CTEX User's Guide for Unix

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Chapter 1

Introduction

CTEX is a pure, portable and device-independent extension of TEX and its `dvi`-drivers. CTEX is designed specifically for the professional oriental language typesetting community. In CTEX, oriental languages are not longer the "foreign languages" for TEX users. All features of the existing TEX and its `dvi`-drivers are extended to the oriental languages. CTEX provides the following unique features for the professional document production:

- Being a pure extension of TEX. There is no difference between CTEX and TEX when typesetting western languages. However, in CTEX, the oriental language texts are formatted in the same way as the western ones, and the existing features of TEX and its `dvi`-drivers are extended to the oriental languages.
- Supporting multiple oriental languages in a single document. You are encouraged to combine `GB`-coded and `BIG5`-coded Chinese, `JIS`-coded Japanese with the western languages in a single document.
- Supporting a large number of oriental fonts (up to 128 fonts), and therefore it can typeset very complicated documents.
- Supporting both outline and bitmap fonts. The CTEX outline font manager is fast and powerful. For instance, on a 486/33MHz PC, it generates `17` distinct characters per second at size `12pt` and resolution `300dpi`.
- Supporting user defined bitmap symbols. Using the quick bitmap interface (`bitfac`) of CTEX, you are able to easily achieve some special visual effects for your publications. (Unavailable for Unix)
- Supporting `16` different character widths in each oriental font. Punctuation and the end of sentence could be spaced in a different way from the normal characters.
- Supporting your favorite `dvi`-drivers automatically.
- Being able to split your printer files based on the font capability of your printer.
- Providing utilities to generate the CTEX fonts based on your own bitmap fonts. (Unavailable for Unix)

Chapter 2

CTEX Components

The multiuser Unix CTEX package has two components:

- `Cntex`: file translation between `GB/Big5` and TEX formats. Some TEX implementation may not require using this.
- `Dvic`: generation of the final documents from `dvi` files.

2.1 Cntex

The standard preprocessor `cntex` does some special preprocessing of the normal GB/Big5 documents for TEX:

- Some TEX implementation may not be able to recognize the extended ASCII code `128-254`. In this case, `cntex` can translate between the extended ASCII codes and the corresponding TEX codes.
- In the Big5 coding scheme, the second bytes of Chinese characters are the special characters reserved by TEX and `cntex` shifts them to others and restores them when converting back.
- Many Chinese editors do not automatically insert spaces between Chinese characters and cause TEX out of memory when processing. `Cntex` inserts spaces for normal Chinese characters but not for punctuation characters, so that TEX would not break a line between a normal Chinese character and a Chinese punctuation character.

The usage of `cntex` is

```
cntex [-ir] foo.tex
```

where the option `-i` forces `cntex` to use the TEX representation of extended ASCII codes when translating to TEX file. The option `-r` converts your document back to the initial GB/Big5 representation. The file `foo.tex` is overridden by `cntex`.

The following table summarizes the usage of `cntex`:

Using `cntex`		
TEX Implementations	GB2312 Document	Big5/Mixed Document
Extended ASCII accepted	Not required	`cntex`
Extended ASCII rejected	`cntex -i`	`cntex -i`

2.2 Dvic

`Dvic` is the CTEX `dvi`-driver. When you finish editing a Chinese document `foo.tex`, you use `cntex` to convert the document if necessary, as described in the last section and you issue `tex foo` to produce a file `foo.dvi`. Now you need to print or view the document using `dvic`.

The `dvic` has the following usage:

```
dvic [-gv] file[.dvi] [options]
```

Where `[...]` denotes an optional command line argument and the `dvi` file extension `.dvi` is optional. The option `[-g]` forces `dvic` into the `go`-mode, in which `dvic` tries to use the existing `pk/pxl` files. This mode is used to speed up processing of the `dvi` file without regenerating the `pk/pxl` files. For instance, when a user generates a `foo.dvi` from `tex` and wishes to view and print the document, he may issue the following sequence of commands:

```
dvic -v foo
dvic -g foo
```

As you will see in the resource file definition in Appendix B, you have two `dvi`-drivers in the resource file, one for previewing (`-v` calls it) and the other for printing (the default driver).

