A Brief Introduction to Emacs and AUCTEX

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Contents

Overview of Emacs

- Emacs is a text editor with the following features
  - **Powerful**, a complete working environment: manage files and directories; run shell commands; write LaTeX files; debug programs...
  - **Customizable**: rebind any keys on the keyboard that you find comfortable to existing commands.
  - **Extensible**: create entirely new commands.
  - ...
- Issue the following command to install Emacs:
  ```
  sudo apt-get install emacs
  ```

Emacs terminology

- **frame**: a graphical window or terminal screen occupied by Emacs.
- **menu bar**, **tool bar**.
- **echo area**: where informative messages are displayed and where you enter information when Emacs asks for it.
- **mode line**.
- **scroll bar**.
- **buffer**: the text or other graphics you are editing or viewing.
- **window**: where the buffer is displayed.

Modes

- The modes set up an environment designed for the type of editing you are doing, with features such as having appropriate key bindings available and automatically indenting according to standard conventions for that type of document.
- **Major modes**: include modes for various programming languages.
    `LaTeX-mode Text-mode c++-mode`
- **Minor modes**: set or unset features that are independent of the major mode.
    `company-mode auto-fill-mode LaTeX-math-mode`
  `reftex-mode`

Emacs Commands and Keys

- C- indicates that the Ctrl key is pressed at the same time as the character that follows. Similarly, M- indicates the use of the Meta key.
- M denotes the Alt key, RET denotes the Enter key, DEL denotes the Backspace key, SPACE denotes the Space key.
- Emacs does not assign meanings to keys directly. Instead, Emacs assigns meanings to named commands, and then gives keys their meanings by binding them to commands.
- An Emacs command can be executed by typing
    M-x command-name
  or the key bound to it.

File-Handling Commands

- `C-x C-f` Find file and read it
- `C-x C-v` Read another file; replace the one read with C-x C-f
- `C-x C-s` Save buffer contents to file
- `C-x C-w` Write buffer contents to file
- `C-x C-c` Exit Emacs
- `C-z` Suspend Emacs

- `C-g` Get out of current command operation
- `C-x u(C-/, C-_)` Undo last edit
- `C-u n(M-n)` Repeat the next command n times

Cursor-Movement Commands

- `C-f(C-b)` Move *forward*(*backward*) one character
- `M-f(M-b)` Move *forward*(*backward*) one word
- `C-p(C-n)` Move to *previous*(*next*) line
- `C-a(C-e)` Move to beginning(*end*) of line
- `C-v(M-v)` Move forward(backward) one screen
- `M-<(M->)` Move to beginning(end) of buffer
- `C-l` Redraw screen with current line in the center

Deletion Commands

- DEL Delete previous character
- C-d Delete character under cursor
- M-DEL Delete previous word
- M-d Delete the word the cursor is on
- C-k Delete from cursor to end of line
- M-k Delete sentence the cursor is on
- C-x DEL Delete previous sentence

Kill and Yank

- Operating on a region.
- `C-@`(`C-SPACE`) Mark the beginning(or end) of a region
- `C-x h` Mark the whole buffer
- `C-w` Kill a marked region("cut")
- `M-w` "copy"
- `C-y` Yank("paste")
- `M-y` Yank(including earlier regions)

Search Commands

- C-s(C-r) Incremental search forward(backward)
- C-M-s(C-M-r) Regular expression search forward(backward)
- M-% Search and replace
  - y(SPACE) Replace and go the next instance
  - n Don't replace; move to the next instance
  - . Replace the current instance and quit
  - , Replace and let me see the result before moving on
  - ! Replace all the rest and don't ask
  - ^ Back to the previous instance
  - q Exit query-replace

Buffer-Manipulation Commands

- `C-x b` Move to specified buffer
- `C-x C-b` Display buffer list
- `C-x k` Delete specified buffer
- `C-x s` Ask whether to save each modified buffer

Window Commands

- `C-x 0` Delete current window
- `C-x 1` Delete all windows but this one
- `C-x 2` Divide the current window into two, one on top of the other
- `C-x 3` Divide the current window into two, side by side
- `C-x o` Move to the *other* window
- `C-M-v` Scroll other window

