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Emacs Mini Manual (PART 1) - THE BASICS

Before we start:

- Please remember that you can always access a section using the floating table of contents at the upper-right corner of your screen.
- Many people asked how this manual can be "mini", since it is pretty big for an online single page article. Yes, if this page is exported to PDF, it is more than 40 pages. However, this manual is "mini" relative to the size of the official Emacs manual, which is more than 600 pages. That's why.
- If you find the page is loading too slow for you, you can always clone the git repo of this mini manual and read it offline: https://github.com/tuhdo/tuhdo.github.io

Why Emacs?

In Emacs, you can do many things aside from editing. Emacs is a programming platform, not just another editor in the sense that people think. For more details, read the Appendix.

Take a tour from the official Emacs homepage.

Here is my personal tour, **with 3rd party plugins added**. Don't worry if your Emacs does not look like the screenshots. You can have something like mine and even better, but for now you need to get a solid foundation. The screenshots are just for show. Even though, after going through this guide, you will be able to browse the Linux kernel source tree with ease.

- Performance: Editing a 39MB C source file with no problem. But well, it's not your favorite editor's fault if it crashes from editing such a large source file.

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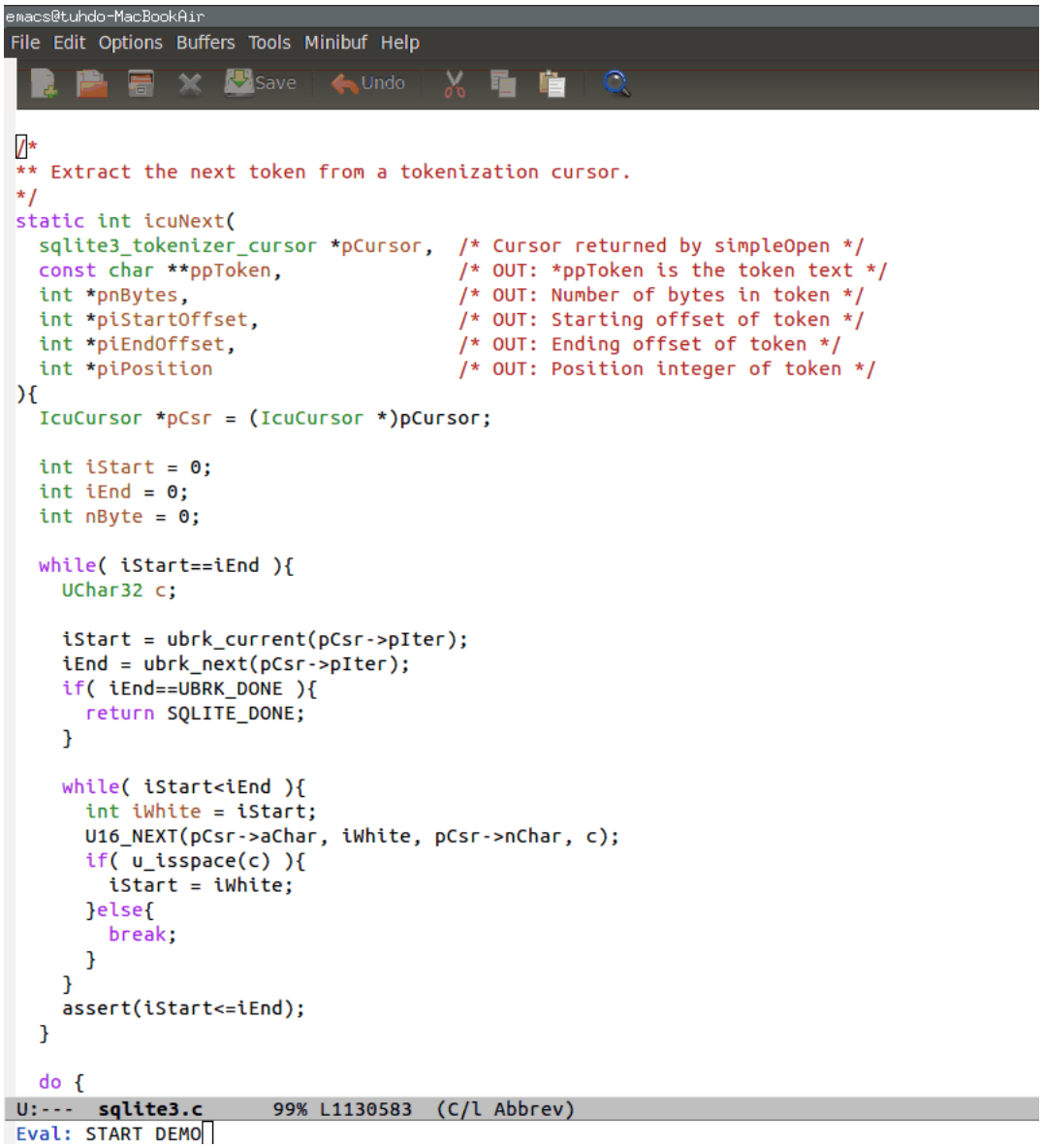

- Programming:
  - Jump to any header file:

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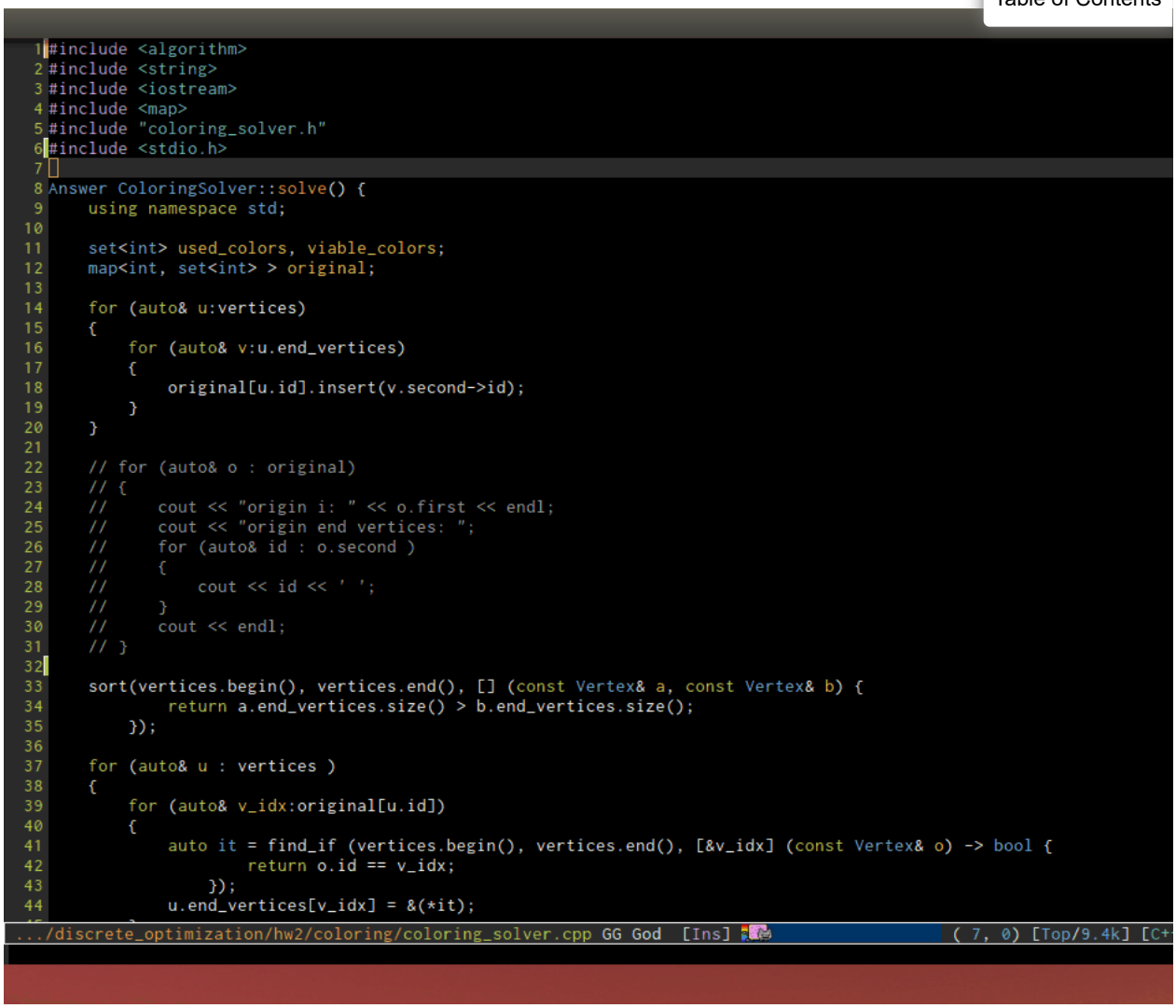

