

# xpinyin 宏包

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## 1 简介

xpinyin 是一个  $\LaTeX$  宏包, 提供了为汉字自动注音的功能。

## 2 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  $\pdf\LaTeX$  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  $X_{\LaTeX}$ , 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  $\pdf\LaTeX$  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。

$X_{\LaTeX}$  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。

## 3 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 huāng táng xì àn zé shēn yǒu qù wèi dài zài xià jiāng cǐ lái lì zhù míng fāng shǐ  
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  
yuè zhè liǎo rán bù huò  
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 `pinyin` 环境的命令形式。`\xpinyin` 可以在 `pinyin` 环境和 `\xpinyin*` 中使用。例如,

长  
甄士隐梦幻识通灵  
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,

lú 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<sup>1</sup>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

`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}}}
```

<sup>1</sup><http://www.unicode.org/Public/UNIDATA/UniHan.zip>

---

footnote footnote =  $\langle true|false \rangle$

---

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`

`\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。

---

New: 2014/01/12

## 4 代码实现

```
1 (*package)
2 (@@=xpinyin)
3 \msg_new:nnn { xpinyin } { no-LuaTeX }
4 {
5   The~xpinyin~package~is~not~supported~in~LuaTeX.\\
6   You~must~change~your~typesetting~engine~to\\
7   "xelatex"~or~"pdflatex"~or~"latex"~instead~of~"lualatex".
8 }
9 \luatex_if_engine:T { \msg_critical:nn { xpinyin } { no-LuaTeX } }
10 \RequirePackage { xparse }
11 \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。

```
12 \prop_new:N \c__xpinyin_tone_prop
13 \clist_map_inline:nn
14 {
15   { ā }{ \@tabacckludge= a } ,           { á }{ \@tabacckludge' a } ,
16   { ä }{ \@tabacckludge= v a } ,         { à }{ \@tabacckludge` a } ,
17   { õ }{ \@tabacckludge= o } ,           { ó }{ \@tabacckludge' o } ,
18   { ö }{ \@tabacckludge= v o } ,         { ò }{ \@tabacckludge` o } ,
19   { ē }{ \@tabacckludge= e } ,           { é }{ \@tabacckludge' e } ,
20   { ë }{ \@tabacckludge= v e } ,         { è }{ \@tabacckludge` e } ,
21   { ū }{ \@tabacckludge= u } ,           { ú }{ \@tabacckludge' u } ,
22   { ů }{ \@tabacckludge= v u } ,         { ù }{ \@tabacckludge` u } ,
23   { ṁ }{ \@tabacckludge' m } ,           { ṅ }{ \@tabacckludge' n } ,
24   { ṅ }{ \@tabacckludge' n } ,           { ṇ }{ \@tabacckludge` n } ,
25   { ī }{ \@tabacckludge= { \i } } ,       { í }{ \@tabacckludge' { \i } } ,
26   { ï }{ \@tabacckludge= { \i } } ,       { ì }{ \@tabacckludge` { \i } } ,
27   { ü }{ \@tabacckludge= { \" u } } ,     { ú }{ \@tabacckludge' { \" u } } ,
28   { ũ }{ \@tabacckludge= { \" u } } ,     { ù }{ \@tabacckludge` { \" u } } ,
29   { ü }{ \@tabacckludge= { \" u } } ,     { ü }{ \@tabacckludge` { \" u } } ,
30 }
31 { \prop_gput:Nnn \c__xpinyin_tone_prop #1 }
```

(End definition for `\c__xpinyin_tone_prop`.)

`\__xpinyin_UTF_char:nn`

```
32 \cs_new_protected_nopar:Npn \__xpinyin_UTF_char:nn #1#2
33 {
34   \cs_if_exist:cF { u8:#1 }
35   { \tl_const:cn { u8:#1 } {#2} }
36 }
```

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

`\__xpinyin_GBK_char:nn`

```
37 \cs_new_protected_nopar:Npn \__xpinyin_GBK_char:nn #1#2
38 {
39   \__xpinyin_UTF_char:nn {#1} {#2}
40   \exp_args:Nx \__xpinyin_GBK_char_aux:nn { \tl_head:n {#1} } {#1}
41 }
42 \cs_new_protected_nopar:Npn \__xpinyin_GBK_char_aux:nn #1#2
43 { \exp_args:Nf \__xpinyin_GBK_char_aux:nnn { \int_eval:n { `#1 } } {#1} {#2} }
44 \cs_new_protected_nopar:Npn \__xpinyin_GBK_char_aux:nnn #1#2#3
```

```

45 {
46   \cs_if_exist:cF { __xpinyin_UTF_ #1 :w }
47   {
48     \exp_args:Nf \__xpinyin_GBK_char_def:nnn
49     {
50       \int_case:nn { \tl_count:n {#3} }
51       {
52         { \c_two } { ##1 }
53         { \c_three } { ##1##2 }
54         { \c_four } { ##1##2##3 }
55       }
56     }
57     {#1} {#2}
58     \exp_args:Nc \__xpinyin_save_UTF_cs:Nn { __xpinyin_UTF_ #1 :w } {#1}
59     \tl_gput_right:Nx \c__xpinyin_reset_UTF_catcode_tl
60     { \char_set_catcode:nn {#1} { \char_value_catcode:n {#1} } }
61     \char_set_catcode_active:n {#1}
62   }
63 }
64 \cs_new_protected_nopar:Npn \__xpinyin_GBK_char_def:nnn #1#2#3
65 {
66   \cs_new_protected_nopar:cpn { __xpinyin_UTF_ #2 :w } #1
67   { \use:c { u8: \tl_to_str:n { #3#1 } } }
68 }
69 \tl_new:N \c__xpinyin_reset_UTF_catcode_tl

```

(End definition for \\_\_xpinyin\_GBK\_char:nn.)