The arguments `[options]` are the arguments a user wishes to pass to his `dvi`-driver in addition to the arguments defined in the `dvic` resource file. For instance, if you set up the entry `dvipxx: dvips` in the `dvi` resource file and call:

```
dvic foo -c 20
```

The `dvic` will invoke `dvips` with the option `-c 20`, and will make `20` copies of the document in `cfoo.ps`.

For a big document using too many fonts, a normal `dvi`-driver usually does not coordinate with the printer's capacity and goes ahead to produce an unprintable output file. When using `dvic`, the output is automatically split into several printable files, named as `cfoo.xx`, `c1foo.xx` etc. If splitting occurs, `dvic` tells you the number of files it splits into:

```
[Output split to # files]
```

Chapter 3

Using CTEX

In a CTEX document, you may work with multiple languages. Suppose that your TEX supports English and French, by using CTEX, it supports the oriental languages in addition. Typically, you can put all of the following things together in a single CTEX document:

- English, French and other languages already supported by TEX;
- Mathematical formula, tables, and other nice things already supported by TEX;
- Simplified Chinese, traditional Chinese and other oriental languages;
- Your bitmap symbols. The bitmap symbols will automatically scale to the right size independent of your printer;
- All the `\special` things supported by your `dvi`-driver. If the `special` things can `special`ize English, they `special`ize Chinese too;
- Finally, you can replace the English text with Chinese for a native Chinese output, e.g., the title "Contents" can be replaced by 目 录, so that your book is in the real Chinese style.

All the above features make CTEX a powerful and professional text formatting system.

To produce a Chinese TEX/LaTEX document, you use a text editor supporting the `GB` and/or `Big5` coding schemes.[1] In the very beginning of your document, you must `\input` the header file `ctex.tex/clatex.tex`.

Now you are in CTEX. Generally speaking, in CTEX you have a fresh new TEX mode, the Chinese mode. To enable TEX to accept the Chinese mode, you must issue a TEX command `\acceptChinese`. To disable the Chinese mode, you issue the command `\rejectChinese`, after which the Chinese mode will not longer be valid until you issue the command `\acceptChinese` again. If you are using multiple languages in a document, e.g. English, French, Chinese and Japanese, you may need to use `\rejectChinese` to switch to French. If you use only English and Chinese in a document, you do not have to use `\rejectChinese`.

When Chinese characters can be recognized after you issued `\acceptChinese`, TEX automatically enters the Chinese mode upon encountering a Chinese character. However, you need to *explicitly* end the Chinese mode by call the control sequence `\.`, whenever you want to switch to other modes or other languages or another Chinese font, or when you want to end a group. Between two Chinese characters, you may specify any number of control sequences without leaving the Chinese mode. A most frequently occurred error comes with using Chinese characters in an argument of a macro without having `\.` to end Chinese mode. This causes TEX to go past the end of the argument without calling the macro.

[1] However, do not use any Chinese editor that formats your document as this is prohibited by TEX.

There are two styles of spacing in Chinese. One is known as traditional, in which all characters have the same width. The other is English-like spacing, in which punctuation characters have smaller widths. The traditional spacing is the default setting of CTEX. The current version of `ctex.tex/clatex.tex` uses the traditional spacing. Although CTEX provides the ability to produce indent widths for punctuation characters using TEX char 8-127, it is generally not recommended doing so. In addition, when doing document formatting, people do not want a line break between a normal Chinese character and a punctuation character. This has been taken care of by CTEX.

3.1 Font Naming Conventions

To choose a Chinese font, you issue a font selection command `\cfont`. It accepts two arguments, the *font name* and the *font size number*. CTEX header file `ctex.tex` chooses `\cfont{cgbkai10}{0}` as the default Chinese font. This section describes the CTEX conventions of the *font name* and *font size number*.

If you are using LaTeX, font selection is simpler: `\gbkai` selects the GB Kai Ti; `\bfkai` selects the Big5 Kai Ti; `\large` selects a large size, etc.