- Autocompletion: Pay attention to completion candidates when `include <linux/printk.h>` is present and when it's not.

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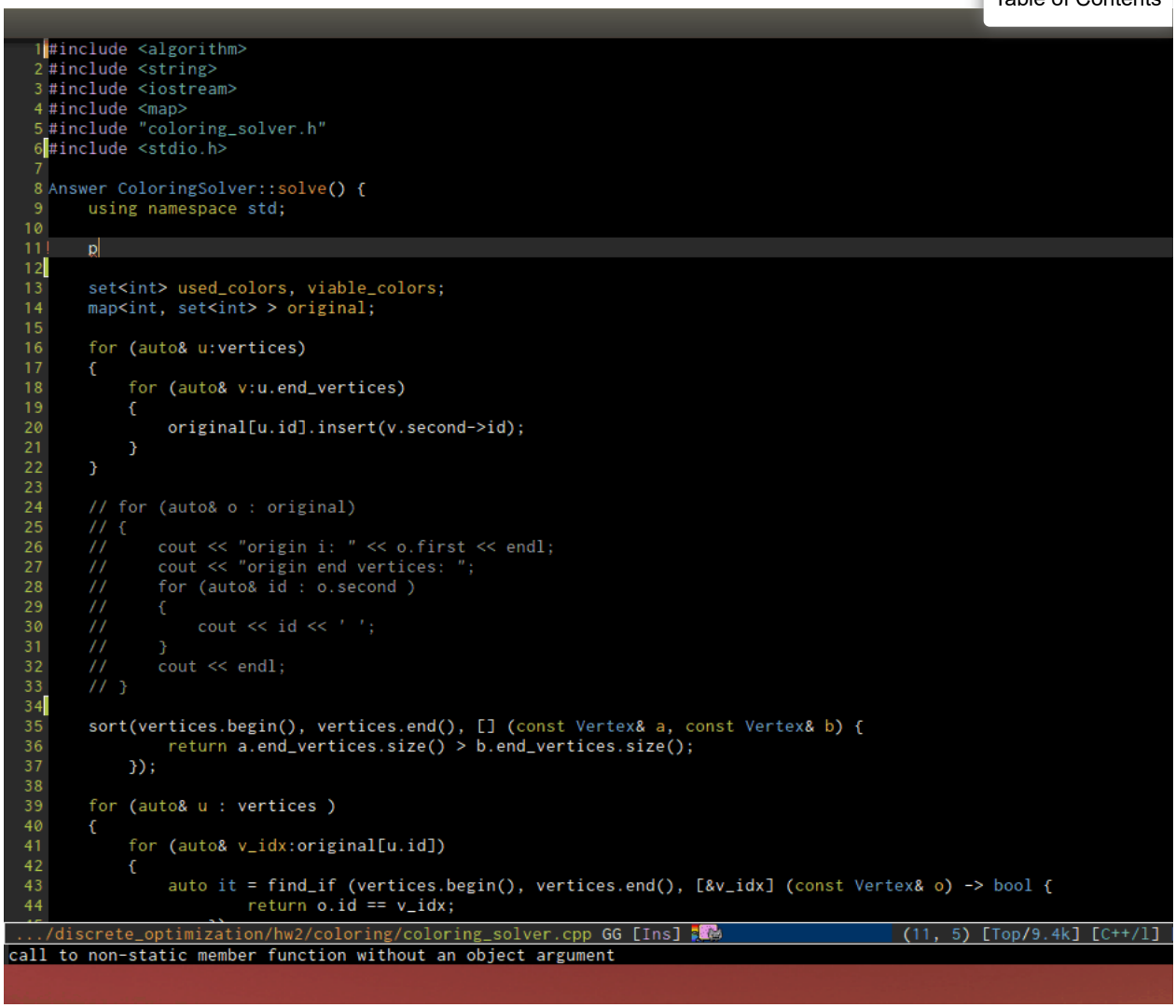
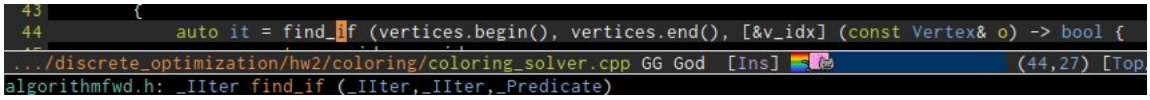


- Showing function arguments:



- Quickly comment multiple lines:

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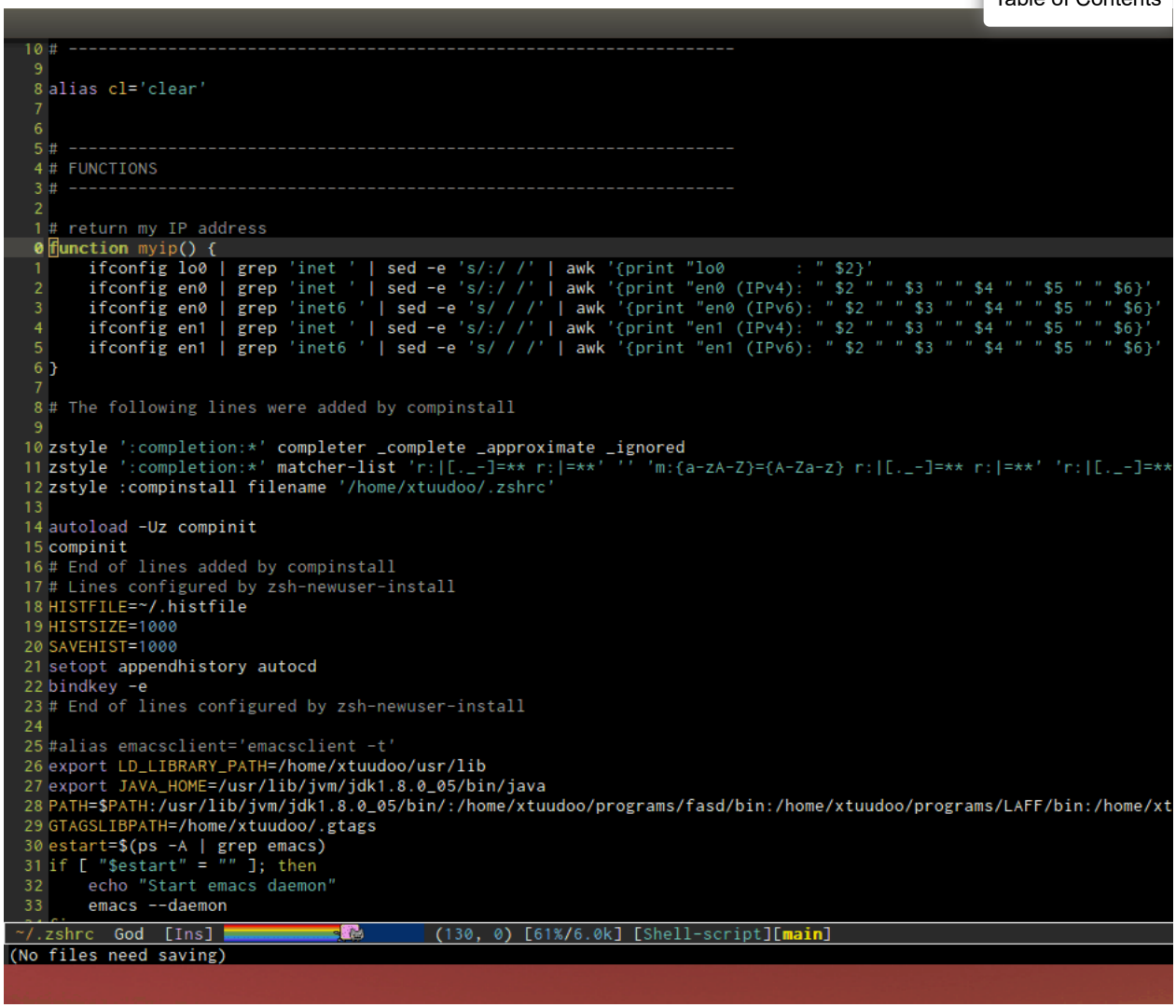

- GDB:

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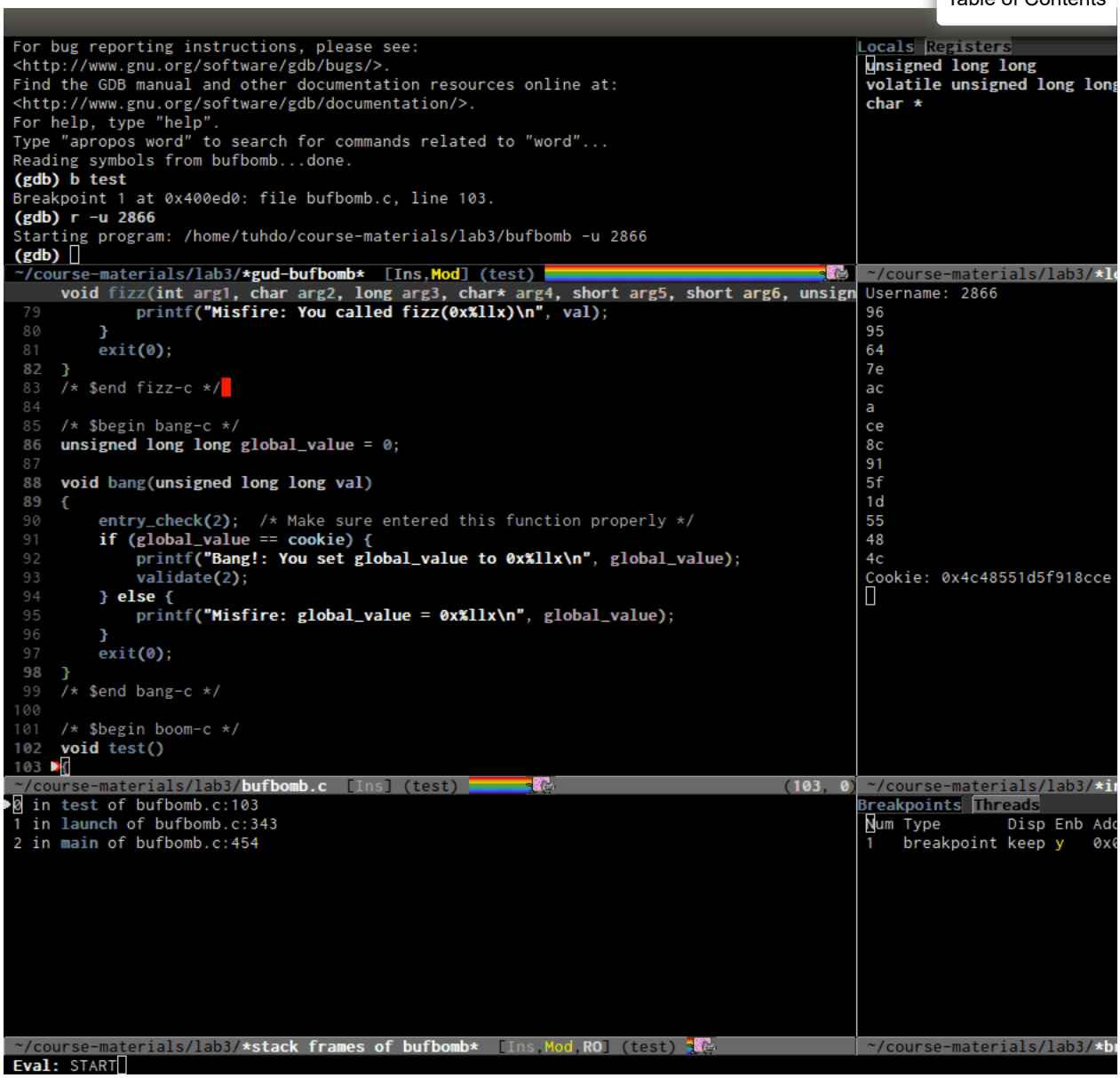

- Diff between current editing file and latest file revision:

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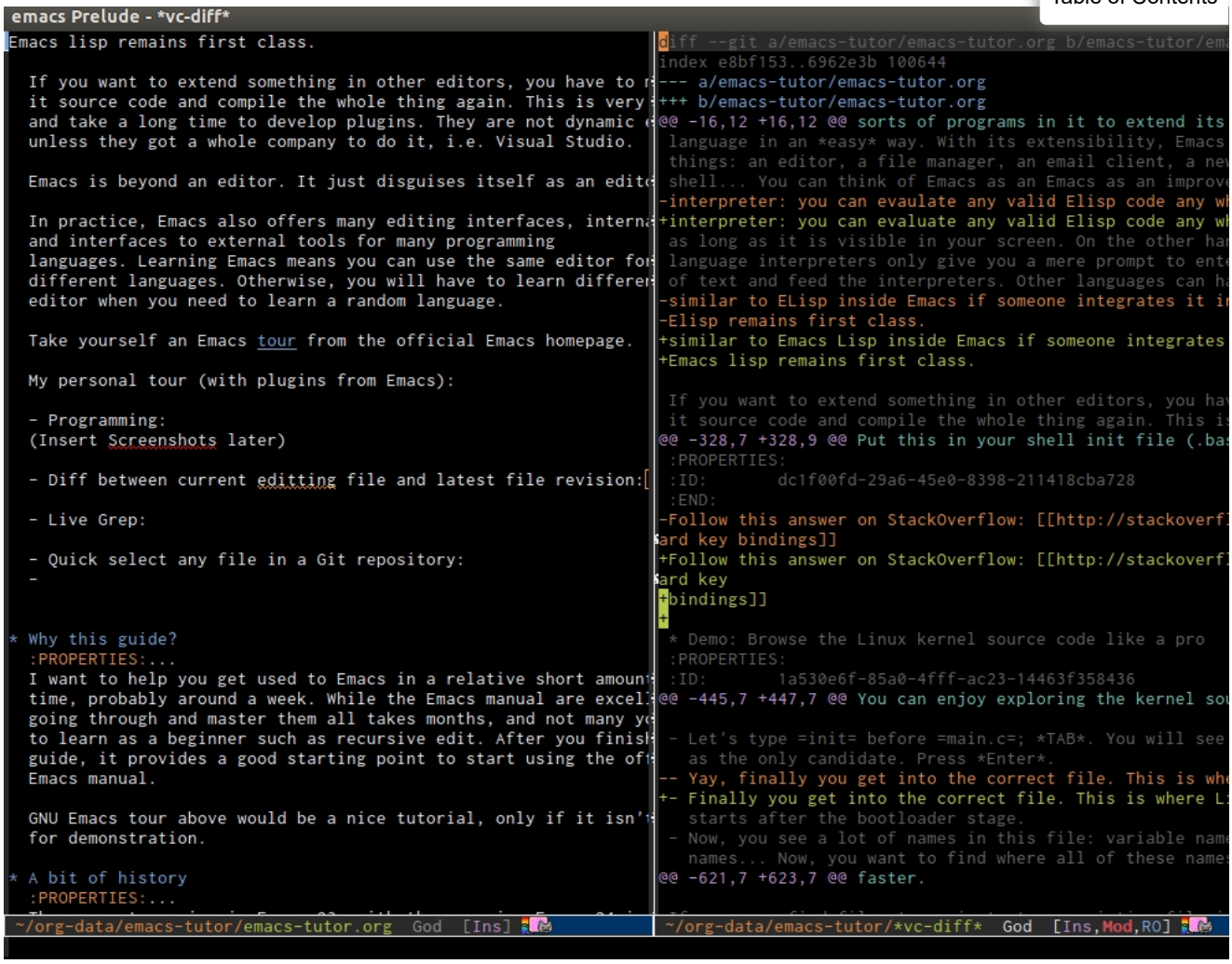

- Magit: From unstage -> stage -> commit -> push

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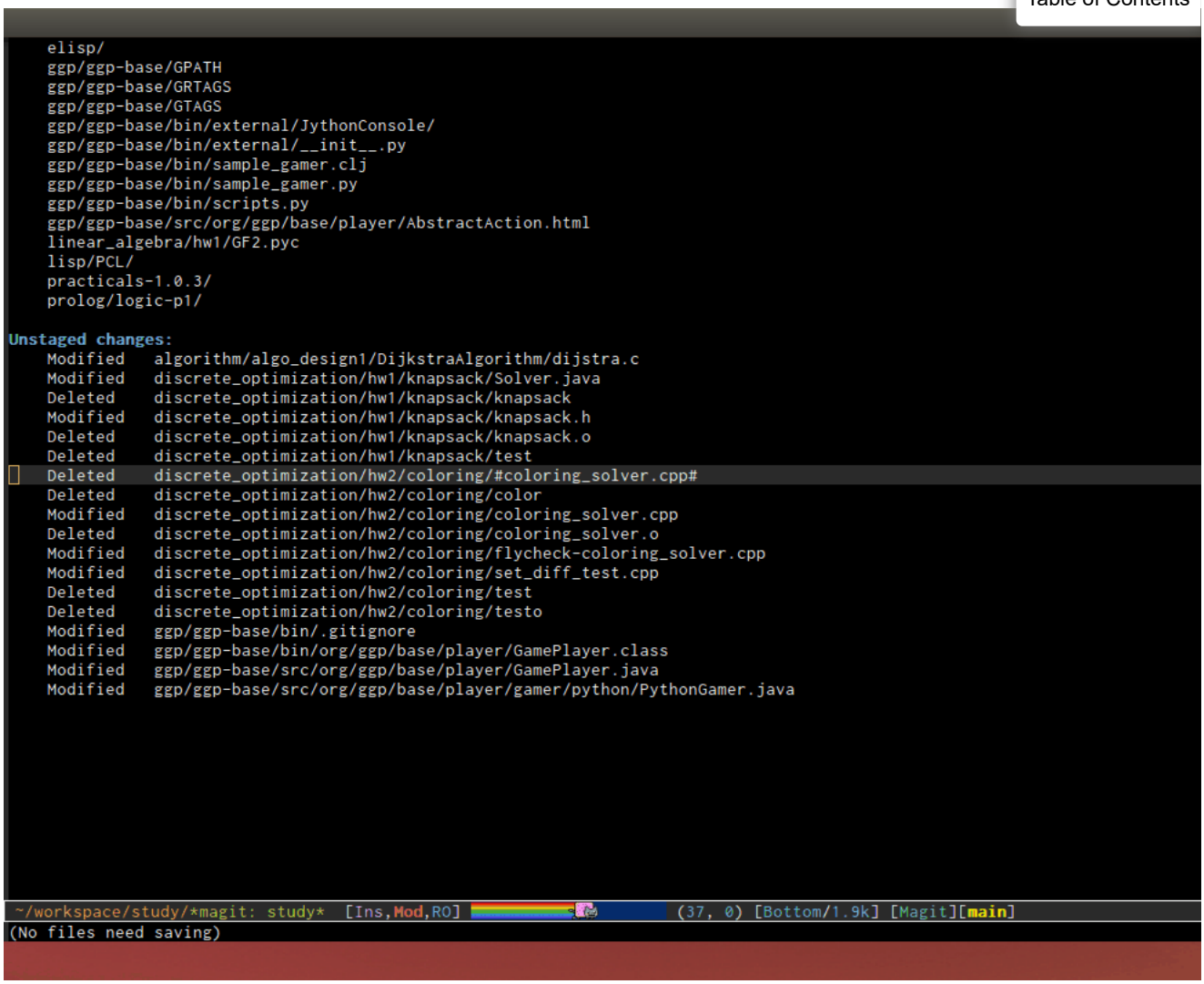

- Live Grep:

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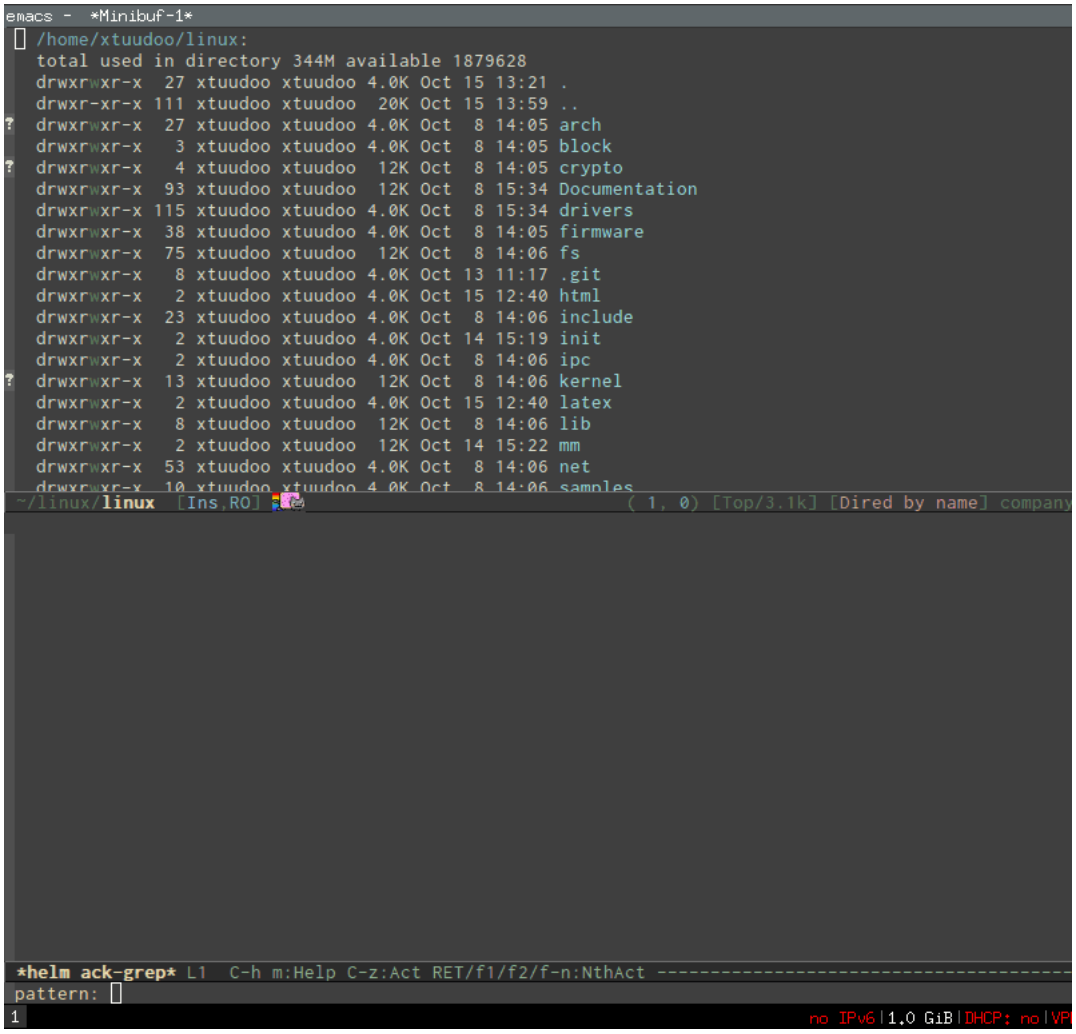

- Quickly select any file in a directory under a Version Control System, for example from the Linux kernel. Note that in the demos you may see me type in the commands. You can think of it like the start menu in Windows, but those commands can actually be executed quickly with a shortcut.

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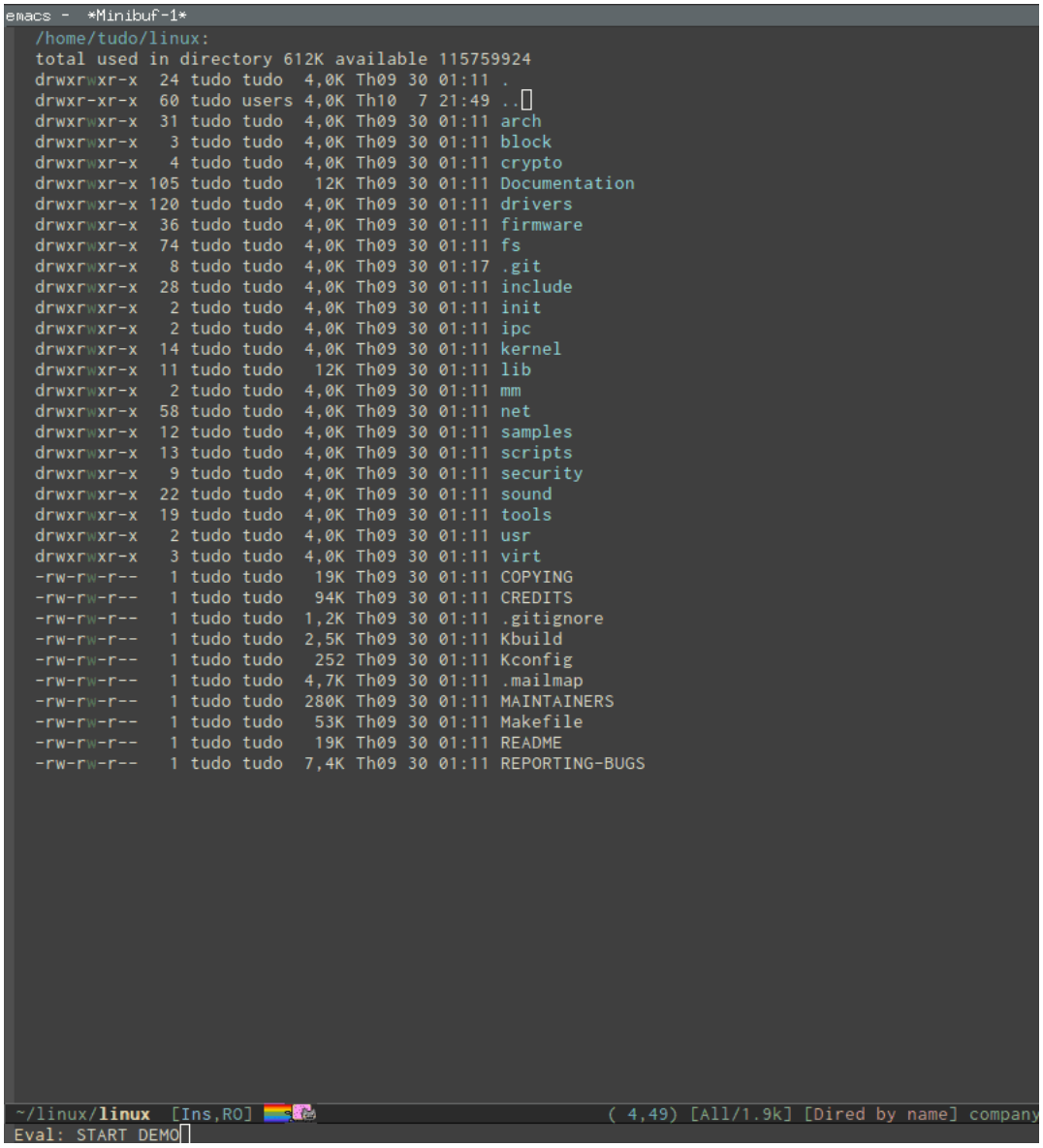