\\_\_xpinyin\_save\_UTF\_cs:Nn

```

70 \group_begin:
71 \char_set_catcode_active:n { 126 }
72 \cs_new_protected_nopar:Npn \__xpinyin_save_UTF_cs:Nn #1#2
73 {
74   \group_begin:
75   \char_set_lccode:nn { 126 } {#2}
76   \tex_lowercase:D
77   {
78     \group_end:
79     \tl_gput_right:Nn \c__xpinyin_reset_UTF_cs_tl { \cs_set_eq:NN ~ #1 }
80   }
81 }
82 \group_end:
83 \tl_new:N \c__xpinyin_reset_UTF_cs_tl

```

(End definition for \\_\_xpinyin\_save\_UTF\_cs:Nn.)

```

84 \bool_new:N \g__xpinyin_GBK_bool
85 \@ifpackageloaded { xeCJK }
86 { \AtEndOfPackage { \__xpinyin_adjust_xeCJK_hook: } }
87 {
88   \@ifpackageloaded { CJKutf8 }
89   {
90     \prop_map_function:NN \c__xpinyin_tone_prop \__xpinyin_UTF_char:nn
91     \AtEndOfPackage { \__xpinyin_adjust_CJK_hook: }
92   }
93   {
94     \@ifpackageloaded { CJK }
95     {
96       \RequirePackage { xCJK2uni }
97       \prop_map_function:NN \c__xpinyin_tone_prop \__xpinyin_GBK_char:nn
98       \AtEndOfPackage
99       {
100         \tl_put_right:Nn \l__xpinyin_pinyin_box_hook_tl
101         { \c__xpinyin_reset_UTF_cs_tl }
102         \__xpinyin_adjust_CJK_hook:
103         \tl_use:N \c__xpinyin_reset_UTF_catcode_tl
104       }
105       \bool_gset_true:N \g__xpinyin_GBK_bool
106     }
107   }

```

```

108     \xetex_if_engine:TF
109     {
110         \RequirePackage { xeCJK }
111         \AtEndOfPackage { \__xpinyin_adjust_xeCJK_hook: }
112     }
113     {
114         \RequirePackage { CJKutf8 }
115         \prop_map_function:NN \c__xpinyin_tone_prop \__xpinyin_UTF_char:nn
116         \AtEndOfPackage { \__xpinyin_adjust_CJK_hook: }
117     }
118 }
119 }
120 }

```

\l\_\_xpinyin\_tmpa\_box

\l\_\_xpinyin\_tmpb\_box

```

121 \box_new:N \l__xpinyin_tmpa_box
122 \box_new:N \l__xpinyin_tmpb_box

```

(End definition for \l\_\_xpinyin\_tmpa\_box and \l\_\_xpinyin\_tmpb\_box.)

\\_\_xpinyin\_width:Nn

```

123 \cs_new_protected:Npn \__xpinyin_width:Nn #1#2
124 {
125     \hbox_set:Nn \l__xpinyin_tmpa_box {#2}
126     #1 = \box_wd:N \l__xpinyin_tmpa_box
127 }

```

(End definition for \\_\_xpinyin\_width:Nn.)

\\_\_xpinyin\_leave\_vmode:

```

128 \cs_if_exist:NTF \quitvmode
129 { \cs_new_eq:NN \__xpinyin_quit_vmode: \quitvmode }
130 {
131     \cs_new_protected_nopar:Npn \__xpinyin_quit_vmode:
132     {
133         \if_mode_vertical:
134         \exp_after:wN \tex_indent:D
135         \fi:
136     }
137 }

```

(End definition for \\_\_xpinyin\_leave\_vmode:.)

\\_\_xpinyin\_make\_pinyin\_box:nnn

```

138 \cs_new_protected_nopar:Npn \__xpinyin_make_pinyin_box:nnn #1#2#3
139 {
140     \__xpinyin_leavevmode:
141     \hbox_overlap_right:n
142     {
143         \hbox_set:Nn \l__xpinyin_tmpa_box
144         { \__xpinyin_CJKsymbol_hook: \__xpinyin_save_CJKsymbol:n {#2} }
145         \hbox_set:Nn \l__xpinyin_tmpb_box
146         {
147             \color_group_begin: \color_ensure_current:
148             \l__xpinyin_pinyin_box_hook_tl
149             \__xpinyin_select_font:
150             \clist_if_exist:cTF { c__xpinyin_multiple_ #1_clist }
151             { \l__xpinyin_multiple_tl \l__xpinyin_format_tl }
152             { \l__xpinyin_format_tl }
153             {#3}
154             \color_group_end:
155         }
156         \dim_compare:nNnT
157         { \box_wd:N \l__xpinyin_tmpb_box } >
158         { \box_wd:N \l__xpinyin_tmpa_box + \l__xpinyin_CJKglue_dim }
159         {
160             \box_resize:Nnn \l__xpinyin_tmpb_box
161             { \box_wd:N \l__xpinyin_tmpa_box + \l__xpinyin_CJKglue_dim }
162             { \box_ht:N \l__xpinyin_tmpb_box + \box_dp:N \l__xpinyin_tmpb_box }

