xCJK2uni 宏包

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2014/06/20 v0.4

1 简介

xCJK2uni 是一个 LaTeX 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 pdfLaTeX 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 pdfTeX 作为编译引擎的工作方式。

xCJK2uni 依赖 l3kernel。应该与 CJK 或 CCT 等配合使用，但 xCJK2uni 不会自动引入它们。

2 基本命令

\useCJKencmap `\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{一}` 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。

3 代码实现

3.1 xCJK2uni

```
⟨*package⟩
⟨@@=CJKtu⟩
\pdftex_if_engine:F
  {
    \msg_new:nnn  { xCJK2uni } { pdflatex }
      { The~xCJK2uni~package~is~only~supported~in~pdfTeX. }
    \msg_critical:nn { xCJK2uni } { pdflatex }
  }
\tl_new:N \l__CJKtu_sfd_tl
\prop_new:N \c__CJKtu_sfd_prop
\seq_new:N \c__CJKtu_encoding_seq
\int_new:N \l__CJKtu_i_min_int
\int_new:N \l__CJKtu_i_max_int
\int_new:N \l__CJKtu_ii_min_int
\int_new:N \l__CJKtu_ii_max_int
\int_new:N \l__CJKtu_gap_begin_int
\int_new:N \l__CJKtu_gap_end_int
\int_new:N \l__CJKtu_plane_int
```

```
\int_set:Nn \l__CJKtu_i_max_int { "FE }
\int_set:Nn \l__CJKtu_ii_max_int { "FE }
```

__CJKtu_set_enc:nnnnnn

```
\cs_new_protected_nopar:Npn \__CJKtu_set_enc:nnnnnn #1#2#3#4#5#6
  {
    \seq_put_right:Nn \c__CJKtu_encoding_seq {#1}
    \prop_gput:Nnn \c__CJKtu_sfd_prop {#1} {#2}
    \int_const:cn { c__CJKtu_ #1 _i_min_int } {#3}
    \int_const:cn { c__CJKtu_ #1 _ii_min_int } {#4}
    \tl_if_empty:nTF {#5}
      {
        \int_const:cn { c__CJKtu_ #1 _gap_begin_int }
          { \l__CJKtu_ii_max_int + \c_one }
        \int_const:cn { c__CJKtu_ #1 _gap_end_int }
          { \use:c { c__CJKtu_ #1 _gap_begin_int } }
        \int_const:cn { c__CJKtu_ #1 _plane_int }
          { \l__CJKtu_ii_max_int - (#4) + \c_one }
      }
      {
        \int_const:cn { c__CJKtu_ #1 _gap_begin_int } { #5 + \c_one }
        \int_const:cn { c__CJKtu_ #1 _gap_end_int } {#6}
        \int_const:cn { c__CJKtu_ #1 _plane_int }
          { (#5) - (#4) + \l__CJKtu_ii_max_int - (#6) + \c_two }
      }
    \cs_if_exist_use:NTF \CJKaddEncHook
      { {#1} { \__CJKtu_enc_map:nn {#1} {#2} } }
      {
        \AtBeginDocument
          {
            \cs_if_exist_use:NT \CJKaddEncHook
              { {#1} { \__CJKtu_enc_map:nn {#1} {#2} } }
          }
      }
  }
```

(*End definition for* `\__CJKtu_set_enc:nnnnnn`.)

__CJKtu_enc_map:nn

```
\cs_new_protected_nopar:Npn \__CJKtu_enc_map:nn #1#2
  {
    \int_set_eq:Nc \l__CJKtu_i_min_int     { c__CJKtu_ #1 _i_min_int }
    \int_set_eq:Nc \l__CJKtu_ii_min_int    { c__CJKtu_ #1 _ii_min_int }
    \int_set_eq:Nc \l__CJKtu_gap_begin_int { c__CJKtu_ #1 _gap_begin_int }
    \int_set_eq:Nc \l__CJKtu_gap_end_int   { c__CJKtu_ #1 _gap_end_int }
    \int_set_eq:Nc \l__CJKtu_plane_int     { c__CJKtu_ #1 _plane_int }
    \cs_if_exist:cF { CJKtu_ #1 _sfd_map:nn }
      { \group_begin: \file_input:n { xCJK2uni-#2.def } \group_end: }
    \cs_set_eq:Nc \CJKtu_sfd_map:nn { CJKtu_ #1 _sfd_map:nn }
  }
```

