

# xCJK2uni 宏包

李清

sobenlee@gmail.com

2019/04/07 v0.8\*

## 第 1 节 简介

xCJK2uni 是一个 L<sup>A</sup>T<sub>E</sub>X 宏包，提供了将 CJK 文字转换成 Unicode 的功能。以宏包形式实现 gbk2uni 程序的功能，使得使用 **CJK** 和 **hyperref** 宏包时，可以得到正确的书签。并提供了 /ToUnicode 映射文件，使得使用 GBK 等编码时，配合 **cmap** 宏包，用 pdfL<sup>A</sup>T<sub>E</sub>X 编译得到的 pdf 文件支持查找、复制和粘贴。

xCJK2uni 只适用于下一节说明的有效编码和以 pdfL<sup>A</sup>T<sub>E</sub>X 作为编译引擎的工作方式。

xCJK2uni 依赖 **I3kernel**。应该与 **CJK** 或 **CCT** 等配合使用，但 xCJK2uni 不会自动引入它们。

## 第 2 节 基本命令

---

\useCJKEncmap {<Bg5|Bg5+|GB|GBK|JIS|KS>}

设置当前的编码环境。以上是 xCJK2uni 支持的文字编码，缺省使用 GBK。xCJK2uni 会在 CJK 环境内自动更新支持的编码。

---

\CJKchartouni \* \CJKchartouni {<单个CJK文字>}

将文字转换成 16 进制形式的 Unicode。例如 \CJKchartouni{-} 将得到 4E00。将它展开两次就可以得到结果。

---

\CJKsfdtouni \* \CJKsfdtouni {<plane>} {<slot>}

<plane> 表示由 .sfd 文件定义的子字体的编号，<slot> 表示在子字体中的位置，这个命令将得到该坐标位置的 Unicode。将它展开两次就可以得到结果。如果在当前编码下，该坐标位置不合法，将展开为空。

## 第 3 节 代码实现

### 3.1 xCJK2uni

```
1 <*package>
2 <@@=CJKTu>
3 \msg_new:nnn { xCJK2uni } { 13-too-old }
4 {
5   Support~package~`expl3'~too~old. \\ \\
6   Please~update~an~up~to~date~version~of~the~bundles\\ \\
7   'l3kernel'~and~'l3packages'\\ \\
```

---

\* ctex-kit rev. 21b29fd.

```

8      using~your~TeX~package~manager~or~from~CTAN.
9    }
10 \ifpackagelater { expl3 } { 2019/03/05 } { }
11   { \msg_error:nn { xCJK2uni } { 13-too-old } }
12 \sys_if_engine_pdftex:F
13 {
14   \msg_new:nnn { xCJK2uni } { pdflatex }
15     { The~xCJK2uni~package~is~only~supported~in~pdfTeX. }
16   \msg_critical:nn { xCJK2uni } { pdflatex }
17 }

18 \tl_new:N \l__CJKtu_sfd_tl
19 \prop_new:N \c__CJKtu_sfd_prop
20 \seq_new:N \c__CJKtu_encoding_seq
21 \int_new:N \l__CJKtu_i_min_int
22 \int_new:N \l__CJKtu_i_max_int
23 \int_new:N \l__CJKtu_ii_min_int
24 \int_new:N \l__CJKtu_ii_max_int
25 \int_new:N \l__CJKtu_gap_begin_int
26 \int_new:N \l__CJKtu_gap_end_int
27 \int_new:N \l__CJKtu_plane_int
28 \int_set:Nn \l__CJKtu_i_max_int { "FE" }
29 \int_set:Nn \l__CJKtu_ii_max_int { "FE" }

\__CJKtu_set_enc:nnnnnn
30 \cs_new_protected_nopar:Npn \__CJKtu_set_enc:nnnnnn #1#2#3#4#5#6
31 {
32   \seq_gput_right:Nn \c__CJKtu_encoding_seq {#1}
33   \prop_gput:Nnn \c__CJKtu_sfd_prop {#1} {#2}
34   \int_const:cn { c__CJKtu_ #1 _i_min_int } {#3}
35   \int_const:cn { c__CJKtu_ #1 _ii_min_int } {#4}
36   \tl_if_empty:nTF {#5}
37   {
38     \int_const:cn { c__CJKtu_ #1 _gap_begin_int }
39       { \l__CJKtu_ii_max_int + 1 }
40     \int_const:cn { c__CJKtu_ #1 _gap_end_int }
41       { \use:c { c__CJKtu_ #1 _gap_begin_int } }
42     \int_const:cn { c__CJKtu_ #1 _plane_int }
43       { \l__CJKtu_ii_max_int - (#4) + 1 }
44   }
45   {
46     \int_const:cn { c__CJKtu_ #1 _gap_begin_int } { #5 + 1 }
47     \int_const:cn { c__CJKtu_ #1 _gap_end_int } {#6}
48     \int_const:cn { c__CJKtu_ #1 _plane_int }
49       { (#5) - (#4) + \l__CJKtu_ii_max_int - (#6) + 2 }
50   }
51   \cs_if_exist_use:NTF \CJKAaddEncHook
52   { {#1} { \__CJKtu_enc_map:nn {#1} {#2} } }
53   {
54     \AtBeginDocument
55     {
56       \cs_if_exist_use:NT \CJKAaddEncHook
57         { {#1} { \__CJKtu_enc_map:nn {#1} {#2} } }
58     }
59   }
60 }

\__CJKtu_enc_map:nn
61 \cs_new_protected_nopar:Npn \__CJKtu_enc_map:nn #1#2
62 {
63   \int_set_eq:Nc \l__CJKtu_i_min_int { c__CJKtu_ #1 _i_min_int }
64   \int_set_eq:Nc \l__CJKtu_ii_min_int { c__CJKtu_ #1 _ii_min_int }
65   \int_set_eq:Nc \l__CJKtu_gap_begin_int { c__CJKtu_ #1 _gap_begin_int }
66   \int_set_eq:Nc \l__CJKtu_gap_end_int { c__CJKtu_ #1 _gap_end_int }
67   \int_set_eq:Nc \l__CJKtu_plane_int { c__CJKtu_ #1 _plane_int }
68   \cs_if_exist:cF { CJKtu_ #1 _sfd_map:nn }
69     { \group_begin: \file_input:n { xCJK2uni-#2.def } \group_end: }
70   \cs_set_eq:Nc \CJKtu_sfd_map:nn { CJKtu_ #1 _sfd_map:nn }
71 }

\__CJKtu_use_enc_map:n
72 \cs_new_protected_nopar:Npn \__CJKtu_use_enc_map:n #1