```

```

163     }
164     \box_move_up:nn { \l__xpinyin_vsep_tl }
165     {
166         \hbox_to_wd:nn { \box_wd:N \l__xpinyin_tmpa_box }
167         { \tex_hss:D \box_use_clear:N \l__xpinyin_tmpb_box \tex_hss:D }
168     }
169 }
170 }
171 \tl_new:N \l__xpinyin_pinyin_box_hook_tl
172 \pdfTeX_if_engine:T
173 {
174     \tl_put_right:Nn \l__xpinyin_pinyin_box_hook_tl
175     { \cs_set_eq:NN \CJK@plane \tex_undefined:D }
176 }
177 \cs_generate_variant:Nn \__xpinyin_make_pinyin_box:nnn { x }

```

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

`\__xpinyin_CJKsymbol:n`

```

178 \cs_new_protected_nopar:Npn \__xpinyin_CJKsymbol:n #1
179 { \__xpinyin_CJKsymbol:xn { \__xpinyin_to_unicode:n {#1} } {#1} }
180 \cs_new_protected_nopar:Npn \__xpinyin_CJKsymbol:nn #1#2
181 {
182     \__xpinyin_make_pinyin_box:nnn {#1} {#2} { \use:c { c__xpinyin_ #1 _tl } }
183     \__xpinyin_save_CJKsymbol:n {#2}
184 }
185 \cs_generate_variant:Nn \__xpinyin_CJKsymbol:nn { x }

```

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

**pinyinscope**

```

186 \NewDocumentEnvironment { pinyinscope } { 0 { } }
187 {
188     \keys_set:nn { xpinyin } {#1}
189     \enablepinyin
190 }
191 { }

```

(End definition for `pinyinscope`. This function is documented on page 1.)

**\xpinyin**

```

192 \NewDocumentCommand \xpinyin { s 0 { } m }
193 {
194     \IfBooleanTF {#1}
195     {
196         \group_begin:
197         \keys_set:nn { xpinyin } {#2}
198         \enablepinyin
199         #3
200         \group_end:
201     }
202     {
203         \group_begin:
204         \keys_set:nn { xpinyin } {#2}
205         \bool_if:NF \l__xpinyin_enable_bool
206         { \__xpinyin_width:Nn \l__xpinyin_CJKglue_dim { \CJKglue } }
207         \__xpinyin_quit_vmode:
208         \__xpinyin_single_aux:nn {#3}
209     }
210 }

```

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

`\l__xpinyin_enable_bool`

```

211 \bool_new:N \l__xpinyin_enable_bool

```

(End definition for `\l__xpinyin_enable_bool`.)

`\__xpinyin_CJKglue:`

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

*(End definition for \\_\_xpinyin\_CJKglue:.)*

`\enablepinyin`

```
214 \NewDocumentCommand \enablepinyin { }
215 {
216   \bool_if:NF \l__xpinyin_enable_bool
217   {
218     \tl_if_empty:NF \l__xpinyin_hsep_tl
219     {
220       \cs_set_eq:NN \__xpinyin_save_CJKglue: \CJKglue
221       \cs_set_eq:NN \CJKglue \__xpinyin_CJKglue:
222     }
223     \__xpinyin_width:Nn \l__xpinyin_CJKglue_dim { \CJKglue }
224     \__xpinyin_replace_CJKsymbol:
225     \__xpinyin_restore_footnote:
226     \bool_set_true:N \l__xpinyin_enable_bool
227   }
228 }
```

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

`\disablepinyin`

```
229 \NewDocumentCommand \disablepinyin { }
230 {
231   \bool_if:NT \l__xpinyin_enable_bool
232   {
233     \cs_if_eq:NNT \CJKglue \__xpinyin_CJKglue:
234     { \cs_set_eq:NN \CJKglue \__xpinyin_save_CJKglue: }
235     \__xpinyin_restore_CJKsymbol:
236     \bool_set_false:N \l__xpinyin_enable_bool
237   }
238 }
```

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

`\__xpinyin_restore_footnote:`

```
239 \cs_new_protected_nopar:Npn \__xpinyin_restore_footnote:
240 {
241   \bool_if:NF \l__xpinyin_footnote_bool
242   { \tl_put_left:Nn \@parboxrestore { \l__xpinyin_restore_footnote_tl } }
243 }
```

*(End definition for \\_\_xpinyin\_restore\_footnote:.)*

`\l__xpinyin_restore_footnote_tl`

```
244 \tl_new:N \l__xpinyin_restore_footnote_tl
245 \tl_set:Nn \l__xpinyin_restore_footnote_tl
246 {
247   \int_compare:nNnT \etex_currentgrouptype:D = \c_eleven
248   { \disablepinyin }
249 }
```

*(End definition for \l\_\_xpinyin\_restore\_footnote\_tl.)*

`\l__xpinyin_CJKglue_dim`

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

*(End definition for \l\_\_xpinyin\_CJKglue\_dim.)*

\\\_xpinyin\_single\_aux:nn

```
251 \cs_new_protected_nopar:Npn \\_xpinyin_single_aux:nn #1#2
252 {
253   \\_xpinyin_replace_CJKsymbol_single:n {#2}
254   #1
255   \group_end:
256 }
257 \cs_new_protected_nopar:Npn \\_xpinyin_replace_CJKsymbol_single_aux:n #1
258 {
259   \bool_if:NF \l__xpinyin_enable_bool { \\_xpinyin_replace_CJKsymbol: }
260   \cs_set_protected_nopar:Npn \CJKsymbol ##1
261     { \\_xpinyin_single_CJKsymbol:nn {##1} {#1} }
262 }
263 \cs_new_protected_nopar:Npn \\_xpinyin_single_CJKsymbol:nn #1#2
264 {
265   \\_xpinyin_make_pinyin_box:xnn
266   { \\_xpinyin_to_unicode:n {#1} } {#1} { \\_xpinyin_pinyin:n {#2} }
267   \\_xpinyin_save_CJKsymbol:n {#1}
268 }
```

(End definition for \\\_xpinyin\_single\_aux:nn.)