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

__CJKtu_use_enc_map:n

```
\cs_new_protected_nopar:Npn \__CJKtu_use_enc_map:n #1
  {
    \prop_get:NxNTF \c__CJKtu_sfd_prop {#1} \l__CJKtu_sfd_tl
      { \__CJKtu_enc_map:nn {#1} { \l__CJKtu_sfd_tl } }
      { \msg_error:nnx { xCJK2uni } { invalid-encoding } {#1} }
  }
\msg_new:nnn { xCJK2uni } { invalid-encoding }
  {
    The~enconding~`#1'~is~invalid.\\
    Only~\seq_use:Nnnn \c__CJKtu_encoding_seq { ~and~ } { ,~ } { ,~and~ } ~
    are~supported.
  }
\cs_generate_variant:Nn \prop_get:NnNTF { Nx }
```

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

```
\__CJKtu_set_enc:nnnnnn { GB   } { UGB }      { "A1 } { "A1 } { } { }
\__CJKtu_set_enc:nnnnnn { JIS  } { UJIS }     { "A1 } { "A1 } { } { }
\__CJKtu_set_enc:nnnnnn { KS   } { UKS }      { "A1 } { "A1 } { } { }
\__CJKtu_set_enc:nnnnnn { Bg5  } { UBig5 }    { "A1 } { "40 } { "7E } { "A1 }
\__CJKtu_set_enc:nnnnnn { Bg5+ } { UBg5plus } { "81 } { "40 } { "7E } { "80 }
\__CJKtu_set_enc:nnnnnn { GBK  } { UGBK }     { "81 } { "40 } { "7E } { "80 }
```

`\__CJKtu_sfd_to_unicode:nn`

```
\cs_new_nopar:Npn \__CJKtu_sfd_to_unicode:nn #1#2
  {
    \tex_romannumeral:D -`0 \exp_last_unbraced:Nf
    \__CJKtu_get_unicode:w \CJKtu_sfd_map:nn {#1} {#2} \s__stop
  }
```

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

`\__CJKtu_get_unicode:w`

```
\cs_new_nopar:Npn \__CJKtu_get_unicode:w #1 \s__stop
  { \tl_if_empty:nF {#1} { \__CJKtu_get_unicode_aux:w #1 \q_stop } }
\cs_new_nopar:Npn \__CJKtu_get_unicode_aux:w #1 \or: #2 \q_stop
  { \or: #2 \exp_stop_f: #1 }
```

(*End definition for* `\__CJKtu_get_unicode:w`.)

`\__CJKtu_char_to_unicode:n`

```
\group_begin:
\char_set_catcode_active:n { "7F }
\cs_new_nopar:Npn \__CJKtu_char_to_unicode:n #1
  {
    \tex_romannumeral:D -`0
    \int_compare:nNnTF { \tl_count:n {#1} } = \c_two
      { \CJKtu_byte:NN #1 }
      {
        \tl_if_head_eq_meaning:nNTF {#1} ^^7f
          { \__CJKtu_byte:wNwnw #1 }
          { \__CJKtu_encoding_error: }
      }
  }
\cs_new_nopar:Npn \__CJKtu_byte:wNwnw ^^7f #1 ^^7f #2 ^^7f
  { \CJKtu_byte_map:nn { `#1 } {#2} }
\cs_new_nopar:Npn \__CJKtu_byte:Nwnw #1 ^^7f #2 ^^7f
  { \CJKtu_byte_map:nn { `#1 } {#2} }
```

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

`\CJKtu_bookmarks_hook:`

```
\cs_new_protected_nopar:Npn \CJKtu_bookmarks_hook:
  {
    \cs_set_eq:NN ^^7f \__CJKtu_byte:Nwnw
    \cs_set_eq:NN \CJK@XX  \CJKtu_byte:NN
    \cs_set_eq:NN \CJKchar \__CJKtu_byte:wnn
    \cs_set_eq:NN \CCTchar \CJKtu_byte:nn
    \cs_set_eq:NN \@CCTSetChar \__CJKtu_CCT_byte:NNN
    \cs_set_eq:NN \__CJKtu_get_unicode:n \__CJKtu_UTF_xvi_be:n
  }
\group_end:
```

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

`\CJKtu_byte:NN`
`\__CJKtu_CCT_byte:NNN`

```
\cs_new_nopar:Npn \CJKtu_byte:NN #1#2
  { \CJKtu_byte:nn { `#1 } { `#2 } }
\cs_new_nopar:Npn \__CJKtu_CCT_byte:NNN #1#2#3
  { \CJKtu_byte:nn { `#1 } { `#3 } }
```

(*End definition for* `\CJKtu_byte:NN` *and* `\__CJKtu_CCT_byte:NNN`.)