```

```

73  {
74      \prop_get:NxNTF \c_CJKtu_sfd_prop {#1} \l_CJKtu_sfd_t1
75      { \l_CJKtu_enc_map:nn {#1} { \l_CJKtu_sfd_t1 } }
76      { \msg_error:nnx { xCJK2uni } { invalid-encoding } {#1} }
77  }
78 \msg_new:nnn { xCJK2uni } { invalid-encoding }
79  {
80      The~enconding~`#1'~is~invalid.\\
81      Only~\seq_use:Nnnn \c_CJKtu_encoding_seq { ~and~ } { ,~ } { ,~and~ } ~
82      are~supported.
83  }
84 \prg_generate_conditional_variant:Nnn \prop_get:NnN { Nx } { TF }

85 \l_CJKtu_set_enc:nnnnnn { GB } { UGB } { "A1" } { "A1" } { } { }
86 \l_CJKtu_set_enc:nnnnnn { JIS } { UJIS } { "A1" } { "A1" } { } { }
87 \l_CJKtu_set_enc:nnnnnn { KS } { UKS } { "A1" } { "A1" } { } { }
88 \l_CJKtu_set_enc:nnnnnn { Bg5 } { UBIG5 } { "A1" } { "40" } { "7E" } { "A1" }
89 \l_CJKtu_set_enc:nnnnnn { Bg5+ } { UBIG5plus } { "81" } { "40" } { "7E" } { "80" }
90 \l_CJKtu_set_enc:nnnnnn { GBK } { UGBK } { "81" } { "40" } { "7E" } { "80" }

\_l_CJKtu_sfd_to_unicode:nn
91 \cs_new_nopar:Npn \l_CJKtu_sfd_to_unicode:nn #1#2
92  {
93      \exp:w \exp_last_unbraced:Nf
94      \l_CJKtu_get_unicode:w \CJKtu_sfd_map:nn {#1} {#2} \exp_end:
95  }

\_l_CJKtu_get_unicode:w
96 \cs_new_nopar:Npn \l_CJKtu_get_unicode:w #1 \exp_end:
97  {
98      \tl_if_empty:nTF {#1}
99      { \exp_end: }
100     { \l_CJKtu_get_unicode_aux:w #1 \q_stop }
101  }
102 \cs_new_nopar:Npn \l_CJKtu_get_unicode_aux:w #1 \or: #2 \q_stop
103  { \or: #2 \exp_end: #1 }

\_l_CJKtu_char_to_unicode:n
104 \group_begin:
105 \char_set_catcode_active:n { "7F" }
106 \cs_new_nopar:Npn \l_CJKtu_char_to_unicode:n #1
107  {
108      \exp:w
109      \int_compare:nNnTF { \tl_count:n {#1} } = 2
110      { \CJKtu_byte>NN #1 }
111      {
112          \tl_if_head_eq_meaning:nNTF {#1} ^^7f
113          { \l_CJKtu_byte:wNnw #1 }
114          { \l_CJKtu_encoding_error: }
115      }
116  }
117 \cs_new_nopar:Npn \l_CJKtu_byte:wNnw ^^7f #1 ^^7f #2 ^^7f
118  { \CJKtu_byte_map:nn { `#1 } {#2} }
119 \cs_new_nopar:Npn \l_CJKtu_byte:Nnw #1 ^^7f #2 ^^7f
120  { \CJKtu_byte_map:nn { `#1 } {#2} }

\l_CJKtu_bookmarks_hook:
121 \cs_new_protected_nopar:Npn \l_CJKtu_bookmarks_hook:
122  {
123      \cs_set_eq:NN ^^7f \l_CJKtu_byte:Nnw
124      \cs_set_eq:NN \CJK@XX \l_CJKtu_byte>NN
125      \cs_set_eq:NN \CJKchar \l_CJKtu_byte:nn
126      \cs_set_eq:NN \CCTchar \l_CJKtu_byte:nn
127      \cs_set_eq:NN \CCTSetChar \l_CJKtu_CCT_byte>NNN
128      \cs_set_eq:NN \l_CJKtu_get_unicode:n \l_CJKtu_UTF_xvi_be:n
129  }
130 \group_end:

\l_CJKtu_byte>NN
131 \cs_new_nopar:Npn \l_CJKtu_byte>NN #1#2
132  { \CJKtu_byte:nn { `#1 } { `#2 } }
133 \cs_new_nopar:Npn \l_CJKtu_CCT_byte>NNN #1#2#3
134  { \CJKtu_byte:nn { `#1 } { `#3 } }