\\\_xpinyin\_replace\_CJKsymbol\_aux:

```
269 \cs_new_protected_nopar:Npn \\_xpinyin_replace_CJKsymbol_aux:
270 {
271   \cs_set_eq:NN \\_xpinyin_save_CJKsymbol:n \CJKsymbol
272   \cs_set_eq:NN \CJKsymbol \\_xpinyin_CJKsymbol:n
273 }
```

(End definition for \\\_xpinyin\_replace\_CJKsymbol\_aux:.)

\\\_xpinyin\_restore\_CJKsymbol\_aux:

```
274 \cs_new_protected_nopar:Npn \\_xpinyin_restore_CJKsymbol_aux:
275 { \cs_set_eq:NN \CJKsymbol \\_xpinyin_save_CJKsymbol:n }
```

(End definition for \\\_xpinyin\_restore\_CJKsymbol\_aux:.)

\\\_xpinyin\_select\_font\_xetex:

```
276 \cs_new_protected_nopar:Npn \\_xpinyin_select_font_xetex:
277 {
278   \cs_if_exist_use:cF { \l__xpinyin_coor_tl }
279   {
280     \tl_set:Nx \l__xpinyin_current_coor_tl { \l__xpinyin_coor_tl }
281     \\_xpinyin_select_font_aux:
282     \int_compare:nNnF { \XeTeXfonttype \tex_font:D } = \c_zero
283     {
284       \exp_last_unbraced:NNV
285       \cs_gset_eq:cN \l__xpinyin_current_coor_tl \tex_font:D
286     }
287   }
288 }
```

(End definition for \\\_xpinyin\_select\_font\_xetex:.)

\\\_xpinyin\_select\_font\_aux:

```
289 \cs_new_protected_nopar:Npn \\_xpinyin_select_font_aux:
290 {
291   \fontsize
292   { \l__xpinyin_ratio_tl \etex_dimexpr:D \f@size pt \scan_stop: }
293   { \f@baselineskip }
294   \normalfont
295   \l__xpinyin_font_tl
296   \selectfont
297 }
```

(End definition for \\\_xpinyin\_select\_font\_aux:.)



\\_xpinyin\_to\_unicode\_xetex:n

```
298 \cs_new_nopar:Npn \_xpinyin_to_unicode_xetex:n #1
299 { \int_to_arabic:n { `#1 } }
```

(End definition for \\_xpinyin\_to\_unicode\_xetex:n.)

\\_xpinyin\_UTF\_to\_unicode:n

\\_xpinyin\_UTFchar\_to\_unicode:n

```
300 \cs_new_nopar:Npn \_xpinyin_UTF_to_unicode:n #1
301 {
302   \int_to_arabic:n
303     { \exp_args:No \int_from_hex:n { \CJK@plane } * "100 + #1 }
304 }
305 \cs_new_nopar:Npn \_xpinyin_UTFchar_to_unicode:n #1
306 { \int_to_arabic:n { \_xpinyin_UTF_viii_to_unicode:NNW #1 \q_stop } }
307 \cs_new_nopar:Npn \_xpinyin_UTF_viii_to_unicode:NNW #1#2#3#4 \q_stop
308 {
309   \tl_if_empty:nTF {#4}
310     { ( `#1 - "E0 ) * "1000 + ( `#2 - "80 ) * "40 + ( `#3 - "80 ) }
311     { ( `#1 - "F0 ) * "4000 + ( `#2 - "80 ) * "1000 + ( `#3 - "80 ) * "40 + ( `#4 - "80 ) }
312 }
```

(End definition for \\_xpinyin\_UTF\_to\_unicode:n and \\_xpinyin\_UTFchar\_to\_unicode:n.)

\\_xpinyin\_GBK\_to\_unicode:n

\\_xpinyin\_GBKchar\_to\_unicode:n

```
313 \cs_new_nopar:Npn \_xpinyin_GBK_to_unicode:n #1
314 { \int_to_arabic:n { " \CJKtu_sfd_map:nn { \CJK@plane } {#1} } }
315 \cs_new_nopar:Npn \_xpinyin_GBKchar_to_unicode:n #1
316 { \int_to_arabic:n { " \CJKchartouni {#1} } }
```

(End definition for \\_xpinyin\_GBK\_to\_unicode:n and \\_xpinyin\_GBKchar\_to\_unicode:n.)