- Quickly select any file/directory from a previous working session:

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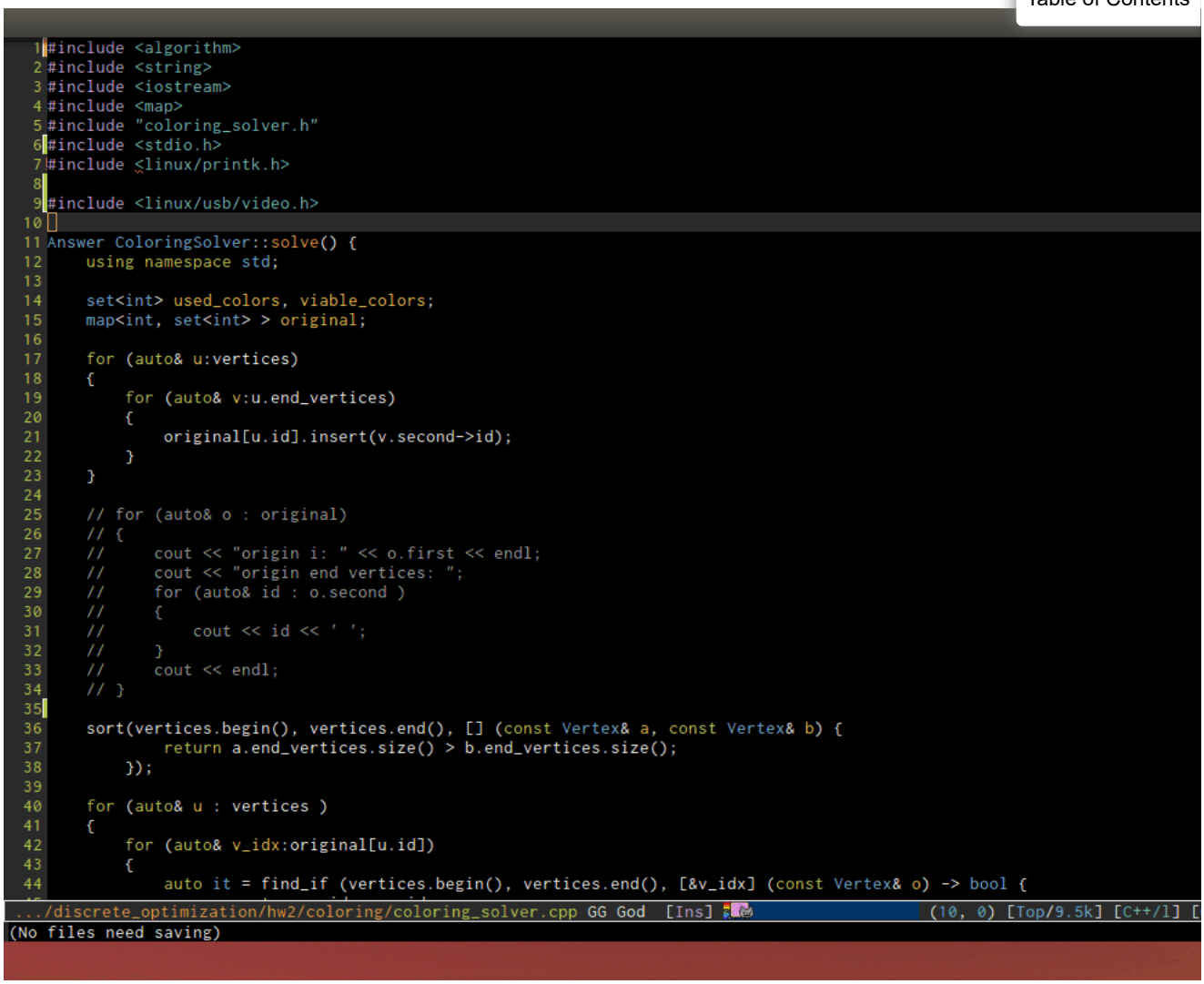
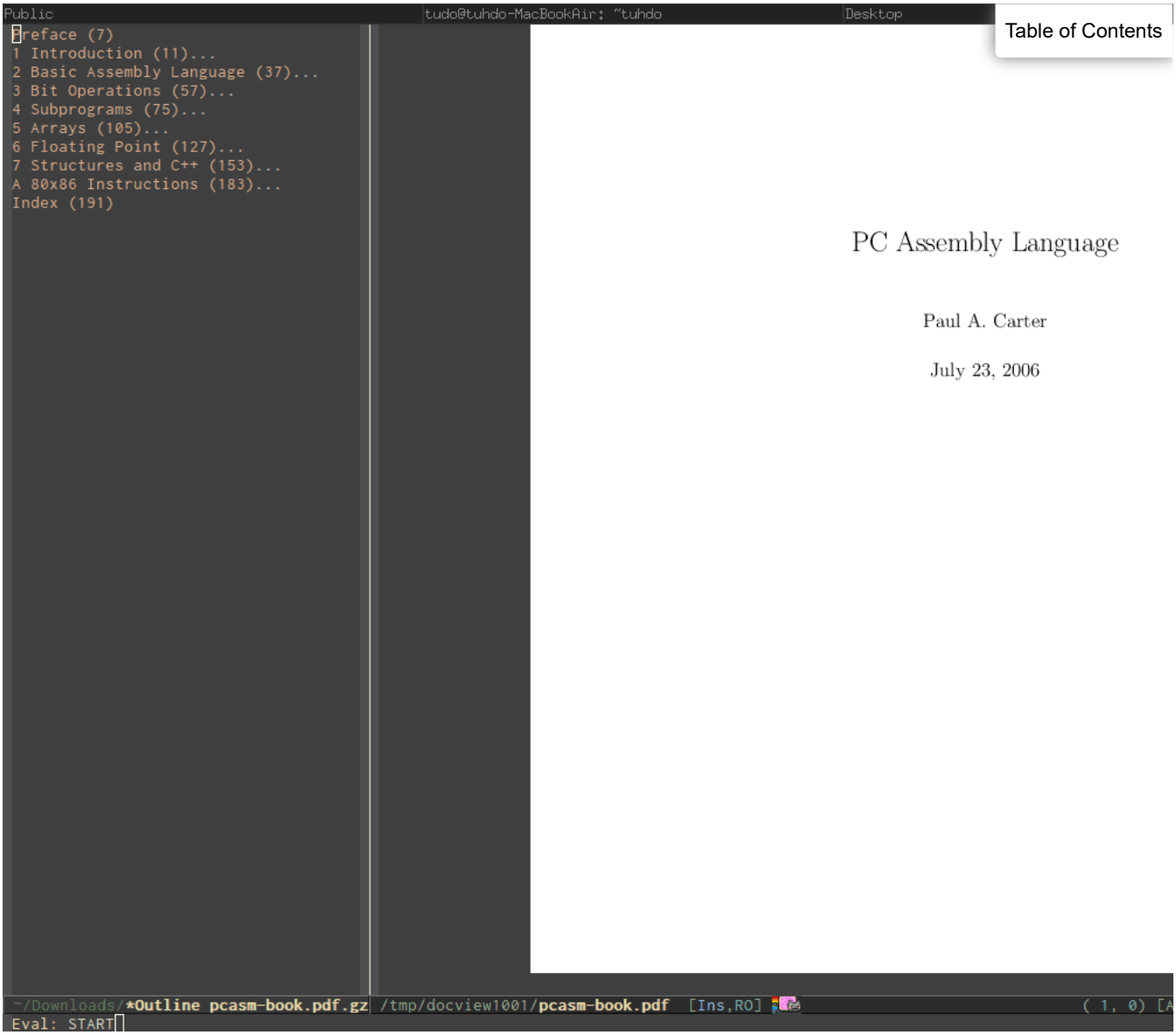


- Emacs is a PDF Reader: I can search text in the PDF file with highlighting and a table of contents side by side. All can be controlled with keyboard.