```

```

\__CJKtu_byte:wnn 135 \cs_new_nopar:Npn \__CJKtu_byte:wnn #1# { \CJKtu_byte:nn }

\__CJKtu_byte:nn 136 \cs_new_nopar:Npn \__CJKtu_byte:nn #1#2
137 {
138     \int_compare:nTF { \l__CJKtu_i_min_int <= #1 <= \l__CJKtu_i_max_int }
139     {
140         \int_compare:nTF { \l__CJKtu_ii_min_int <= #2 < \l__CJKtu_gap_begin_int }
141         {
142             \int_compare:nTF
143                 { \l__CJKtu_gap_end_int <= #2 <= \l__CJKtu_ii_max_int }
144                 {
145                     \__CJKtu_byte_map:nn {#1} {#2}
146                 }
147             }
148         }
149     { \__CJKtu_encoding_error: }
150 }
151 \cs_new_nopar:Npn \__CJKtu_encoding_error:
152 {
153     \msg_expandable_error:nn { xCJK2uni } { encoding-error }
154     \exp_end:
155 }
156 \msg_new:nnn { xCJK2uni } { encoding-error }
157 { Wrong~encoding~scheme. }

\__CJKtu_byte_map:nn 158 \cs_new_nopar:Npn \__CJKtu_byte_map:nn #1#2
159 {
160     \exp_args:Nf \__CJKtu_index_map:n
161     {
162         \int_eval:n
163         {
164             ( #1 - \l__CJKtu_i_min_int ) * \l__CJKtu_plane_int
165             + (#2) - \l__CJKtu_ii_min_int
166             \int_compare:nNnf {#2} < \l__CJKtu_gap_begin_int
167             { + \l__CJKtu_gap_begin_int - \l__CJKtu_gap_end_int }
168         }
169     }
170 }

\__CJKtu_index_map:n 171 \cs_new_nopar:Npn \__CJKtu_index_map:n #1
172 {
173     \__CJKtu_get_unicode:n
174     {
175         \__CJKtu_sfd_map:nn
176         {
177             \int_div_truncate:nn {#1} { 256 } + 1
178             { \int_mod:nn {#1} { 256 } }
179         }
180     }
181 }

\__CJKtu_get_unicode:n 180 \cs_new_nopar:Npn \__CJKtu_get_unicode:n #1
181 { \exp_last_unbraced:Nf \__CJKtu_get_unicode:w #1 \exp_end: }

\__CJKtu_UTF_xvi_be:n 182 \cs_new_nopar:Npn \__CJKtu_UTF_xvi_be:n #1
183 { \exp_args:Nf \__CJKtu_UTF_xvi_aux:n { \int_eval:n { "#1" } } }
184 \cs_new_nopar:Npn \__CJKtu_UTF_xvi_aux:n #1
185 {
186     \HyPsd@DecimalToOctalFirst
187     { \int_div_truncate:nn {#1} { 256 } }
188     \HyPsd@DecimalToOctalSecond
189     { \int_mod:nn {#1} { 256 } }
190 }

191 \cs_if_exist_use:NTF \hypersetup { { unicode , CJKbookmarks = false } }
192 { \PassOptionsToPackage { unicode , CJKbookmarks = false } { hyperref } }
193 \msg_new:nnn { xCJK2uni } { UTF-8-encoding }
194 { It~is~not~necessary~to~load~xCJK2uni~in~UTF-8~encoding. }
195 \tl_if_exist:NF \pdfstringdefPreHook { \tl_new:N \pdfstringdefPreHook }
196 @ifpackageloaded { CJKutf8 }

```

```

197 { \msg_warning:nn { xCJK2uni } { UTF-8-encoding } }
198 {
199   \cs_new_eq:NN \CJKTu@bookmarks@hook \CJKTu_bookmarks_hook:
200   \tl_gput_right:Nn \pdfstringdefPreHook { \CJKTu@bookmarks@hook }
201   \AtBeginDocument
202   {
203     \c_ifpackageloaded { CJKutf8 }
204     {
205       \cs_gset_eq:NN \CJKTu@bookmarks@hook \scan_stop:
206       \msg_warning:nn { xCJK2uni } { UTF-8-encoding }
207     }
208     { \cs_if_exist_use:NT \hypersetup { { CJKbookmarks = false } } }
209   }
210 }

\useCJKEncmap
\cjkchartouni
\cjktsfdtouni
\cjktsfdtouni

\_CJKTu_initial:N
214 \cs_new_protected_nopar:Npn \_CJKTu_initial:N #1
215 {
216   \tl_if_exist:NTF #1
217   {
218     \prop_get:NxNTF \c_CJKTu_sfd_prop {#1} \l_CJKTu_sfd_tl
219     { \_CJKTu_enc_map:nn {#1} { \_CJKTu_sfd_tl } }
220     { \_CJKTu_use_enc_map:n { GBK } }
221   }
222   { \_CJKTu_use_enc_map:n { GBK } }
223 }

224 \exp_args:Nc \_CJKTu_initial:N { CJK @ @ @ enc }
225 
```