\\_xpinyin\_adjust\_xeCJK\_hook:

```
317 \cs_new_protected_nopar:Npn \_xpinyin_adjust_xeCJK_hook:
318 {
319   \cs_new_eq:NN \_xpinyin_select_font:      \_xpinyin_select_font_xetex:
320   \cs_new_eq:NN \_xpinyin_to_unicode:n      \_xpinyin_to_unicode_xetex:n
321   \cs_new_eq:NN \_xpinyin_char_to_unicode:n \_xpinyin_to_unicode:n
322   \cs_new_eq:NN \_xpinyin_restore_CJKsymbol: \_xpinyin_restore_CJKsymbol_aux:
323   \cs_new_eq:NN \_xpinyin_replace_CJKsymbol: \_xpinyin_replace_CJKsymbol_aux:
324   \cs_new_eq:NN \_xpinyin_replace_CJKsymbol_single:n
325     \_xpinyin_replace_CJKsymbol_single_aux:n
326   \tl_if_exist:NTF \l_xeCJK_current_font_tl
327   {
328     \tl_set:Nn \l__xpinyin_coor_tl
329     {
330       ( \tl_to_str:N \l__xpinyin_font_tl ) /
331       \l_xeCJK_current_font_tl/\l__xpinyin_ratio_tl
332     }
333   }
334   {
335     \tl_set:Nn \l__xpinyin_coor_tl
336     {
337       ( \tl_to_str:N \l__xpinyin_font_tl ) /
338       \xeCJK@family/\f@series/\f@shape/\f@size/\l__xpinyin_ratio_tl
339     }
340   }
341   \cs_new_eq:NN \_xpinyin_leavevmode: \prg_do_nothing:
342   \cs_new_protected_nopar:Npx \_xpinyin_CJKsymbol_hook:
343   {
344     \exp_not:N \makeXeCJKinactive
345     \cs_if_exist_use:NF \xeCJK_select_font:
346     { \exp_not:N \xeCJK@setfont }
347   }
348 }
```

(End definition for \\_xpinyin\_adjust\_xeCJK\_hook:.)

\\\_xpinyin\_adjust\_CJK\_hook:

```
349 \cs_new_protected_nopar:Npn \\_xpinyin_adjust_CJK_hook:
350 {
351   \bool_if:NTF \g__xpinyin_GBK_bool
352   {
353     \cs_new_eq:NN \\_xpinyin_to_unicode:n      \\_xpinyin_GBK_to_unicode:n
354     \cs_new_eq:NN \\_xpinyin_char_to_unicode:n \\_xpinyin_GBKchar_to_unicode:n
355   }
356   {
357     \cs_new_eq:NN \\_xpinyin_to_unicode:n      \\_xpinyin_UTF_to_unicode:n
358     \cs_new_eq:NN \\_xpinyin_char_to_unicode:n \\_xpinyin_UTFchar_to_unicode:n
359   }
360   \cs_new_eq:NN \\_xpinyin_select_font:      \\_xpinyin_select_font_aux:
361   \cs_new_eq:NN \\_xpinyin_leavevmode:      \\_xpinyin_quit_vmode:
362   \cs_new_eq:NN \\_xpinyin_CJKsymbol_hook: \prg_do_nothing:
363   \@ifpackageloaded { CJKpunct }
364   { \\_xpinyin_adjust_CJKpunct_hook: }
365   {
366     \cs_new_eq:NN \\_xpinyin_restore_CJKsymbol: \\_xpinyin_restore_CJKsymbol_aux:
367     \cs_new_eq:NN \\_xpinyin_replace_CJKsymbol: \\_xpinyin_replace_CJKsymbol_aux:
368     \cs_new_eq:NN \\_xpinyin_replace_CJKsymbol_single:n
369                 \\_xpinyin_replace_CJKsymbol_single_aux:n
370     \AtBeginDocument
371     {
372       \@ifpackageloaded { CJKpunct }
373       {
374         \cs_undefine:N \\_xpinyin_restore_CJKsymbol:
375         \cs_undefine:N \\_xpinyin_replace_CJKsymbol:
376         \cs_undefine:N \\_xpinyin_replace_CJKsymbol_single:n
377         \\_xpinyin_adjust_CJKpunct_hook:
378       } { }
379     }
380   }
381 }
```

(End definition for \\\_xpinyin\_adjust\_CJK\_hook:.)

\\\_xpinyin\_adjust\_CJKpunct\_hook:

```
382 \cs_new_protected_nopar:Npn \\_xpinyin_adjust_CJKpunct_hook:
383 {
384   \cs_new_protected_nopar:Npn \\_xpinyin_restore_CJKsymbol:
385   {
386     \int_compare:nNnTF { \CJKpunct@punctstyle } = { \CJKpunct@ps@plain }
387     { \\_xpinyin_restore_CJKsymbol_aux: }
388     { \cs_set_eq:NN \CJKKosymbol \\_xpinyin_save_CJKsymbol:n }
389   }
390   \cs_new_protected_nopar:Npn \\_xpinyin_replace_CJKsymbol:
391   {
392     \int_compare:nNnTF { \CJKpunct@punctstyle } = { \CJKpunct@ps@plain }
393     { \\_xpinyin_replace_CJKsymbol_aux: }
394     {
395       \cs_set_eq:NN \\_xpinyin_save_CJKsymbol:n \CJKKosymbol
396       \cs_set_eq:NN \CJKKosymbol \\_xpinyin_CJKsymbol:n
397     }
398   }
399   \cs_new_protected_nopar:Npn \\_xpinyin_replace_CJKsymbol_single:n ##1
400   {
401     \int_compare:nNnTF { \CJKpunct@punctstyle } = { \CJKpunct@ps@plain }
402     { \\_xpinyin_replace_CJKsymbol_single_aux:n { ##1 } }
403     {
404       \bool_if:NF \l__xpinyin_enable_bool
405       { \cs_set_eq:NN \\_xpinyin_save_CJKsymbol:n \CJKKosymbol }
406       \cs_set_protected_nopar:Npn \CJKKosymbol #####1
407       { \\_xpinyin_single_CJKsymbol:nn { #####1 } { ##1 } }
408     }
409   }
410 }
```

(End definition for \\\_xpinyin\_adjust\_CJKpunct\_hook:.)