`\__CJKtu_byte:wnn`

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

(*End definition for* `\__CJKtu_byte:wnn`.)

\CJKtu_byte:nn

```
\cs_new_nopar:Npn \CJKtu_byte:nn #1#2
  {
    \int_compare:nTF { \l__CJKtu_i_min_int <= #1 <= \l__CJKtu_i_max_int }
      {
        \int_compare:nTF { \l__CJKtu_ii_min_int <= #2 < \l__CJKtu_gap_begin_int }
          { \CJKtu_byte_map:nn {#1} {#2} }
          {
            \int_compare:nTF
              { \l__CJKtu_gap_end_int <= #2 <= \l__CJKtu_ii_max_int }
              { \CJKtu_byte_map:nn {#1} {#2} }
              { \__CJKtu_encoding_error: }
          }
      }
      { \__CJKtu_encoding_error: }
  }
\cs_new_nopar:Npn \__CJKtu_encoding_error:
  { \exp_stop_f: \__msg_expandable_error:n { Wrong~encoding~scheme. } }
```

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

\CJKtu_byte_map:nn

```
\cs_new_nopar:Npn \CJKtu_byte_map:nn #1#2
  {
    \exp_args:Nf \__CJKtu_index_map:n
      {
        \int_eval:n
          {
              ( #1 - \l__CJKtu_i_min_int ) * \l__CJKtu_plane_int
            + (#2) - \l__CJKtu_ii_min_int
            \int_compare:nNnF {#2} < \l__CJKtu_gap_begin_int
              { + \l__CJKtu_gap_begin_int - \l__CJKtu_gap_end_int }
          }
      }
  }
```

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

__CJKtu_index_map:n

```
\cs_new_nopar:Npn \__CJKtu_index_map:n #1
  {
    \__CJKtu_get_unicode:n
      {
        \CJKtu_sfd_map:nn
          { \int_div_truncate:nn {#1} { \c_two_hundred_fifty_six } + \c_one }
          { \int_mod:nn {#1} { \c_two_hundred_fifty_six } }
      }
  }
```

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

__CJKtu_get_unicode:n

```
\cs_new_nopar:Npn \__CJKtu_get_unicode:n #1
  { \exp_last_unbraced:Nf \__CJKtu_get_unicode:w #1 \s__stop }
```

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

__CJKtu_UTF_xvi_be:n

```
\cs_new_nopar:Npn \__CJKtu_UTF_xvi_be:n #1
  { \exp_args:Nf \__CJKtu_UTF_xvi_aux:n { \int_eval:n { "#1 } } }
\cs_new_nopar:Npn \__CJKtu_UTF_xvi_aux:n #1
  {
    \HyPsd@DecimalToOctalFirst
      { \int_div_truncate:nn {#1} { \c_two_hundred_fifty_six } }
    \HyPsd@DecimalToOctalSecond
      { \int_mod:nn {#1} { \c_two_hundred_fifty_six } }
  }
```

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

```
\cs_if_exist_use:NTF \hypersetup { { unicode , CJKbookmarks = false } }
  { \PassOptionsToPackage { unicode , CJKbookmarks = false } { hyperref } }
\msg_new:nnn { xCJK2uni } { UTF-8-encoding }
  { It~is~not~necessary~to~load~xCJK2uni~in~UTF-8~encoding. }
\tl_if_exist:NF \pdfstringdefPreHook { \tl_new:N \pdfstringdefPreHook }
\@ifpackageloaded { CJKutf8 }
  { \msg_warning:nn { xCJK2uni } { UTF-8-encoding } }
  {
    \cs_new_eq:NN \CJKtu@bookmarks@hook \CJKtu_bookmarks_hook:
    \tl_gput_right:Nn \pdfstringdefPreHook { \CJKtu@bookmarks@hook }
    \AtBeginDocument
      {
        \@ifpackageloaded { CJKutf8 }
          {
            \cs_gset_eq:NN \CJKtu@bookmarks@hook \scan_stop:
            \msg_warning:nn { xCJK2uni } { UTF-8-encoding }
          }
          { \cs_if_exist_use:NT \hypersetup { { CJKbookmarks = false } } }
      }
  }
```