## 3.2 xCJK2uni-make

```

226 <*make>
227 \msg_new:nnn { xCJK2uni } { file-not-found }
228 {
229   SFD file~#2'~for~encoding~#1'~not~found.\\
230   xCJK2uni~will~not~work!
231 }

232 \ior_new:N \g_CJKTu_sfd_ior
233 \str_new:N \g_CJKTu_path_str
234 \sys_if_engine_luatex:TF
235 {
236   \str_gset:Nx \g_CJKTu_path_str
237   {
238     \lua_now:e
239     {
240       kpse.set_program_name("kpsewhich") ~
241       local ~ sfd = kpse.find_file("UGBK.sfd", "subfont~definition~files") ~
242       if ~ sfd ~ then ~
243         tex.write(sfd) ~
244       end
245     }
246   }
247 }
248 {
249   \sys_shell_get:nnNTF { kpsewhich ~ UGBK.sfd } { } \l_tmpa_str
250   { \str_gset_eq:NN \g_CJKTu_path_str \l_tmpa_str }
251   { \msg_fatal:nnnn { xCJK2uni } { file-not-found } { GBK } { UGBK.sfd } }
252 }

253 \tl_if_blank:oTF { \g_CJKTu_path_str }
254 { \msg_fatal:nnnn { xCJK2uni } { file-not-found } { GBK } { UGBK.sfd } }
255 {
256   \exp_args:No \file_parse_full_name:nNNN { \g_CJKTu_path_str }
257   \l_tmpa_str \l_tmpb_str \l_tmpb_str
258   \str_gset_eq:NN \g_CJKTu_path_str \l_tmpa_str

```

```

259    }
260 \str_const:Nx \c__CJKtu_indent_str
261   { \c_catcode_other_space_tl \c_catcode_other_space_tl }
262 \iow_new:N \g__CJKtu_sfd_map_iow
263 \iow_new:N \g__CJKtu_sfd_cmap_iow
264 \seq_new:N \l__CJKtu_sfd_plane_seq
265 \seq_new:N \l__CJKtu_sfd_line_seq
266 \tl_new:N \l__CJKtu_sfd_plane_tl
267 \tl_new:N \l__CJKtu_cmap_block_tl
268 \int_new:N \l__CJKtu_sfd_index_int
\c__CJKtu_sfd_map_prop
269 \prop_const_from_keyval:Nn \c__CJKtu_sfd_map_prop
270   {
271     GB    = { 10 } { UGB } ,
272     JIS   = { 40 } { UJIS } ,
273     KS    = { 60 } { UKS } ,
274     Bg5   = { 00 } { UBig5 } ,
275     Bg5+  = { 09 } { UBg5plus } ,
276     GBK   = { 19 } { UGBK }
277   }

\_CJKTu_write_file:nnn
278 \cs_new_protected_nopar:Npn \_CJKTu_write_file:nnn #1#2#3
279   {
280     \group_begin:
281     \seq_put_right:No \l_file_search_path_seq { \g__CJKtu_path_str }
282     \ior_open:NnTF \g__CJKtu_sfd_ior { #3.sfd }
283     {
284       \group_end:
285       \seq_clear:N \l__CJKtu_sfd_plane_seq
286       \_CJKTu_write_sfd_map_header:n {#1}
287       \ior_str_map_inline:Nn \g__CJKtu_sfd_ior
288         { \str_if_eq:nnT {##1} { 00 ~ 0x0000_0x0OFF } { \ior_map_break: } }
289       \ior_str_map_inline:Nn \g__CJKtu_sfd_ior
290         {
291           \tl_if_blank:nTF {##1}
292             {
293               \ior_map_break:n
294                 {
295                   \_CJKTu_write_sfd_map_trailer:n {#1}
296                   \_CJKTu_write_cmap_file:n {#2}
297                 }
298             }
299             { \_CJKTu_read_sfd_line:nnn {##1} {#1} {#2} }
300         }
301       \iow_close:N \g__CJKtu_sfd_cmap_iow
302       \ior_close:N \g__CJKtu_sfd_ior
303       \seq_clear:N \l__CJKtu_sfd_plane_seq
304       \seq_clear:N \l__CJKtu_sfd_line_seq
305     }
306     {
307       \group_end:
308       \msg_critical:nnxx { xCJK2uni } { file-not-found } {#1} { #3.sfd }
309     }
310   }

\_CJKTu_read_sfd_line:n
311 \cs_new_protected_nopar:Npx \_CJKTu_read_sfd_line:nnn #1#2#3
312   {
313     \exp_not:N \_CJKTu_read_sfd_line:nwnn #1
314       \c_backslash_str \exp_not:N \q_nil \exp_not:N \q_stop {#2} {#3}
315   }
316 \use:x
317   {
318     \cs_new_protected_nopar:Npn \exp_not:N \_CJKTu_read_sfd_line:nwnn
319       ##1 0 \token_to_str:N x ##2 \c_backslash_str ##3 \exp_not:N \q_stop
320       ##4##5
321       {
322         \exp_not:N \_CJKTu_read_sfd_line:nnnn
323           {##1} { 0 \token_to_str:N x } {##2} {##4} {##5}