/

Finally, Emacs is featured in Tron Legacy.

Why this guide?

Let's look at part of the Emacs manual:

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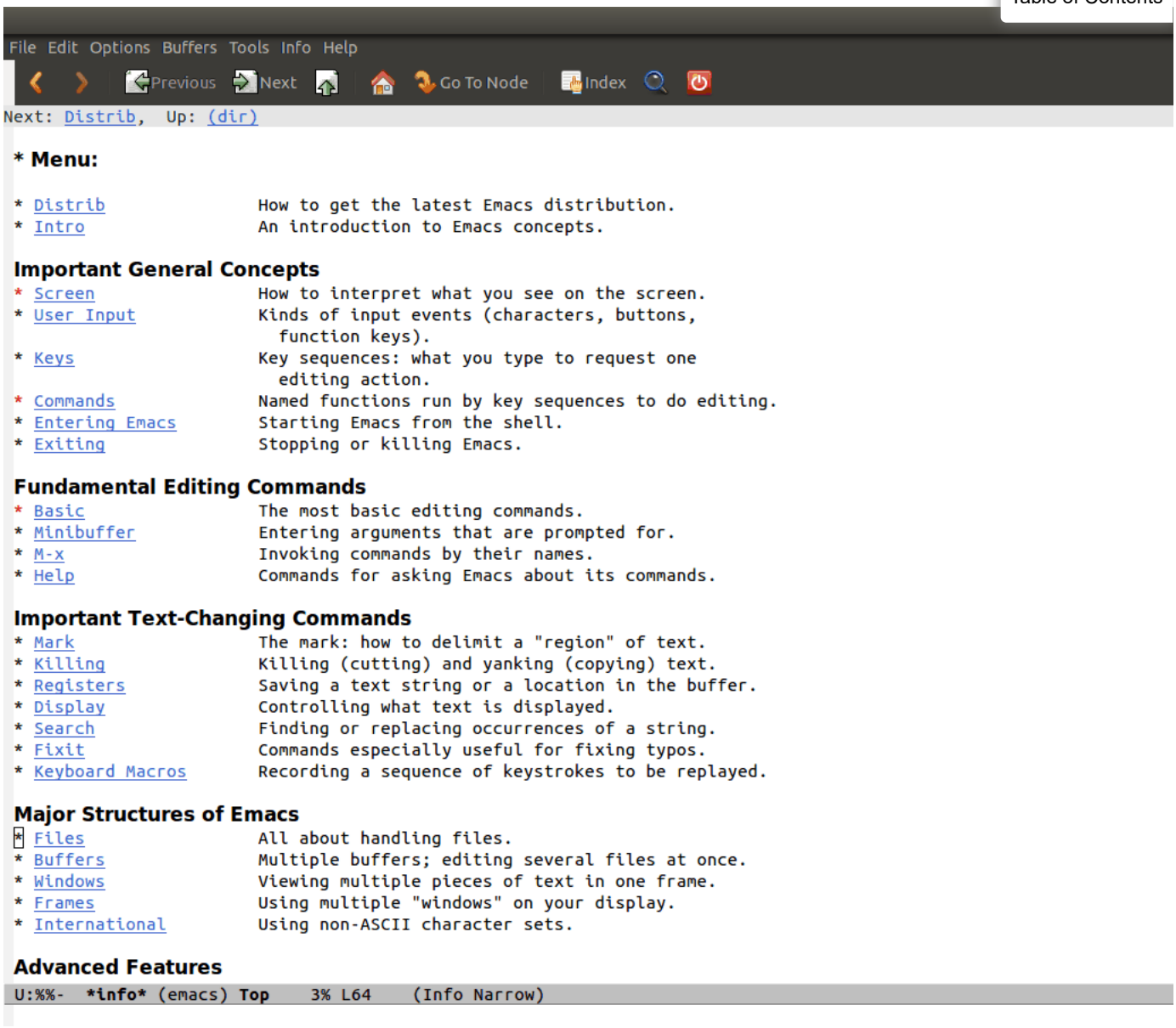

"All about handling files" is inside the `Files` entry, which includes how to open files, save files, revert and auto-revert files, compare files..., many things from basic to advanced. If you are a beginner reading the Emacs manual, you have to actively search the manual to learn how to do the basic common tasks you know from other editors.

It would take a long time before you can start using Emacs for basic operations (e.g. opening files) if you read the manual cover to cover. The "Fundamental Editing Commands" section is placed before the "Major Structures of Emacs" section that contains information on file handling. How can you learn the basic editing commands if you don't even know how to open a file? The problem with the manual is that it's not organized for a new Emacs user to progressively learn Emacs.

I want to help you use Emacs efficiently in a relatively short amount of time, probably around a week. That's why I wrote this guide especially for complete beginners. The Emacs manual is excellent, but it would be much easier with a solid ground understanding and after using Emacs for a while.

This guide provides a good starting point for the official Emacs manual. The GNU Emacs tour would be a nice tutorial, only if it isn't made for demonstration.

A bit of history

Quote from GNU Emacs homepage:

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For those curious about Emacs history: Emacs was originally implemented in 1976 on the MIT AI Lab's Incompatible Timesharing System (ITS), as a collection of TECO macros. The name “Emacs” was originally chosen as an abbreviation of “Editor MACroS”. This version of Emacs, GNU Emacs, was originally written in 1984. For more information, see the 1981 paper by Richard Stallman, describing the design of the original Emacs and the lessons to be learned from it, and a transcript of his 2002 speech at the International Lisp Conference, My Lisp Experiences and the Development of GNU Emacs. Here is the cover of the original Emacs Manual for ITS; the cover of the original Emacs Manual for Twenex; and (the only cartoon RMS has ever drawn) the Self-Documenting Extensible Editor.

"I don't want a complicated editor, I want something simple like Notepad"

Well, that's your choice. But I suggest that writing code without any support is harmful.

A programmer should automate things as much as possible if the automation cost does not outweigh the cost of doing it manually. One *really easy* way to do this is by using a good editor that automates many menial and tedious tasks. For example, one of the things that annoy me is using the command `cd` to change into a deep directory path like this:

```
/path/to/a/very/long/long/long/long/long/long/..../directory/
```

In Emacs, if you have a directory under a version control system, you can immediately jump to any file quickly, even if it is buried 20 levels deep (as demonstrated at the beginning).

Another example is quickly commenting out multiple lines of code in a programming language that only supports single line comments. In many editors you would have to tediously comment them out line by line. But in Emacs you can simply highlight the lines and press a shortcut to comment them out.

