore_CJKsymbol_aux:

```
\cs_new_protected_nopar:Npn \__xpinyin_restore_CJKsymbol_aux:
  { \cs_set_eq:NN \CJKsymbol \__xpinyin_save_CJKsymbol:n }
```

(*End definition for* __xpinyin_restore_CJKsymbol_aux:.)

__xpinyin_select_font_xetex:

```
\cs_new_protected_nopar:Npn \__xpinyin_select_font_xetex:
  {
    \cs_if_exist_use:cF { \l__xpinyin_coor_tl }
      {
        \tl_set:Nx \l__xpinyin_current_coor_tl { \l__xpinyin_coor_tl }
        \__xpinyin_select_font_aux:
        \int_compare:nNnF { \xetex_fonttype:D \tex_font:D } = \c_zero
          {
            \exp_last_unbraced:NNV
            \cs_gset_eq:cN \l__xpinyin_current_coor_tl \tex_font:D
          }
      }
  }
```

(*End definition for* __xpinyin_select_font_xetex:.)

__xpinyin_select_font_aux:

```
\cs_new_protected_nopar:Npn \__xpinyin_select_font_aux:
  {
    \fontsize
      { \l__xpinyin_ratio_tl \etex_dimexpr:D \f@size pt \scan_stop: }
      { \f@baselineskip }
    \normalfont
    \l__xpinyin_font_tl
    \selectfont
  }
```

(*End definition for* __xpinyin_select_font_aux:.)

__xpinyin_to_unicode_xetex:n

```
\cs_new_nopar:Npn \__xpinyin_to_unicode_xetex:n #1
  { \int_to_arabic:n { `#1 } }
```

(*End definition for* __xpinyin_to_unicode_xetex:n.)

__xpinyin_UTF_to_unicode:n
__xpinyin_UTFchar_to_unicode:n

```
\cs_new_nopar:Npn \__xpinyin_UTF_to_unicode:n #1
  {
    \int_to_arabic:n
      { \exp_args:No \int_from_hex:n { \CJK@plane } * "100 + #1 }
  }
\cs_new_nopar:Npn \__xpinyin_UTFchar_to_unicode:n #1
  { \int_to_arabic:n { \__xpinyin_UTF_viii_to_unicode:NNNw #1 \q_stop } }
```

```
\cs_new_nopar:Npn \__xpinyin_UTF_viii_to_unicode:NNNw #1#2#3#4 \q_stop
  {
    \tl_if_empty:nTF {#4}
      { ( `#1 - "E0 ) * "1000 + ( `#2 - "80 ) * "40 + ( `#3 - "80 ) }
     { ( `#1 - "F0 ) * "4000 + ( `#2 - "80 ) * "1000 + ( `#3 - "80 ) * "40 + ( `#4 - "80 ) }
  }
```

(*End definition for* `\__xpinyin_UTF_to_unicode:n` *and* `\__xpinyin_UTFchar_to_unicode:n`.)

`\__xpinyin_GBK_to_unicode:n`
`\__xpinyin_GBKchar_to_unicode:n`

```
\cs_new_nopar:Npn \__xpinyin_GBK_to_unicode:n #1
  { \int_to_arabic:n { " \CJKtu_sfd_map:nn { \CJK@plane } {#1} } }
\cs_new_nopar:Npn \__xpinyin_GBKchar_to_unicode:n #1
  { \int_to_arabic:n { " \CJKchartouni {#1} } }
```

(*End definition for* `\__xpinyin_GBK_to_unicode:n` *and* `\__xpinyin_GBKchar_to_unicode:n`.)

`\__xpinyin_adjust_xeCJK_hook:`

```
\cs_new_protected_nopar:Npn \__xpinyin_adjust_xeCJK_hook:
  {
    \cs_new_eq:NN \__xpinyin_select_font:       \__xpinyin_select_font_xetex:
    \cs_new_eq:NN \__xpinyin_to_unicode:n       \__xpinyin_to_unicode_xetex:n
    \cs_new_eq:NN \__xpinyin_char_to_unicode:n  \__xpinyin_to_unicode:n
    \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
    \tl_if_exist:NTF \l_xeCJK_current_font_tl
      {
        \tl_set:Nn \l__xpinyin_coor_tl
          {
            ( \tl_to_str:N \l__xpinyin_font_tl ) /
            \l_xeCJK_current_font_tl/\l__xpinyin_ratio_tl
          }
      }
      {
        \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 }
      }
  }
```

(*End definition for* `\__xpinyin_adjust_xeCJK_hook:`.)

`\__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:     \__xpinyin_quit_vmode:
    \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:
            } { }
        }
    }
```

(*End definition for* `\__xpinyin_adjust_CJK_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 } }
          }
      }
  }
```

(*End definition for* `\__xpinyin_adjust_CJKpunct_hook:`.)