\useCJKencmap
\CJKchartouni
\CJKsfdtouni

```
\cs_new_eq:NN \useCJKencmap \__CJKtu_use_enc_map:n
\cs_new_eq:NN \CJKchartouni \__CJKtu_char_to_unicode:n
\cs_new_eq:NN \CJKsfdtouni  \__CJKtu_sfd_to_unicode:nn
```

(*End definition for* `\useCJKencmap`, `\CJKchartouni`, *and* `\CJKsfdtouni`. *These functions are documented on page* 1.)

__CJKtu_initial:N

```
\cs_new_protected_nopar:Npn \__CJKtu_initial:N #1
  {
    \tl_if_exist:NTF #1
      {
        \prop_get:NxNTF \c__CJKtu_sfd_prop {#1} \l__CJKtu_sfd_tl
          { \__CJKtu_enc_map:nn {#1} { \l__CJKtu_sfd_tl } }
          { \__CJKtu_use_enc_map:n { GBK } }
      }
      { \__CJKtu_use_enc_map:n { GBK } }
  }
```

(*End definition for* `\__CJKtu_initial:N`.)

```
\exp_args:Nc \__CJKtu_initial:N { CJK @ @ @ enc }
```

⟨/package⟩

3.2 xCJK2uni-make

⟨*make⟩

```
\msg_new:nnn { xCJK2uni } { file-not-found }
  {
    SFD file~`#2'~for~encoding~`#1'~not~found.\\
    xCJK2uni~will~not~work!
  }
\ior_new:N \g__CJKtu_sfd_ior
\tl_new:N \g__CJKtu_path_str
\luatex_if_engine:TF
  {
    \tl_gset:Nx \g__CJKtu_path_str
      {
        \luatex_directlua:D
          {
            kpse.set_program_name("luatex") ~
            local ~ sfd = kpse.find_file("UGBK.sfd", "subfont~definition~files") ~
            if ~ sfd ~ then ~
              tex.write(sfd) ~
            end
          }
```

```
      }
  }
  {
    \ior_open:NnTF \g__CJKtu_sfd_ior { |kpsewhich ~ UGBK.sfd }
      {
        \ior_get_str:NN \g__CJKtu_sfd_ior \g__CJKtu_path_str
        \ior_close:N \g__CJKtu_sfd_ior
      }
      { \msg_fatal:nnnn { xCJK2uni } { file-not-found } { GBK } { UGBK.sfd } }
  }
\tl_if_blank:oTF { \g__CJKtu_path_str }
  { \msg_fatal:nnnn { xCJK2uni } { file-not-found } { GBK } { UGBK.sfd } }
  {
    \seq_set_split:NnV \l_tmpa_seq { / } \g__CJKtu_path_str
    \seq_pop_right:NN \l_tmpa_seq \g__CJKtu_path_str
    \tl_gset:Nx \g__CJKtu_path_str { \seq_use:Nn \l_tmpa_seq { / } }
  }
\tl_const:Nx \c__CJKtu_hash_str { \iow_char:N \# }
\tl_const:Nx \c__CJKtu_lbrace_str { \iow_char:N \{ }
\tl_const:Nx \c__CJKtu_rbrace_str { \iow_char:N \} }
\tl_const:Nx \c__CJKtu_backslash_str { \iow_char:N \\ }
\tl_const:Nx \c__CJKtu_indent_str
  { \c_catcode_other_space_tl \c_catcode_other_space_tl }
\iow_new:N \g__CJKtu_sfd_map_iow
\iow_new:N \g__CJKtu_sfd_cmap_iow
\seq_new:N \l__CJKtu_sfd_plane_seq
\seq_new:N \l__CJKtu_sfd_line_seq
\tl_new:N \l__CJKtu_sfd_plane_tl
\tl_new:N \l__CJKtu_cmap_block_tl
\int_new:N \l__CJKtu_sfd_index_int
```