Since CTEX handles more than one hundred Chinese fonts, it is necessary to introduce some naming conventions:

- The first character is always `c`, meaning a CTEX Font.
- The following two characters specify the coding scheme, they can be `gb` (GB 2312 coding scheme), `b5` (Big5 coding scheme), `js` (JIS coding scheme), `uc` (Unicode scheme) or `bt` (quick `bit`map interface).
- The following 2-3 characters are for styles: `zhn` (Zheng Ti), `kai`(Kai Ti), `hei` (Hei Ti), `fsn` (Fang Song Ti) and `wb` (Wei Bei Ti). For quick bitmap interface, these three characters are `fac` (Inter`face`).
- The 1-2 digits followed specifies the ratio of width to height. For instance, 8 stands for 8pt:10pt.

The standard distribution of the CTEX provides the following TEX font metric files:

Table of Chinese TEX font names		
font name	Width:Height	Style
cgbzhn8–cgbzhn12	8pt:10pt–12pt:10pt	国标正体
cgbkai8–cgbkai12	8pt:10pt–12pt:10pt	国标楷体
cgbhei8–cgbhei12	8pt:10pt–12pt:10pt	国标黑体
cgbfsn8–cgbfsn12	8pt:10pt–12pt:10pt	国标仿宋体
cgbwb8–cgbwb12	8pt:10pt–12pt:10pt	国标魏碑体
cb5zhn8–cb5zhn12	8pt:10pt–12pt:10pt	大五正體
cb5kai8–cb5kai12	8pt:10pt–12pt:10pt	大五楷體
cb5hei8–cb5hei12	8pt:10pt–12pt:10pt	大五黑體
cb5fsn8–cb5fsn12	8pt:10pt–12pt:10pt	大五仿宋體
cb5wb8–cb5wb12	8pt:10pt–12pt:10pt	大五魏碑體

The size of a Chinese font is quantized according to the Chinese typographic conventions, and the *font size numbers* are assigned for different sizes:

Table of Chinese TEX font size numbers		
font size number	Physical Font Size	Chinese Font Size Number
-2	7.88pt	No.6
-1	9pt	Small No.5
0	10.5pt	No.5
1	12pt	Small No.4
2	14pt	No.4
3	15.75pt	No.3
4	21pt	No.2
5	28pt	No.1
6	36pt	No.0
7	45pt	Hugh

3.2 Using More Fonts

Now that you know how to use the standard CTEX fonts, you may be curious about how to use more fonts. This section tells you the whole story of setting a font in CTEX.

Currently CTEX supports both outline and bitmap fonts. A bitmap font does not look so pretty as an outline font when scaled. Using the bitmap or outline font for a specific Chinese TEX font is controlled by the `dvic` resource file, where you can instruct `dvic` to use your preferred CTEX font files.

Now suppose that you want to add a `JIS` font `cjsfoo11` and use a CTEX font `cjsfoo.fnt`. This can be done simply by inserting a line in `(part-tfm)` of the `dvic` resource file `dvic.res`:

```
tfm:  cjsfoo11 w[10.9545pt]
```

and a line in `(part-fonts)`:

```
fnt:  cjsfoo11 cjsfoo.fnt
```

The `dvic` resource file is actually the font organizer, containing the font-specific instructions to utilize the full set of oriental fonts. Use the font tool `ctfmgen` to generate the `tfm` file in order that you can use it in your TEX documents. If you do not have `ctfmgen`, you may simply copy the file `cgbkai11.tfm` and rename it as `cjsfoo11.tfm`. CTEX will automatically take care of the remaining things for font manipulation.

3.3 Summary

As a summary, CTEX has the following TEX commands:

- `\acceptChinese`: Ready to accept Chinese text.
- `\.`: Ends Chinese text, ready to switch to other languages or another Chinese font.
- LaTEX — `\gbzhn`, `bfzhn`, `\gbkai`, `bfkai`, `\gbhei`, `bfhei`, `\gbfsn`, `bffsn`, `\gbwb`, `bfwb`: selects a corresponding Chinese font.
- LaTEX — `\tiny`, `\scriptsize`, `\small`, `\normalsize`, `\large`, `\Large`, `\LARGE`, `\huge`, `\Huge`: selects a proper size.
- TEX — `\cfont#1#2`: Selects a Chinese font. `#1` is a *font name* and `#2` is a *font size number*. e.g. `\cfont{cgbkai10}{7}` chooses Kai Ti at 45pt.
- `\rejectChinese`: Rejects Chinese text until the next `\acceptChinese` is issued.