```

```

324         }
325     }
326 \cs_new_protected_nopar:Npn \__CJKTu_read_sfd_line:nnnn #1#2#3#4#5
327   {
328     \tl_if_blank:nF {#1}
329     {
330       \seq_if_empty:NF \l__CJKTu_sfd_plane_seq
331       {
332         \iow_now:Nx \g__CJKTu_sfd_map_iow
333         {
334           \c__CJKTu_indent_str \c__CJKTu_indent_str
335           \token_to_str:N \fi: \iow_newline:
336           \c__CJKTu_indent_str \c_right_brace_str
337         }
338         \__CJKTu_write_cmap_file:n {#5}
339       }
340       \__CJKTu_write_plane_map:nn {#1} {#4}
341       \tl_set:Nx \l__CJKTu_sfd_plane_tl { \tl_trim_spaces:n {#1} }
342     }
343     \seq_set_split:Nnn \l__CJKTu_sfd_line_seq {#2} {#3}
344     \seq_concat:NNN \l__CJKTu_sfd_plane_seq
345     \l__CJKTu_sfd_plane_seq \l__CJKTu_sfd_line_seq
346     \iow_now:Nx \g__CJKTu_sfd_map_iow
347     {
348       \c__CJKTu_indent_str \c__CJKTu_indent_str \c__CJKTu_indent_str
349       \seq_use:Nn \l__CJKTu_sfd_line_seq { ~ \or: } ~
350       \token_to_str:N \or:
351     }
352   }

\__CJKTu_write_plane_map:nn
353 \cs_new_protected_nopar:Npn \__CJKTu_write_plane_map:nn #1#2
354   {
355     \iow_now:Nx \g__CJKTu_sfd_map_iow
356     {
357       \cs_new_nopar:cpn { ~ \__CJKTu_ #2 _sfds_map_ \int_eval:n {#1} :n ~ } ~
358       \c_hash_str 1 \iow_newline:
359       \c__CJKTu_indent_str \c_left_brace_str \iow_newline:
360       \c__CJKTu_indent_str \c__CJKTu_indent_str
361       \exp_not:N \if_case:w \tex_numexpr:D
362         \c_hash_str 1 ~ \token_to_str:N \scan_stop:
363     }
364   }

\__CJKTu_write_cmap_file:n
365 \cs_new_protected_nopar:Npn \__CJKTu_write_cmap_file:n #1
366   {
367     \tl_clear:N \l__CJKTu_cmap_block_tl
368     \int_zero:N \l__CJKTu_sfd_index_int
369     \iow_open:Nn \g__CJKTu_sfd_cmap_iow { c #1 \l__CJKTu_sfd_plane_tl .cmap }
370     \__CJKTu_write_cmap_header:nn { C #1 } { \l__CJKTu_sfd_plane_tl }
371     \iow_now:Nx \g__CJKTu_sfd_cmap_iow
372     {
373       \iow_newline:
374       \begin{c��}{\iow_newline:}
375         \c__CJKTu_indent_str < 00 > ~
376         <
377           \int_to_Hex:n
378             { \seq_count:N \l__CJKTu_sfd_plane_seq - 1 }
379         > \iow_newline:
380         \end{c��}
381     }
382     \seq_map_function:NN \l__CJKTu_sfd_plane_seq \__CJKTu_write_cmap_body:n
383     \tl_if_empty:NF \l__CJKTu_cmap_block_tl
384     {
385       \iow_now:Nx \g__CJKTu_sfd_cmap_iow
386       {
387         \iow_newline:
388         \int_mod:nn { \l__CJKTu_sfd_index_int } { 100 } ~