Detail Information Help Commands

- `C-h t` Run the Emacs tutorial
- `C-h b` Display all the key bindings for this buffer
- `C-h c` What command does this keystroke sequence run?
- `C-h k` What command does this keystroke sequence run, and what does it do?
- `C-h f` Describe function
- `C-h v` Describe variable
- `KEYS C-h` Display all the keystroke sequences with `KEYS` as prefix

Shell Mode Commands

M-! Run a shell command and display the results

- M-x shell Enter shell mode
- C-c C-c Interrupt current job; equivalent to C-c
- C-c C-d Send EOF character
- C-c C-z Suspend or stop a job; equivalent to C-z
- C-c C-u Erase current line; equivalent to C-u
- M-p(M-n) Retrieve previous(next) commands
- C-c C-o Delete output from last command
- C-c C-r Move first line of output to top of window
- C-c C-e Move last line of output to bottom of window
- C-c C-p(C-c C-n) Move to previous(next) command

Spell-Checking Commands

- M-$ Check the word the cursor is on or the word following the cursor.
- M-x ispell-buffer
    - r Replace word;
    - R Start a query-replace;
    - SPACE Skip;
    - i Insert into private dictionary;
    - a Accept the word for the rest of the session for all buffers;
    - A Accept the word for this session but only in this buffer.

Emacs Customization

- Some basic customization can be done via `Options` on the menu bar.
- You can also modify your ~/.emacs file. Here are some useful examples:

```
;; Grammar highlight
(global-font-lock-mode 1)
;; Highlight current line
(global-hl-line-mode 1)
;; Disable automatic creation of backup files
(setq make-backup-files nil)
(fset 'yes-or-no-p 'y-or-n-p)
;; Fullscreen
(add-to-list 'default-frame-alist '(fullscreen .
maximized))
```

Emacs Customization: Installing company

- Temporarily disable signature verification:
  `M-x customize-variable RET package-check-signature RET`
- Install a package:
  `M-x package-install RET gnu-elpa-keyring-update RET`
- Install the company package:
  `M-x package-install RET company RET`
- Add the following line to your ~/.emacs file:
  `(global-company-mode 1)`

Overview of AUCTEX

- AUCTEX is a comprehensive customizable integrated environment for writing input files for LATEX using Emacs.
- AUCTEX supports fast insertion of macros, environments, and sectioning commands by providing completion alternatives and prompting for parameters.

Installing and Customizing AUCTEX

- Issue the following command to install texlive-full:
    ```
    sudo apt-get install texlive-full
    ```
- Install AUCTEX within Emacs(This step may take a long time):
    ```
    M-x package-install RET auctex RET
    ```
- Add the following lines to your ~/.emacs file:
    ```
    (setq TeX-auto-save t)
    (setq TeX-parse-self t)
    (setq-default TeX-master nil)
    ```
- To insert $ in pair:
    ```
    M-x customize-variable RET TeX-electric-math RET
    ```

Inserting Macros: C-c RET

- Type C-c C-m, or simply C-c RET, and select a macro. Use TAB for completion.
- The following can be added: usepackage, frac, binom, biggl...

Inserting Sectioning Commands: `C-c C-s`

- Type `C-c C-s`, and select a sectioning type.
- The following can be added: `chapter`, `section`, `subsection`...

Inserting Environments: `C-c C-e`

- Type `C-c C-e`, and select an environment type.
- The following can be added: `equation`, `itemize`, `figure`, `table`...
- Close environment: `C-c ]`

Compiling and Debugging

- C-c C-c Compile the document
- C-c C-v Quick view
- C-c C-a Compile the document and run the viewer
- C-c ' Display the first error, fix it in the document buffer and use it again to get to the next error
- M-x TeX-error-overview RET Display a nicely formatted list of all errors and warnings reported by the compiler.