\c__CJKtu_sfd_map_prop

```
\prop_new:N \c__CJKtu_sfd_map_prop
\prop_gput:Nnn \c__CJKtu_sfd_map_prop { GB   } { { 10 } { UGB } }
\prop_gput:Nnn \c__CJKtu_sfd_map_prop { JIS  } { { 40 } { UJIS } }
\prop_gput:Nnn \c__CJKtu_sfd_map_prop { KS   } { { 60 } { UKS } }
\prop_gput:Nnn \c__CJKtu_sfd_map_prop { Bg5  } { { 00 } { UBig5 } }
\prop_gput:Nnn \c__CJKtu_sfd_map_prop { Bg5+ } { { 09 } { UBg5plus } }
\prop_gput:Nnn \c__CJKtu_sfd_map_prop { GBK  } { { 19 } { UGBK } }
```

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

__CJKtu_write_file:nnn

```
\cs_new_protected_nopar:Npn \__CJKtu_write_file:nnn #1#2#3
  {
    \group_begin:
    \file_path_include:n { \g__CJKtu_path_str / }
    \ior_open:NnTF \g__CJKtu_sfd_ior { #3.sfd }
      {
        \group_end:
        \seq_clear:N \l__CJKtu_sfd_plane_seq
        \__CJKtu_write_sfd_map_header:n {#1}
        \ior_str_map_inline:Nn \g__CJKtu_sfd_ior
          { \str_if_eq:nnT {##1} { 00 ~ 0x0000_0x00FF } { \ior_map_break: } }
        \ior_str_map_inline:Nn \g__CJKtu_sfd_ior
          {
            \tl_if_blank:nTF {##1}
              {
                \ior_map_break:n
                  {
                    \__CJKtu_write_sfd_map_trailer:n {#1}
                    \__CJKtu_write_cmap_file:n {#2}
                  }
              }
              { \__CJKtu_read_sfd_line:nnn {##1} {#1} {#2} }
          }
        \iow_close:N \g__CJKtu_sfd_cmap_iow
        \ior_close:N \g__CJKtu_sfd_ior
        \seq_clear:N \l__CJKtu_sfd_plane_seq
```

```
        \seq_clear:N \l__CJKtu_sfd_line_seq
      }
      {
        \group_end:
        \msg_critical:nnxx { xCJK2uni } { file-not-found } {#1} { #3.sfd }
      }
  }
```

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

`\__CJKtu_read_sfd_line:n`
`\__CJKtu_read_sfd_line:nn`

```
\group_begin:
\char_set_lccode:nn { \c_zero } { `\\ }
\char_set_lccode:nn { \c_one }  { `\x }
\char_set_catcode_other:n { \c_zero }
\char_set_catcode_other:n { \c_one }
\tl_to_lowercase:n
  {
    \group_end:
    \cs_new_protected_nopar:Npn \__CJKtu_read_sfd_line:nnn #1#2#3
      { \__CJKtu_read_sfd_line:nwnn #1 ^^00 \q_nil \q_stop {#2} {#3} }
    \cs_new_protected_nopar:Npn \__CJKtu_read_sfd_line:nwnn
      #1 0^^01 #2 ^^00 #3 \q_stop #4#5
      { \__CJKtu_read_sfd_line:nnnnn {#1} { 0^^01 } {#2} {#4} {#5} }
  }
```

(*End definition for* `\__CJKtu_read_sfd_line:n` *and* `\__CJKtu_read_sfd_line:nn`.)

`\__CJKtu_read_sfd_line:nnnnn`

```
\cs_new_protected_nopar:Npn \__CJKtu_read_sfd_line:nnnnn #1#2#3#4#5
  {
    \tl_if_blank:nF {#1}
      {
        \seq_if_empty:NF \l__CJKtu_sfd_plane_seq
          {
            \iow_now:Nx \g__CJKtu_sfd_map_iow
              {
                \c__CJKtu_indent_str \c__CJKtu_indent_str
                \token_to_str:N \fi: \iow_newline:
                \c__CJKtu_indent_str \c__CJKtu_rbrace_str
              }
            \__CJKtu_write_cmap_file:n {#5}
          }
        \__CJKtu_write_plane_map:nn {#1} {#4}
        \tl_set:Nx \l__CJKtu_sfd_plane_tl { \tl_trim_spaces:n {#1} }
      }
    \seq_set_split:Nnn \l__CJKtu_sfd_line_seq {#2} {#3}
    \seq_concat:NNN \l__CJKtu_sfd_plane_seq
      \l__CJKtu_sfd_plane_seq \l__CJKtu_sfd_line_seq
    \iow_now:Nx \g__CJKtu_sfd_map_iow
      {
        \c__CJKtu_indent_str \c__CJKtu_indent_str \c__CJKtu_indent_str
        \seq_use:Nn \l__CJKtu_sfd_line_seq { \or: }
        \token_to_str:N \or:
      }
  }
```