```

```

389         beginbfchar \iow_newline:
390         \l_CJKtu_cmap_block_tl
391         endbfchar
392     }
393 }
394 \__CJKtu_write_cmap_trailer:
395 \seq_clear:N \l_CJKtu_sfd_plane_seq
396 }

\__CJKtu_write_cmap_body:n 397 \cs_new_protected_nopar:Npn \__CJKtu_write_cmap_body:n #1
398 {
399     \int_case:nnTF { \l_CJKtu_sfd_index_int }
400     { { 99 } { } { 199 } { } }
401     {
402         \iow_now:Nx \g_CJKtu_sfd_cmap_iow
403         {
404             \iow_newline:
405             100 ~ beginbfchar \iow_newline:
406             \l_CJKtu_cmap_block_tl
407             < \int_to_Hex:n { \l_CJKtu_sfd_index_int } > ~
408             <#1> \iow_newline:
409             endbfchar
410         }
411         \tl_clear:N \l_CJKtu_cmap_block_tl
412     }
413     {
414         \tl_put_right:Nx \l_CJKtu_cmap_block_tl
415         {
416             <
417                 \int_compare:nNnF \l_CJKtu_sfd_index_int > { 15 } { 0 }
418                 \int_to_Hex:n { \l_CJKtu_sfd_index_int }
419             > ~ <#1> \iow_newline:
420         }
421     }
422     \int_incr:N \l_CJKtu_sfd_index_int
423 }

\__CJKtu_write_sfd_map_header:n 424 \group_begin:
425 \char_set_catcode_other:N \%
426 \cs_new_protected_nopar:Npn \__CJKtu_write_sfd_map_header:n #1
427 {
428     \iow_now:Nx \g_CJKtu_sfd_map_iow
429     {
430         %<#1> \iow_newline:
431         \cs_new_nopar:cpx { ~ CJKtu_#1_sfd_map:nn ~ } ~ \c_hash_str 1
432         \iow_newline: \c_CJKtu_indent_str \c_left_brace_str \iow_newline:
433         \c_CJKtu_indent_str \c_CJKtu_indent_str
434         \token_to_str:N \cs_if_exist_use:cF
435         \iow_newline: \c_CJKtu_indent_str \c_CJKtu_indent_str \c_CJKtu_indent_str
436         { ~ __CJKtu_#1_sfd_map_ ~ \exp_not:N \int_eval:n { \c_hash_str 1 } ~ :n ~ }
437         \iow_newline: \c_CJKtu_indent_str \c_CJKtu_indent_str \c_CJKtu_indent_str
438         { ~ \exp_not:N \use_none:n } \iow_newline:
439         \c_CJKtu_indent_str \c_right_brace_str
440     }
441 }

\__CJKtu_write_sfd_map_trailer:n 442 \cs_new_protected_nopar:Npn \__CJKtu_write_sfd_map_trailer:n #1
443 {
444     \iow_now:Nx \g_CJKtu_sfd_map_iow
445     {
446         \c_CJKtu_indent_str \c_CJKtu_indent_str
447         \token_to_str:N \fi: \iow_newline:
448         \c_CJKtu_indent_str \c_right_brace_str \iow_newline:
449         %</#1>
450     }
451 }

\__CJKtu_write_cmap_header:nn 452 \cs_new_protected_nopar:Npn \__CJKtu_write_cmap_header:nn #1#

```

```

453 {
454   \iow_now:Nx \g__CJKtu_sfd_cmap_iow
455   {
456     %!PS-Adobe-3.0~Resource-CMap \iow_newline:
457     %%DocumentNeededResources:~ProcSet~(CIDInit) \iow_newline:
458     %%IncludeResource:~ProcSet~(CIDInit) \iow_newline:
459     %%BeginResource:~CMap~(TeX-#1-#2-0) \iow_newline:
460     %%Title:~(TeX-#1-#2-0~TeX~#1-#2~0) \iow_newline:
461     %%Version:~1.000 \iow_newline:
462     %%EndComments \iow_newline: \iow_newline:
463     /CIDInit~/ProcSet~findresource~begin \iow_newline: \iow_newline:
464     12~dict~begin \iow_newline: \iow_newline:
465     begin cmap \iow_newline: \iow_newline:
466     /CIDSSystemInfo~3~dict~dup~begin \iow_newline:
467     \c__CJKtu_indent_str /Registry~(TeX)~def \iow_newline:
468     \c__CJKtu_indent_str /Ordering~(#1-#2)~def \iow_newline:
469     \c__CJKtu_indent_str /Supplement~0~def \iow_newline:
470     end~def \iow_newline: \iow_newline:
471     /CMapName~/TeX-#1-#2-0~def \iow_newline:
472     /CMapVersion~1.000~def \iow_newline:
473     /CMapType~2~def \iow_newline: \iow_newline:
474     /WMode~0~def
475   }
476 }

__CJKtu_write_cmap_trailer: 477 \cs_new_protected_nopar:Npx __CJKtu_write_cmap_trailer:
478 {
479   \iow_now:Nn \g__CJKtu_sfd_cmap_iow
480   {
481     \iow_newline:
482     endcmap \iow_newline:
483     CMapName~currentdict~/CMap~defineresource~pop \iow_newline:
484     end \iow_newline:
485     end \iow_newline: \iow_newline:
486     %%EndResource \iow_newline:
487     %%EOF
488   }
489 }
490 \group_end:

491 \iow_open:Nn \g__CJKtu_sfd_map_iow { xCJK2uni-sfd.def }
492 \prop_map_inline:Nn \c__CJKtu_sfd_map_prop
493 { __CJKtu_write_file:nnn {#1} #2 }
494 \iow_close:N \g__CJKtu_sfd_map_iow
495 \cs_if_exist_use:NF \CJKtuend { \tex_end:D }
496 
```