Changing the Font

- Try `C-c C-f C-e`, `C-c C-f C-b`
- Try `C-c C-f C-a`, `C-c C-f C-b`, `C-c C-f C-s` in math environments.
- Use `C-c C-f C-h` to see all available choices.
- You can also add other shortcuts by customizing the variable `LaTeX-font-list`:
    - `M-x customize-variable RET LaTeX-font-list RET`

Entering Mathematics

- AUCTEX offers a special minor mode for entering text with many mathematical symbols. Enter this mode by typing C-c ~.
- To enable LaTeX Math mode by default, add the following line to your ~/.emacs file:

    (add-hook 'LaTeX-mode-hook 'LaTeX-math-mode)

- Some examples:
    - ` a inserts $\alpha$ (` is the "backquote" key above TAB).
    - ` A inserts $\forall$, ` I inserts ∞, ` C-l inserts lim...
    - Type ` C-h to see a full list of available symbols.
    - You can add other shortcuts by customizing the variable LaTeX-math-list.
    - If you don't like typing `, you can customize the variable LaTeX-math-abbrev-prefix.

Multifile Documents

- When writing a relatively large document, it's a good habit to spread it over many files. This can be done by having a "master" file in which you include the various files with the TeX macro '\input' or the LaTeX macro '\include'.
- C-c C-_ Set master file
- C-c C-^ Switch to master file
- C-c C-d Save document

Preview-LaTeX

- "What you see is what you get."
- `C-c C-p C-e` Generate previews for environment
- `C-c C-p C-s` Generate previews for section
- `C-c C-p C-b` Generate previews for buffer
- `C-c C-p C-c C-e` Remove previews from environment
- `C-c C-p C-c C-s` Remove previews from section
- `C-c C-p C-c C-b` Remove previews from buffer
- Preview may not work under some color theme and some AucTEX version due to a bug caused by Ghostscript!!!

RefTEX

- RefTEX is a specialized package for support of labels, references, citations, and the index in LATEX.
- To turn RefTEX Mode on and off in a particular buffer, use M-x reftex-mode RET. To turn RefTEX Mode on for all LATEX files, add the following line to your ~/.emacs file:

      (add-hook 'LaTeX-mode-hook 'turn-on-reftex)

Table of Contents: C-c =

- Pressing the keys C-c = pops up a buffer named '*toc*' showing the table of contents of the document.
- Here is a list of special commands in the '*toc*' buffer. A summary of this information is always available by pressing ?.
    - p(n) Goto previous(next) entry in the table of contents.
    - C-c C-p(C-c C-n) Goto previous(next) section heading.
    - N z Jump to section N.
    - SPACE Show the corresponding location in another window.
    - TAB Goto the location in another window.
    - RET Go to the location and hide the '*toc*' buffer.
    - f Toggle follow mode. When follow mode is active, the other window will always show the location corresponding to the line at point in the '*toc*' buffer.
    - l Toggle the display of labels in the '*toc*' buffer.
    - q Hide the '*toc*' buffer.

Creating Labels: C-c (

- Typing C-c (will insert a label at point. RefTEX will either
  - derive a label from context (default for section labels)
  - prompt for a label string (default for figures and tables) or
  - insert a simple label made of a prefix and a number (all other environments).

Referencing Labels: C-c)

- Typing C-c) will make a reference at point. This shows an outline of the document with labels of a certain type (figure, equation,...) and some label context. Selecting a label inserts a macro into the original buffer.

Citations: C-c [

- Typing C-c [will let you specify a regular expression to search in current BibTeX database files and pull out a list of matches for you to choose from.

Viewing Cross-References: `C-c &`

- When point is on the key argument of a cross-referencing macro(\label, \ref, \cite...) or inside a BibTEX database entry, you can press `C-c &` to display corresponding locations in the document and associated BibTEX database files.

编写中文文档

Add the following lines to your ~/.emacs file:

```
alias emacsCHN='LC_CTYPE=zh_CN.UTF-8 emacs'
```

Issue the following from command line:

```
emacsCHN &
```

Use the package CJKutf8 and add the following to your .tex file where you want Chinese characters inserted:

```
\begin{CJK*}{UTF8}{gkai}

  在此处插入中文

\end{CJK*}
```

References

- Learning GNU Emacs
- Linux in a Nutshell
- GNU Emacs Manual
- https://www.gnu.org/software/auctex/manual/auctex.html
- https://www.gnu.org/software/auctex/manual/reftex.html