Appendix A

System Administration

After decompression, the CTEX package contains the following files:

- `ctex.tex/clatex.tex`: the TEX/LaTEX header file for `GB` and `Big5`.
- `cntex`: the preprocessor.
- `dvic`: the CTEX `dvi`-driver.
- `c*.tfm`: the standard `tfm` files.
- `c*.ol`: the outline font files.
- `dvic.res`: a `dvic` resource file, used by `dvic`.
- `ctexunx.*`: the CTEX user's guide.

The following steps should be taken to complete the installation:

1. copy the files `cntex` and `dvic` to a `bin` directory for user accesses.
2. copy the files `ctex.tex` and `clatex.tex` to your TEX/LaTEX `inputs` directory, e.g. `/usr/tex/inputs`.
3. copy the files `c*.tfm` to your TEX `tfm` directory `/usr/tex/tfm` and modify the `tfm-path` setting of your `dvic.res`.
4. copy the files `dvic.res` and `ctexunx.*` to the CTEX directory `/usr/tex/ctex`.
5. copy the files `c*.ol` to the directory `/usr/tex/ctex/cfonts`.
6. configure the `dvi`-drivers for your CTEX by modifying the `dvivxx` and `dvipxx` entries in your `dvic.res`. See Appendix B.
7. set up an environment variable in the `master.login` file: `setenv CTEXRES /usr/tex/ctex/dvic.res`.
8. modify the `pk` file search paths for your `dvi`-drivers.

Appendix B

CTEX Configuration

B.1 DVI-Driver Options

CTEX supports two `dvi`-drivers in each resource file. Typically, one driver is set as the preview/screen driver and the other as the printer driver. Each user may copy the `dvic.res` to their own directory and modify the file for a particular configuration. Assume that you have a PostScript printer driver and a text screen previewer, this can be set as:

```
dvivxx:  dvi2tty
dvipxx:  dvips
```

Invoking `dvic -v foo` gets the previewer to work and `dvic` without option `-v` gets the printer driver to work. When invoking `dvic`, there are two ways passing the arguments to the `dvi`-drivers. One way is by the options in the resource file. The other way is by the options in the command line. `Dvic` passes the options in the resource file as the last options to the `dvi`-driver.

B.2 Configuring the Dvic Resource File

`Dvic` is the `dvi`-driver of CTEX. Each user has an environment variable `CTEXRES` set as the `dvic` resource file name. The multiuser CTEX Unix version has this environment variable set up by the system administrator in the `master.login` file. Individual users may override this setting in their `.login` files. In case `CTEXRES` does not exist, `dvic` assumes the resource file `dvic.res` on the current directory.

The resource file consists of three parts: `global`, `tfm`, and `fonts`. The `global` part begins with `(part-global)` and ends with `(end-part-global)`, with the following instructions in between:

- `version:  2.1`: The `dvic` version. This should be consistent with the `dvic` driver. It will be upgraded for later versions.
- `resolution:  300dpi`: Most TEX drivers generate `300dpi` for laser printers. You may change it to whatever you want, but it must be consistent with your `dvi`-drivers and your printer.
- `font-split`: This parameter tells `dvic` to split the output file if the total number of fonts used is more than this number. This parameter is printer-dependent. Most printers have a limited font resource. Some printers supporting PostScript may have a large font resource, others don't. `HP` laser printers may support `16-32` fonts.
- `dvivxx:  dvi2tty`: This instructs `dvic` to use the `dvi2tty` as the primary preview `dvi`-driver. The command line parameters passed to `dvic` will be passed to `dvi2tty` in addition to the options defined here. Therefore, the options defined here become the default options.
- `dvipxx:  dvips`: This instructs `dvic` to use the `dvips` as the primary print `dvi`-driver. The command line parameters passed to `dvic` will be passed to `dvips` in addition to the arguments defined here (if any).

The `tfm` part begins with `(part-tfm)` and ends with `(end-part-tfm)`, with the following instructions in between:

- `tfm-path: /usr/tex/tfm`: The TEX Font Metric directory. The `tfm` files used by CTEX should reside here. You are responsible to set up this `tfm` directory for TEX to use the `tfm` files.
- `tfm-height: 10pt`: Set the character height to `10pt`, not to be changed.
- `tfm: cgbzhn10 w[10.00000pt]`: The font `cgbzhn10` has a width of `10pt`. CTEX is able to scale the characters in the horizontal and vertical directions by different scaling factors. You may set up `128` oriental fonts here.