## 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	
\%	425
\\"	5, 6, 7, 80, 229
A	
\AtBeginDocument	54, 201
C	
catcode commands:	
\c_catcode_other_space_t1	261
\cctchar	126
char commands:	
\char_set_catcode_active:n	105
\char_set_catcode_other:N	425
\CJKaddEncHook	51, 56
\CJKchar	125
\CJKchartouni	1, 211
\CKSfdtouni	1, 211
CJKtu commands:	
\CKTku_bookmarks_hook:	121, 199
\CKTku_byte>NN	110, 124, 131
\CKTku_byte:nn	126, 132, 134, 135, 136
\CKTku_byte_map:nn	118, 120, 141, 145, 158
\CKTku_sfd_map:nn	70, 94, 175
CJKtu internal commands:	
\__CKTku_byte:Nwnw	119, 123
\__CKTku_byte:wnn	125, 135
\__CKTku_byte:wNwnw	113, 117
\__CKTku_CCT_byte>NNN	127, 131
\__CKTku_char_to_unicode:n	104, 212
\l_CKtu_cmap_block_tl	267, 367, 383, 390, 406, 411, 414
\__CKTku_enc_map:nn	52, 57, 61, 75, 219
\__CKTku_encoding_error:	114, 146, 149, 151
\c_CKtu_encoding_seq	20, 32, 81
\l_CKtu_gap_begin_int	25, 65, 140, 166, 167
\l_CKtu_gap_end_int	26, 66, 144, 167
\__CKTku_get_unicode:n	128, 173, 180
\__CKTku_get_unicode:w	94, 96, 181
\__CKTku_get_unicode_aux:w	100, 102
\l_CKtu_i_max_int	22, 28, 138
\l_CKtu_i_min_int	21, 63, 138, 164
\l_CKtu_ii_max_int	24, 29, 39, 43, 49, 144
\l_CKtu_ii_min_int	23, 64, 140, 165
\c_CKtu_indent_str	260, 334, 336, 348, 359, 360, 375, 432, 433, 435, 437, 439, 446, 448, 467, 468, 469
\__CKTku_index_map:n	160, 171
\__CKTku_initial:N	214, 224
\g_CKtu_path_str	233, 236, 250, 253, 256, 258, 281
\l_CKtu_plane_int	27, 67, 164
\__CKTku_read_sfd_line:n	311
\__CKTku_read_sfd_line:nn	311
\__CKTku_read_sfd_line:nnn	299, 311
\__CKTku_read_sfd_line:nnnn	322, 326
\__CKTku_read_sfd_line:nwnn	313, 318
\__CKTku_set_enc:nnnnn	30, 85, 86, 87, 88, 89, 90
\g_CKtu_sfd_cmap_iow	263, 301, 369, 371, 385, 402, 454, 479
\l_CKtu_sfd_index_int	268, 368, 388, 399, 407, 417, 418, 422
\g_CKtu_sfd_iow	232, 282, 287, 289, 302
\l_CKtu_sfd_line_seq	265, 304, 343, 345, 349
\g_CKtu_sfd_map_iow	262, 332, 346, 355, 428, 444, 491, 494
\c_CKtu_sfd_map_prop	269, 492
\l_CKtu_sfd_plane_seq	264, 285, 303, 330, 344, 345, 378, 382, 395
\l_CKtu_sfd_plane_tl	266, 341, 369, 370
\c_CKtu_sfd_prop	19, 33, 74, 218
\l_CKtu_sfd_tl	18, 74, 75, 218, 219
\__CKTku_sfd_to_unicode:nn	91, 213
\__CKTku_use_enc_map:n	72, 211, 220, 222
\__CKTku_UTF_xvi_aux:n	183, 184
\__CKTku_UTF_xvi_be:n	128, 182
\__CKTku_write_cmap_body:n	382, 397
\__CKTku_write_cmap_file:n	296, 338, 365
\__CKTku_write_cmap_header:nn	370, 452
\__CKTku_write_cmap_trailer:	394, 477
\__CKTku_write_file:nnn	278, 493
\__CKTku_write_plane_map:nn	340, 353
\__CKTku_write_sfd_map_header:n	286, 424
\__CKTku_write_sfd_map_trailer:n	295, 442
\CJKTuend	495
cs commands:	
\cs_gset_eq:NN	205
\cs_if_exist:NTF	68
\cs_if_exist_use:NTF	51, 56, 191, 208, 434, 495
\cs_new_eq:NN	199, 211, 212, 213
\cs_new_nopar:Npn	91, 96, 102, 106, 117, 119, 131, 133, 135, 136, 151, 158, 171, 180, 182, 184, 357, 431
\cs_new_protected_nopar:Npn	30, 61, 72, 121, 214, 278, 318, 326, 353, 365, 397, 426, 442, 452
\cs_new_protected_nopar:Npx	311, 477
\cs_set_eq:NN	70, 123, 124, 125, 126, 127, 128
E	
exp commands:	
\exp:w	93, 108
\exp_args:Nc	224
\exp_args:Nf	160, 183
\exp_args:No	256
\exp_end:	94, 96, 99, 103, 154, 181
\exp_last_unbraced:Nn	93, 181