## `\pinyin`

```
411 \NewDocumentCommand \pinyin { 0 { } m }
412 {
413   \group_begin:
414   \keys_set:nn { xpinyin } {#1}
415   \l__xpinyin_font_tl
416   \l__xpinyin_format_tl { }
417   \selectfont
418   \c__xpinyin_reset_UTF_cs_tl
419   \__xpinyin_pinyin:n {#2}
420   \group_end:
421 }
```

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

## `\__xpinyin_pinyin:n`

```
422 \cs_new_protected_nopar:Npn \__xpinyin_pinyin:n #1
423 {
424   \__xpinyin_pinyin_init:
425   \bool_set_true:N \l__xpinyin_first_bool
426   \tl_set:Nn \l__xpinyin_save_tl {#1}
427   \__xpinyin_pinyin_aux:n #1 \q_recursion_tail \q_recursion_stop
428 }
```

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

## `\__xpinyin_pinyin_aux:n`

```
429 \cs_new_protected_nopar:Npn \__xpinyin_pinyin_aux:n #1
430 {
431   \quark_if_recursion_tail_stop_do:nn {#1}
432   {
433     \bool_if:NTF \l__xpinyin_first_bool { \l__xpinyin_save_tl }
434     { \tl_if_empty:NF \l__xpinyin_item_tl { \l__xpinyin_pysep_tl \l__xpinyin_item_tl } }
435   }
436   \__xpinyin_if_number:nTF {#1}
437   {
438     \bool_if:NTF \l__xpinyin_first_bool
439     { \bool_set_false:N \l__xpinyin_first_bool }
440     { \l__xpinyin_pysep_tl }
441     \l__xpinyin_pre_tl
442     \__xpinyin_tone:Nn \l__xpinyin_tone_tl {#1}
443     \l__xpinyin_post_tl
444     \__xpinyin_pinyin_init:
445   }
446   {
447     \int_compare:nNnTF
448     { 0 \cs_if_exist_use:c { c__xpinyin_ \tl_to_str:N \l__xpinyin_tone_tl _tl } } >
449     { 0 \cs_if_exist_use:c { c__xpinyin_ \tl_to_str:n {#1} _tl } }
450     { \tl_put_right:Nn \l__xpinyin_post_tl {#1} }
451     {
452       \tl_set:Nn \l__xpinyin_tone_tl {#1}
453       \tl_set_eq:NN \l__xpinyin_pre_tl \l__xpinyin_item_tl
454       \tl_clear:N \l__xpinyin_post_tl
455     }
456     \tl_put_right:Nx \l__xpinyin_item_tl { \__xpinyin_replace_v:n {#1} }
457   }
458   \__xpinyin_pinyin_aux:n
459 }
```

(End definition for `\__xpinyin_pinyin_aux:n`.)

## `\__xpinyin_tone:Nn`

```
460 \cs_new_protected_nopar:Npn \__xpinyin_tone:Nn #1#2
461 { \use:c { __xpinyin_num_to_tone_ #1 :Nn } {#1} {#2} }
462 \cs_generate_variant:Nn \__xpinyin_tone:Nn { V }
```

(End definition for `\__xpinyin_tone:Nn`.)

\\_xpinyin\_replace\_v:n

```
463 \cs_new_nopar:Npn \_xpinyin_replace_v:n #1
464 {
465   \str_if_eq:nnTF {#1} { v }
466   {
467     \str_case:onTF { \l__xpinyin_item_tl }
468     { { l } { } { n } { } { L } { } { N } { } }
469     { \exp_not:n { ü } } { u }
470   }
471   { \exp_not:n {#1} }
472 }
```

(End definition for \\_xpinyin\_replace\_v:n.)

\\_xpinyin\_pinyin\_init:

```
473 \cs_new_nopar:Npn \_xpinyin_pinyin_init:
474 {
475   \tl_clear:N \l__xpinyin_pre_tl   \tl_clear:N \l__xpinyin_post_tl
476   \tl_clear:N \l__xpinyin_item_tl \tl_clear:N \l__xpinyin_tone_tl
477 }
```

(End definition for \\_xpinyin\_pinyin\_init:.)

\\_xpinyin\_if\_number:nTF

```
478 \prg_new_conditional:Npnn \_xpinyin_if_number:n #1 { TF }
479 {
480   \if_int_compare:w \c_one < 1 \tl_to_str:n {#1} \exp_stop_f:
481   \prg_return_true: \else: \prg_return_false: \fi:
482 }
```

(End definition for \\_xpinyin\_if\_number:nTF.)

\l\_\_xpinyin\_first\_bool

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

(End definition for \l\_\_xpinyin\_first\_bool.)