`\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:
  }
```

(*End definition for* `\pinyin`. *This function is documented on page* 2.)

`\__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
  }
```

(*End definition for* `\__xpinyin_pinyin:n`.)

__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
  }
```

(*End definition for* __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 }
```

(*End definition for* __xpinyin_tone:Nn.)

__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} }
  }
```

(*End definition for* __xpinyin_replace_v:n.)

__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
  }
```

(*End definition for* __xpinyin_pinyin_init:.)

__xpinyin_if_number:nTF

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

(*End definition for* __xpinyin_if_number:nTF.)

\l__xpinyin_first_bool

```
\bool_new:N \l__xpinyin_first_bool
```

(*End definition for* \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 }
```

(*End definition for* `\c__xpinyin_a_tl` *and others.*)

```
\__xpinyin_num_to_tone:Nn
```

```
\cs_new_protected_nopar:Npn \__xpinyin_num_to_tone:Nn #1#2
  {
    \if_case:w \int_eval:n { #2 - \c_one } \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 - \c_one } \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 - \c_one } \exp_stop_f:
          ǖ  \or: ǘ  \or: ǚ  \or: ǜ \else: ü \fi:
      }
      { \__xpinyin_num_to_tone:Nn u {#2} }
  }
```

(*End definition for* `\__xpinyin_num_to_tone:Nn`.)

```
\xpinyinsetup
```

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

(*End definition for* `\xpinyinsetup`. *This function is documented on page 2.*)

```
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 ,
  }
```

(*End definition for* `ratio` *and others. These functions are documented on page 2.*)

```
\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} }
```

(*End definition for* `\xpinyin_customary:nnn` *and* `\xpinyin_multiple:nnn`.)

```
\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} }
  }
```

(*End definition for* `\setpinyin`. *This function is documented on page 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
%%    $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
```

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

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

```
603     local source = xpinyin.database.source
604     local zfilename = source:match("[^/]+$")
605     local zfile = zip_open(zfilename)
606     if not zfile then
607       xpinyin.download(source, zfilename)
608       zfile = assert(zip_open(zfilename))
609     end
610     f = assert(zfile:open(xpinyin.database.file))
611     zfile:close()
612   end
613   local s, prop
614   for line in f:lines() do
615     s = line:explode("\t")
616     if #s == 3 then
617       prop = s[2]:sub(2)
618       if prop == "Mandarin" or
619          prop == "HanyuPinyin" or
620          prop == "XHC1983" or
621          prop == "HanyuPinlu" then
622         xpinyin.insert(s[1], prop, s[3])
623       end
624     elseif line:find("Date") then
625       xpinyin.database.date = line:match("^[#%s]*(.*)")
626     elseif line:find("Unicode version:") then
627       xpinyin.database.version = line:match("^[#%s]*(.*)")
628     end
629   end
630   f:close()
631   if xpinyin.fixreadings then
632     for _, s in pairs(xpinyin.fixreadings) do
633       xpinyin.insert(s[1], s[2], s[3])
634     end
635   end
636 end
```

下载 Unihan.zip。

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

往拼音表中加入项目。

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

```
      mt[#mt + 1] = "\\XPYUM{" .. hanzi .. "}{" .. index .. "}{" .. pinyin ..."}"
    end
  end
  f:write(table.concat(mt, "\n"), "\n")
  f:close()
end
```

将表按照索引排序，代码来源于 *Programming in Lua*。

```
function xpinyin.pairsByKeys (t, f)
  local a = { }
  for n in pairs(t) do a[#a + 1] = n end
  table.sort(a, f)
  local i = 0 -- iterator variable
  return function () -- iterator function
    i = i + 1
    return a[i], t[a[i]]
  end
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。

```
function xpinyin.grep (pyt)
  if pyt.Mandarin then
    return pyt.Mandarin:match("%S+"), "Mandarin"
  elseif pyt.XHC1983 then
    return pyt.XHC1983:match(":(%S+)"), "XHC1983"
  elseif pyt.HanyuPinyin then
    return pyt.HanyuPinyin:match(":([^,%s]+)"), "HanyuPinyin"
  end
end
```

根据 XHC1983 和 HanyuPinyin 选出多音字。

```
function xpinyin.multiple (pyt)
  if pyt.XHC1983 then
    local s = pyt.XHC1983:explode()
    if s[2] then
      local t = { }
      for i, v in ipairs(s) do
        t[#t + 1] = v:explode(":")[2]
      end
      return xpinyin.unique(t), "XHC1983"
    end
  elseif pyt.HanyuPinyin and pyt.HanyuPinyin:find("%D,") then
    local t = { }
    for _, v in ipairs(pyt.HanyuPinyin:explode()) do
      for _, py in ipairs(v:explode(":")[2]:explode(",")) do
        t[#t + 1] = py
      end
    end
    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
```

```
724   end
725   return nt
726 end
727 xpinyin.maketable()
728 xpinyin.output()
729 ⟨/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。

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\' 503
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