(*End definition for* `\__CJKtu_read_sfd_line:nnnnn`.)

`\__CJKtu_write_plane_map:nn`

```
\cs_new_protected_nopar:Npn \__CJKtu_write_plane_map:nn #1#2
  {
    \iow_now:Nx \g__CJKtu_sfd_map_iow
      {
        \cs_new_nopar:cpn { ~ __CJKtu_ #2 _sfd_map_ \int_eval:n {#1} :n ~ } ~
        \c__CJKtu_hash_str 1 \iow_newline:
        \c__CJKtu_indent_str \c__CJKtu_lbrace_str \iow_newline:
        \c__CJKtu_indent_str \c__CJKtu_indent_str
        \exp_not:N \if_case:w \etex_numexpr:D
          \c__CJKtu_hash_str 1 ~ \token_to_str:N \scan_stop:
```

```
      }
  }
```

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

`\__CJKtu_write_cmap_file:n`

```
\cs_new_protected_nopar:Npn \__CJKtu_write_cmap_file:n #1
  {
    \tl_clear:N \l__CJKtu_cmap_block_tl
    \int_zero:N \l__CJKtu_sfd_index_int
    \iow_open:Nn \g__CJKtu_sfd_cmap_iow { c #1 \l__CJKtu_sfd_plane_tl .cmap }
    \__CJKtu_write_cmap_header:nn { C #1 } { \l__CJKtu_sfd_plane_tl }
    \iow_now:Nx \g__CJKtu_sfd_cmap_iow
      {
        \iow_newline:
        1~begincodespacerange \iow_newline:
        \c__CJKtu_indent_str < 00 > ~
        <
          \int_to_Hex:n
            { \seq_count:N \l__CJKtu_sfd_plane_seq - \c_one }
        > \iow_newline:
        endcodespacerange
      }
    \seq_map_function:NN \l__CJKtu_sfd_plane_seq \__CJKtu_write_cmap_body:n
    \tl_if_empty:NF \l__CJKtu_cmap_block_tl
      {
        \iow_now:Nx \g__CJKtu_sfd_cmap_iow
          {
            \iow_newline:
            \int_mod:nn { \l__CJKtu_sfd_index_int } { \c_one_hundred } ~
            beginbfchar \iow_newline:
            \l__CJKtu_cmap_block_tl
            endbfchar
          }
      }
    \__CJKtu_write_cmap_trailer:
    \seq_clear:N \l__CJKtu_sfd_plane_seq
  }
```

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

`\__CJKtu_write_cmap_body:n`

```
\cs_new_protected_nopar:Npn \__CJKtu_write_cmap_body:n #1
  {
    \int_case:nnTF { \l__CJKtu_sfd_index_int }
      { { 99 } { } { 199 } { } }
      {
        \iow_now:Nx \g__CJKtu_sfd_cmap_iow
          {
            \iow_newline:
            100 ~ beginbfchar \iow_newline:
            \l__CJKtu_cmap_block_tl
            < \int_to_Hex:n { \l__CJKtu_sfd_index_int } > ~
            <#1> \iow_newline:
            endbfchar
          }
        \tl_clear:N \l__CJKtu_cmap_block_tl
      }
      {
        \tl_put_right:Nx \l__CJKtu_cmap_block_tl
          {
            <
              \int_compare:nNnF \l__CJKtu_sfd_index_int > \c_fifteen { 0 }
              \int_to_Hex:n { \l__CJKtu_sfd_index_int }
            > ~ <#1> \iow_newline:
          }
      }
    \int_incr:N \l__CJKtu_sfd_index_int
  }
```