\c\_\_xpinyin\_a\_tl

```
\c__xpinyin_o_tl 484 \tl_const:Nn \c__xpinyin_a_tl { 3 }
\c__xpinyin_e_tl 485 \tl_const:Nn \c__xpinyin_o_tl { 2 }
\c__xpinyin_i_tl 486 \tl_const:Nn \c__xpinyin_e_tl { 2 }
\c__xpinyin_u_tl 487 \tl_const:Nn \c__xpinyin_i_tl { 1 }
\c__xpinyin_v_tl 488 \tl_const:Nn \c__xpinyin_u_tl { 1 }
\c__xpinyin_v_tl 489 \tl_const:Nn \c__xpinyin_v_tl { 1 }
```

(End definition for \c\_\_xpinyin\_a\_tl and others.)

\\_xpinyin\_num\_to\_tone:Nn

```
490 \cs_new_protected_nopar:Npn \_xpinyin_num_to_tone:Nn #1#2
491 {
492   \if_case:w \int_eval:n { #2 - \c_one } \exp_stop_f:
493   \= {#1} \or: \'{#1} \or: \v {#1} \or: \` {#1} \else: #1 \fi:
494 }
495 \tl_map_inline:nn { a o e u }
496 { \cs_new_eq:cN { __xpinyin_num_to_tone_ #1 :Nn } \_xpinyin_num_to_tone:Nn }
497 \cs_new_nopar:Npn \_xpinyin_num_to_tone_i:Nn #1#2
498 {
499   \if_case:w \int_eval:n { #2 - \c_one } \exp_stop_f:
500   ī \or: í \or: ï \or: i \else: i \fi:
501 }
502 \cs_new_protected_nopar:Npn \_xpinyin_num_to_tone_v:Nn #1#2
503 {
504   \str_case:onTF { \l__xpinyin_pre_tl }
505   { { l } { } { n } { } { L } { } { N } { } }
506   {
507     \if_case:w \int_eval:n { #2 - \c_one } \exp_stop_f:
508     ū \or: ú \or: ũ \or: ù \else: ü \fi:
509   }
510   { \_xpinyin_num_to_tone:Nn u {#2} }
511 }
```

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

## `\xpinyinsetup`

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

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

```
ratio
vsep 513 \clist_map_inline:nn
hsep 514 { ratio , vsep , hsep , pysep , font , format , multiple }
pysep 515 { \keys_define:nn { xpinyin } { #1 .tl_set:c = { l__xpinyin_ #1 _tl } } }
font 516 \keys_define:nn { xpinyin }
format 517 { footnote .bool_set:N = \l__xpinyin_footnote_bool }
multiple 518 \keys_set:nn { xpinyin }
footnote 519 {
520     ratio    = .4 ,
521     vsep     = 1 em ,
522     pysep    = \c_space_tl ,
523     font     = \normalfont ,
524 }
```

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

## `\xpinyin_customary:nnn`

### `\xpinyin_multiple:nnn`

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

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

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

## `\setpinyin`

```
534 \NewDocumentCommand \setpinyin { m m }
535   {
536     \tl_set:cn
537       { c__xpinyin_ \__xpinyin_char_to_unicode:n {#1} _tl }
538       { \__xpinyin_pinyin:n {#2} }
539   }
```

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

```
540 \ProcessKeysOptions { xpinyin }
```

```
541 </package>
```

## 5 xpinyin.lua

```
542 <lua>
543 xpinyin      = xpinyin or { }
544 local xpinyin = xpinyin
545
546     计算时区2。
545 xpinyin.tzoffset = "+0000"
546 do
547   -- Compute the difference in seconds between local time and UTC.
548   local function get_timezone()
549     local now = os.time()
550     return os.difftime(now, os.time(os.date("!*t", now)))
551   end
552   -- Return a timezone string in ISO 8601:2000 standard form (+hhmm or -hhmm)
553   local function get_tzoffset(timezone)
554     local h, m = math.modf(timezone / 3600)
```

<sup>2</sup><http://lua-users.org/wiki/TimeZone>

```

555     return string.format("%+.4d", 100 * h + 60 * m)
556 end
557 xpinyin.tzoffset = get_tzoffset(get_timezone())
558 end
559 xpinyin = {
560     svnid    = "$Id: xpinyin.dtx 749 2014-12-24 15:05:15Z sobenlee@gmail.com $",
561     uchar   = unicode.utf8.char,
562     readings = { },
563     fixreadings = {
为汉字“〇”增加拼音。
564         {"U+3007", "Mandarin", "líng"}
565     },
566     database = {
567         source = "http://www.unicode.org/Public/UNIDATA/Unihan.zip",
568         file   = "Unihan_Readings.txt",
569         date   = "Date: 2014-05-09 18:17:02 GMT [JHJ]",
570         version = "Unicode version: 7.0.0",
571         dbfile = "xpinyin.db"
572     },

```

DocStrip 会将一行开头的 %% 替换成 \MetaPrefix, 因此我们在行首加了空格, 需要把它去掉。

```

573 preamble = string.gsub([[
574     %%
575     %% Do not edit this file!
576     %% Created from Unihan database:
577     %%
578     %% $file
579     %% $date
580     %% $version
581     %%
582     %% by "texlua xpinyin.lua" on ]]
583     .. os.date("%Y-%m-%d %X ") .. xpinyin.tzoffset
584     .. "\n%", "[ ]+(%%%%)", "%1")
585 ]]
```