\exp_not:N . . . . .	313, 314, 318, 319, 322, 361, 436, 438
<b>F</b>	
fi commands:	
\fi: . . . . .	335, 447
file commands:	
\file_input:n . . . . .	69
\file_parse_full_name:nNNN . . . . .	256
\l_file_search_path_seq . . . . .	281
<b>G</b>	
group commands:	
\group_begin: . . . . .	69, 104, 280, 424
\group_end: . . . . .	69, 130, 284, 307, 490
<b>H</b>	
\hypersetup . . . . .	191, 208
<b>I</b>	
if commands:	
\if_case:w . . . . .	361
int commands:	
\int_case:nnTF . . . . .	399
\int_compare:nNnTF . . . . .	109, 166, 417
\int_compare:nTF . . . . .	138, 140, 143
\int_const:Nn . . . . .	34, 35, 38, 40, 42, 46, 47, 48
\int_div_truncate:nn . . . . .	176, 187
\int_eval:n . . . . .	162, 183, 357, 436
\int_incr:N . . . . .	422
\int_mod:nn . . . . .	177, 189, 388
\int_new:N . . . . .	21, 22, 23, 24, 25, 26, 27, 268
\int_set:Nn . . . . .	28, 29
\int_set_eq:NN . . . . .	63, 64, 65, 66, 67
\int_to_Hex:n . . . . .	377, 407, 418
\int_zero:N . . . . .	368
ior commands:	
\ior_close:N . . . . .	302
\ior_map_break: . . . . .	288
\ior_map_break:n . . . . .	293
\ior_new:N . . . . .	232
\ior_open:NnTF . . . . .	282
\ior_str_map_inline:Nn . . . . .	287, 289
iow commands:	
\iow_close:N . . . . .	301, 494
\iow_new:N . . . . .	262, 263
\iow_newline: . . . . .	335, 358, 359, 373, 374, 379, 387, 389, 404, 405, 408, 419, 430, 432, 435, 437, 438, 447, 448, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 481, 482, 483, 484, 485, 486
\iow_now:Nn . . . . .	332, 346, 355, 371, 385, 402, 428, 444, 454, 479
\iow_open:Nn . . . . .	369, 491
<b>L</b>	
left commands:	
\c_left_brace_str . . . . .	359, 432
lua commands:	
\lua_now:e . . . . .	238

<b>M</b>	
msg commands:	
\msg_critical:nn . . . . .	16
\msg_critical:nnnn . . . . .	308
\msg_error:nn . . . . .	11
\msg_error:nnn . . . . .	76
\msg_expandable_error:nn . . . . .	153
\msg_fatal:nnnn . . . . .	251, 254
\msg_new:nnn . . . . .	3, 14, 78, 156, 193, 227
\msg_warning:nn . . . . .	197, 206
<b>O</b>	
or commands:	
\or: . . . . .	102, 103, 349, 350
<b>P</b>	
\PassOptionsToPackage . . . . .	192
\pdfstringdefPreHook . . . . .	195, 200
prg commands:	
\prg_generate_conditional_variant:Nnn . . . . .	84
prop commands:	
\prop_const_from_keyval:Nn . . . . .	269
\prop_get:NnN . . . . .	84
\prop_get:NnNTF . . . . .	74, 218
\prop_gput:Nnn . . . . .	33
\prop_map_inline:Nn . . . . .	492
\prop_new:N . . . . .	19
<b>Q</b>	
quark commands:	
\q_nil . . . . .	314
\q_stop . . . . .	100, 102, 314, 319
<b>R</b>	
right commands:	
\c_right_brace_str . . . . .	336, 439, 448
<b>S</b>	
scan commands:	
\scan_stop: . . . . .	205, 362
seq commands:	
\seq_clear:N . . . . .	285, 303, 304, 395
\seq_concat:NNN . . . . .	344
\seq_count:N . . . . .	378
\seq_gput_right:Nn . . . . .	32
\seq_if_empty:NTF . . . . .	330
\seq_map_function:NN . . . . .	382
\seq_new:N . . . . .	20, 264, 265
\seq_put_right:Nn . . . . .	281
\seq_set_split:Nnn . . . . .	343
\seq_use:Nn . . . . .	349
\seq_use:Nnnn . . . . .	81
str commands:	
\c_backslash_str . . . . .	314, 319
\c_hash_str . . . . .	358, 362, 431, 436
\str_const:Nn . . . . .	260
\str_gset:Nn . . . . .	236

\str_gset_eq:NN .....	250, 258	tl commands:			
\str_if_eq:nnTF .....	288	\tl_clear:N .....	367, 411		
\str_new:N .....	233	\tl_count:n .....	109		
\l_tmpa_str .....	249, 250, 257, 258	\tl_gput_right:Nn .....	200		
\l_tmpb_str .....	257	\tl_if_blank:nTF .....	253, 291, 328		
sys commands:		\tl_if_empty:NTF .....	383		
\sys_if_engine_luatex:TF .....	234	\tl_if_empty:nTF .....	36, 98		
\sys_if_engine_pdftex:TF .....	12	\tl_if_exist:NTF .....	195, 216		
\sys_shell_get:nnNTF .....	249	\tl_if_head_eq_meaning:nNTF .....	112		
<b>T</b>					
TeX and L <sup>A</sup> T <sub>E</sub> X2 <sub><math>\varepsilon</math></sub> commands:		\tl_new:N .....	18, 195, 266, 267		
\@CCTSetChar .....	127	\tl_put_right:Nn .....	414		
\@ifpackagelater .....	10	\tl_set:Nn .....	341		
\@ifpackageloaded .....	196, 203	\tl_trim_spaces:n .....	341		
\CJK@XX .....	124	token commands:			
\CJKTu@bookmarks@hook .....	199, 200, 205	\token_to_str:N .....	319, 323, 335, 350, 362, 434, 447		
\HyPsd@DecimalToOctalFirst .....	186	<b>U</b>			
\HyPsd@DecimalToOctalSecond .....	188	use commands:			
tex commands:		\use:N .....	41		
\tex_end:D .....	495	\use:n .....	316		
\tex_numexpr:D .....	361	\use_none:n .....	438		
		\useCJKencmap .....	1, 211		