The `fonts` part begins with `(part-fonts)` and ends with `(end-part-fonts)`, with the following instructions in between:

- `cfont-path: /usr/tex/ctex/cfonts`: This is the location of the CTEX fonts.
- `font-path: ./pk`: This is the temporary directory to put the `pk` files generated by CTEX. The multiuser CTEX Unix version allows each user to *optionally* set up an environment variable `CTEXFONTPATH` to override this setting. This path must be made consistent with your `dvi`-drivers. Most `dvi`-drivers allow you do this easily. For instance, in `dvips` from Radical Eye Software, you can set up an environment variable `TEXPKS` or use the option `P` in the config file `.dvipsrs`. If a `dvi`-driver allows users to set the `pk` path as a command line argument, you may simply put it in the `dvipxx` of the `global` part.
- `fnt: cgbzhn10 cgbzhn.ol`: This instructs `dvic` to use the CTEX outline font `cgbzhn.ol` for `cgbzhn10`. You should specify here the corresponding CTEX font files for those fonts in the `tfm` part.

Appendix C

Editors and Languages

C.1 CTEX Editors

CTEX is a coding scheme independent oriental language document formatting system. CTEX internally thinks that an oriental character is an extended ASCII character in the range of 129-254, followed by another character in the range of 0-254.

A CTEX editor must be able to use the following 2-byte sequences to switch from one coding scheme to the other:

Editor Switching Marks	
2-Byte	Coding Scheme
`^^80^^80`	End a coding scheme
`^^80^^81`	Begin GB2312
`^^80^^82`	Begin Big5
`^^80^^83`	Begin JIS
`^^80^^84`	Begin Unicode
`^^80^^85 and up`	Begin others

To use the standard CTEX Chinese outline fonts (in `GB` or `BIG5`), any other Chinese coding scheme must be translated into `GB` or `BIG5` before CTEX formats the document. This requires that a Chinese editor provides an associated translator doing the translation.

C.2 Chinese, Japanese and Korean

Currently, Prosoft International provides only Chinese `GB` and `BIG5` outline fonts (version 1.0) of five families: Kai Ti, Zheng/Song Ti, Hei Ti, Fang Song Ti, and Wei Bei Ti. We will release information about new fonts upon available. Since production of outline fonts is expensive, we charge a proper fee for using additional CTEX outline fonts under Unix.

Japanese and Korean language users: CTEX supports Japanese and Korean languages. Because of lack of font resource, currently we do not have any CTEX fonts available for these languages. However, users are able to produce the CTEX bitmap fonts using the utility `bitgen`. And outline fonts can be produced if there are bitmap fonts available. Any parties interested in supporting Japanese and Korean CTEX fonts should contact us.

Compatibility with other TEX softwares: CTEX is essentially compatible with other TEX packages using Chinese, Japanese and Korean languages. By properly modifying their TEX header files, these packages should go well with CTEX. It is recommended that users write their documents in CTEX style because of its simplicity. CTEX fonts are unique in that they are scalable to arbitrary size (outline fonts), fast, clean (number of files is minimal) and easy to generate (bitmap fonts). One CTEX font requires only one `tfm` file and one bitmap/outline font file. More importantly, CTEX is the only software supporting `128` oriental fonts in a single document.

Appendix D

Bugs Report

The following bugs have been identified:

- In LaTeX `\chapter`-like commands, oriental language characters do not work properly. This is due to the nature of the LaTeX commands, in which the CTeX macros do not expand properly. A different mechanism may fix the problem. [August 20, 1994]

- The paths defined in the `dvic.res` file should not contain the character ~ under Unix shell. That character represents the user's root directory under shell but C does not interpret it that way. [October 25, 1994]

All other bugs should be reported to Prosoft International: `prosoft@caprica.com`

Appendix E

License Agreement and Warranty

Except when otherwise stated in writing, prosoft international provides CTEX program "as is" without warranty of any kind, either expressed or implied, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. The entire risk as to the quality and performance of the program is with you. Should the CTEX program prove defective, you assume your own cost of all necessary servicing, repair or correction.

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