将 Unihan\_Readings.txt<sup>3</sup> 保存到一张表里面。

```

586 function xpinyin.maketable (txt)
587     local f = io.open(txt or xpinyin.database.file, "r")
588     if not f then
589         local source = xpinyin.database.source
590         local zfilename = source:match("[^/]+$")
591         local zfile = zip.open(zfilename)
592         if not zfile then
593             xpinyin.download(source, zfilename)
594             zfile = assert(zip.open(zfilename))
595         end
596         f = assert(zfile:open(xpinyin.database.file))
597         zfile:close()
598     end
599     local s, prop
600     for line in f:lines() do
601         s = line:explode("\t")
602         if #s == 3 then
603             prop = s[2]:sub(2)
604             if prop == "Mandarin" or
605                prop == "HanyuPinyin" or
606                prop == "XHC1983" or
607                prop == "HanyuPinlu" then
608                 xpinyin.insert(s[1], prop, s[3])
609             end
610         elseif line:find("Date") then
611             xpinyin.database.date = line:match("^[#%s]*(.*)")
612         elseif line:find("Unicode version:") then
613             xpinyin.database.version = line:match("^[#%s]*(.*)")
614         end
615     end
616     f:close()

```

<sup>3</sup><http://http://www.unicode.org/reports/tr38/>.

```

617 if xpinyin.fixreadings then
618     for _, s in pairs(xpinyin.fixreadings) do
619         xpinyin.insert(s[1], s[2], s[3])
620     end
621 end
622 end

```

下载 Unihan.zip。

```

623 function xpinyin.download (source, zip)
624     print("\nRetrieving Unihan Database from\n", source)
625     local unihan_data = assert(socket.http.request(source), "download failed")
626     local f = assert(io.open(zip, "wb"), "Unihan file (" .. zip .. ") not writable")
627     f:write(unihan_data)
628     f:close()
629 end

```

往拼音表中加入项目。

```

630 function xpinyin.insert (unicode, prop, value)
631     local index = tonumber(unicode:match("%x+$"), 16)
632     if not xpinyin.readings[index] then
633         xpinyin.readings[index] = { }
634     end
635     xpinyin.readings[index][prop] = value
636 end

```

输出需要的格式文件。

```

637 function xpinyin.output (db)
638     local f = assert(io.open(db or xpinyin.database.dbfile, "w"))
639     local preamble = xpinyin.preamble:gsub("%$(%w+)", xpinyin.database)
640     f:write(preamble, "\n")
641     local hanzi, pinyin
642     local mt = { }
643     for index, pyt in xpinyin.pairsByKeys(xpinyin.readings) do
644         pinyin = assert(xpinyin.grep(pyt))
645         hanzi = xpinyin.uchar(index)
646         f:write("\XPYU{" .. hanzi, "}{" .. index, "}{" .. pinyin, "}\n")
647         pinyin = xpinyin.multiple(pyt)
648         if pinyin then
649             mt[#mt + 1] = "\XPYUM{" .. hanzi .. "}{" .. index .. "}{" .. pinyin .."}"
650         end
651     end
652     f:write(table.concat(mt, "\n"), "\n")
653     f:close()
654 end

```

将表按照索引排序,代码来源于 *Programming in Lua*。

```

655 function xpinyin.pairsByKeys (t, f)
656     local a = { }
657     for n in pairs(t) do a[#a + 1] = n end
658     table.sort(a, f)
659     local i = 0 -- iterator variable
660     return function () -- iterator function
661         i = i + 1
662         return a[i], t[a[i]]
663     end
664 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。

```

665 function xpinyin.grep (pyt)
666     if pyt.Mandarin then
667         return pyt.Mandarin:match("%S+"), "Mandarin"
668     elseif pyt.XHC1983 then
669         return pyt.XHC1983:match(":(%S+)"), "XHC1983"
670     elseif pyt.HanyuPinyin then
671         return pyt.HanyuPinyin:match(":([^,%s]+)"), "HanyuPinyin"
672     end
673 end

```

根据 XHC1983 和 HanyuPinyin 选出多音字。

```

674 function xpinyin.multiple (pyt)
675     if pyt.XHC1983 then

```

```

676     local s = pyt.XHC1983:explode()
677     if s[2] then
678         local t = { }
679         for i, v in ipairs(s) do
680             t[#t + 1] = v:explode(":")[2]
681         end
682         return xpinyin.unique(t), "XHC1983"
683     end
684     elseif pyt.HanyuPinyin and pyt.HanyuPinyin:find("%D,") then
685         local t = { }
686         for _, v in ipairs(pyt.HanyuPinyin:explode()) do
687             for _, py in ipairs(v:explode(":")[2]:explode(", ")) do
688                 t[#t + 1] = py
689             end
690         end
691         return xpinyin.unique(t), "HanyuPinyin"
692     end
693 end

    删除掉数组中的重复元素。
694 function xpinyin.unique (t)
695     local rt = xpinyin.remove_duplicate(t)
696     if #rt > 1 then
697         return table.concat(rt, ",")
698     end
699 end
700 function xpinyin.remove_duplicate (t)
701     local ht = { }
702     local nt = { }
703     for i, v in ipairs(t) do
704         if not ht[v] then
705             nt[#nt + 1] = v
706             ht[v] = true
707         end
708     end
709     return nt
710 end
711 xpinyin.maketable()
712 xpinyin.output()
713 </lua>

```



# 代码索引

斜体的数字表示对应项说明所在的页码,下划线的数字表示定义所在的代码行号,而直立的数字表示对应项使用时所在的行号。

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