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

__CJKtu_write_sfd_map_header:n

```
\group_begin:
\char_set_catcode_other:N \%
\cs_new_protected_nopar:Npn \__CJKtu_write_sfd_map_header:n #1
  {
    \iow_now:Nx \g__CJKtu_sfd_map_iow
      {
        %<*#1> \iow_newline:
        \cs_new_nopar:cpn { ~ CJKtu_#1_sfd_map:nn ~ } ~ \c__CJKtu_hash_str 1
        \iow_newline: \c__CJKtu_indent_str \c__CJKtu_lbrace_str \iow_newline:
        \c__CJKtu_indent_str \c__CJKtu_indent_str
        \token_to_str:N \cs_if_exist_use:cF
        \iow_newline: \c__CJKtu_indent_str \c__CJKtu_indent_str \c__CJKtu_indent_str
          { ~ __CJKtu_#1_sfd_map_ ~ \exp_not:N \int_eval:n { \c__CJKtu_hash_str 1 } ~ :n ~}
        \iow_newline: \c__CJKtu_indent_str \c__CJKtu_indent_str \c__CJKtu_indent_str
          { ~ \exp_not:N \use_none:n } \iow_newline:
        \c__CJKtu_indent_str \c__CJKtu_rbrace_str
      }
  }
```

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

__CJKtu_write_sfd_map_trailer:n

```
\cs_new_protected_nopar:Npn \__CJKtu_write_sfd_map_trailer:n #1
  {
    \iow_now:Nx \g__CJKtu_sfd_map_iow
      {
        \c__CJKtu_indent_str \c__CJKtu_indent_str
        \token_to_str:N \fi: \iow_newline:
        \c__CJKtu_indent_str \c__CJKtu_rbrace_str \iow_newline:
        %</#1>
      }
  }
```

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

__CJKtu_write_cmap_header:nn

```
\cs_new_protected_nopar:Npn \__CJKtu_write_cmap_header:nn #1#2
  {
   \iow_now:Nx \g__CJKtu_sfd_cmap_iow
      {
        %!PS-Adobe-3.0~Resource-CMap \iow_newline:
        %%DocumentNeededResources:~ProcSet~(CIDInit) \iow_newline:
        %%IncludeResource:~ProcSet~(CIDInit) \iow_newline:
        %%BeginResource:~CMap~(TeX-#1-#2-0) \iow_newline:
        %%Title:~(TeX-#1-#2-0~TeX~#1-#2~0) \iow_newline:
        %%Version:~1.000 \iow_newline:
        %%EndComments \iow_newline: \iow_newline:
        /CIDInit~/ProcSet~findresource~begin \iow_newline: \iow_newline:
        12~dict~begin \iow_newline: \iow_newline:
        begincmap \iow_newline: \iow_newline:
        /CIDSystemInfo~3~dict~dup~begin \iow_newline:
        \c__CJKtu_indent_str /Registry~(TeX)~def \iow_newline:
        \c__CJKtu_indent_str /Ordering~(#1-#2)~def \iow_newline:
        \c__CJKtu_indent_str /Supplement~0~def \iow_newline:
        end~def \iow_newline: \iow_newline:
        /CMapName~/TeX-#1-#2-0~def \iow_newline:
        /CMapVersion~1.000~def \iow_newline:
        /CMapType~2~def \iow_newline: \iow_newline:
        /WMode~0~def
      }
  }
```

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

__CJKtu_write_cmap_trailer:

```
\cs_new_protected_nopar:Npx  \__CJKtu_write_cmap_trailer:
  {
    \iow_now:Nn \g__CJKtu_sfd_cmap_iow
      {
```

```
        \iow_newline:
        endcmap \iow_newline:
        CMapName~currentdict~/CMap~defineresource~pop \iow_newline:
        end \iow_newline:
        end \iow_newline: \iow_newline:
        %%EndResource \iow_newline:
        %%EOF
      }
  }
\group_end:
```

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

```
\iow_open:Nn \g__CJKtu_sfd_map_iow { xCJK2uni-sfd.def }
\prop_map_inline:Nn \c__CJKtu_sfd_map_prop
  { \__CJKtu_write_file:nnn {#1} #2 }
\iow_close:N \g__CJKtu_sfd_map_iow
```

```
\cs_if_exist_use:NF \CJKtuend { \tex_end:D }
```

⟨/make⟩

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，而直立体的数字表示对应项使用时所在的行号。

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