Many people think that writing programs manually makes them much cooler than "amateurs" that use a fancy `Integrated Development Environment`. I also used to think like that because working in a Linux environment requires understanding of the underlying processes, such as building software using a Makefile in C/C++, automating with a shell script, installing software by compiling... And this is already considered "user friendly" in the Linux world, as opposed to "click the nice little play button" in a typical IDE. However, I was wrong. While working with such tools allows me to understand what's going on, I do not need to type in code manually to understand it. If you get what a for loop does, typing it character by character is only tedious and interrupts your thinking.

Writing code manually won't make you smarter, because you did the thinking before you started to type. Typing is just a mere reflection of your thoughts into the editor. You need to finish typing as fast as possible, because the quicker you finish, the quicker you can get back to your thinking. Only thoughts matter, and there's no value in manually typing the same things thousands of times. I must say, `Cut`, `Copy` and `Paste` are really great ideas and great automation tools because of their simplicity.

If your job may require you to use an esoteric in-house programming language and if you don't like it, having an editor to help you finish the tasks as soon as possible is a way to make yourself happier.

Typing too much can also lead to RSI. Manually typing too much code is harmful to your fingers. At least if you use a handsaw instead of a circular saw, you do some physical exercise in the process.

In Sum:

- Manually typing does not make you smarter. Not in any form.
- Manually typing does not make you a better programmer.
- Manually typing or other tedious tasks (navigating the file system, remembering changes you made to your files...) are a waste of time if automating is possible. Automate as much as you can.
- Good editors help you automate boring tasks.
- Typing too much potentially leads to RSI.

Instead of wasting your time and memory on tedious tasks, you could save it for more interesting things.

Installation

Linux:

Easy way to install if you are using Ubuntu: `sudo apt-get install emacs`. If you use other Linux distributions, use the package manager of your distribution and install Emacs. However, the package manager only has the

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latest stable Emacs; if you want the latest Emacs, build it from source according to the instructions below.

To use Emacs with GUI:

- Install GTK 3: `sudo apt-get install libgtk-3-dev libgtk-3-common libgtk-3-0`
- Download Emacs; or if you prefer the latest Emacs, get it from source: `git clone http://repo.or.cz/r/emacs.git`
- If you download from the homepage, unpackage: `tar xvf emacs-*.tar.gz`
- Install GTK: `sudo apt-get install libgtk-3-dev libgtk-3-common libgtk-3-0`. You have to use gtk3 to be able to use true type fonts.
- `cd emacs-<version>*`
- `./autogen.sh`
- Add prefix and path to where you want to install. This is useful if you work on a remote server without root access: `./configure --with-x-toolkit=gtk3 [--prefix=/path/to/dir]`

  You should use GTKx 3, so you will be able to use true type fonts such as Inconsolata for a better Emacs experience.
- `make`
- `sudo make install`

If `./configure` tells you there are dependencies missing, you should install them. Recommended dependencies: libtiff, libgiff, libjpeg, libpng and libxml2 for viewing and browsing web inside Emacs:

```
sudo apt-get install libtiff5-dev libpng12-dev libjpeg-dev libgif-dev libgnutls-dev libxml2-dev
```

Using in Terminal only:

- Download and unpackage as above.
- `./configure --without-x [--prefix=/path/to/dir]`
- `make`
- `sudo make install`

If you don't like to compile Emacs yourself, install from the package manager of your Linux distribution.

After installation is done, add this line to your **.bashrc** or **.zshrc**:

```
alias em='emacs'
```

So you can start Emacs as fast as vim!

Windows:

You can either download it on GNU Emacs homepage or better, download the latest 64 bit version: http://semantic.supelec.fr/popineau/programming-emacs.html.

After that, unpackage it in `C:\Program Files\` and create a shortcut to `C:\Program Files\Emacs\bin\emacsclientw.exe` on desktop.

Mac OS X:

Download compiled Emacs for Mac OS X: http://emacsformacosx.com/.

You can also use this version that is more integrated with Mac OSX: https://github.com/railwaycat/emacs-mac-port

Swap Control and Capslock

Swapping Control and Capslock, in general, is not required to make the best out of Emacs, if you at least use a regular key PC keyboard or better. However, it is not nice at all on a laptop keyboard. If you use a laptop keyboard for writing code, I strongly recommended to swap Control and Capslock for a better Emacs experience.

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Swapping Control and Caplock will not only benefit your Emacs usage, it is beneficial in general, as Control is a much more frequently used key than Capslock. Popular shells like Bash or Zsh use Control a lot for quick cursor movement.

Windows

Follow this guide: Swapping Capslock and Control keys

Linux

Put this in your shell init file (.bashrc, .zshrc...):

```
/usr/bin/setxkbmap -option "ctrl:swapcaps"
```

If you use Ubuntu, follow this guide: Swap caps lock and ctrl in ubuntu 13.10.

Mac OS X

Follow this answer on StackOverflow: Emacs on Mac OS X Leopard key bindings

If you don't like to swap Capslock and Control...

You can use your palm to press Control in standard PC keyboard.

Concepts

Command

In Emacs, every user interaction is a function execution. You press a key to insert a character, Emacs runs `self-insert-command`. There are two types of functions in Emacs:

- **Normal functions**: These are like functions in other programming languages, and are used for implementing features in Emacs. Users do not need to care about these functions, unless they want to implement something or modify an existing implementation.
- **Commands**: Commands are like functions, but interactive. It means, commands are features provided to users and users directly use them.

`execute-extended-command` is bound to **M-x**.

Emacs Key Notation

Taken from here: EmacsWiki

Prefix	Meaning
`C-`	(press and hold) the Control key
`M-`	the Meta key (the Alt key, on most keyboards)
`S-`	the Shift key (e.g.'S-TAB' means Shift Tab)
`DEL`	the Backspace key (not the Delete key). Inside Emacs, `DEL` is written as `<backspace>`.
`RET`	the Return or Enter key
`SPC`	the Space bar key
`ESC`	the Escape key
`TAB`	the TAB key

A notation such as **C-M-x** (or, equivalently, **M-C-x**) means press and hold both Control and Meta (Alt) keys while hitting the **x** key. From now on, I won't say something like "Press **M-x**" anymore. For example, if I say "**C-x C-f** your files", you should replace **C-x C-f** with its command like this in your head: "`find-file` your files". All

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commands use verbs, I think, so don't worry. Try to recall the command from the key binding; it will help you get used to Emacs quicker. One exception though: I only say "press **key**" if **key** is a single character on the keyboard.

If you see `M-x command`, it means you need to **M-x** and type **command**.

A prefix key is a part of a full key binding. For example, a full key binding is **C-x r l** to run the command `bookmark-bmenu-list`, then **C-x** and **C-x r** are its prefixes. Note that key sequence such as **C-x** and **M-x** are considered a single character. Knowing prefix key is handy: if you forget key bindings of some commands that use the same prefix key, and remember the prefix, you can press the prefix key and **C-h** to get a list of commands with that prefix.

For example, **C-x r** is the prefix for *register* and *bookmark* commands in Emacs. However, you forget a specific key binding for a command in those features. **C-x r C-h** lists all key bindings that have prefix **C-x r**.

Finally, **C-g** executes the command `keyboard-quit`, which cancels anything Emacs is executing. If you press any key sequence wrongly, **C-g** to cancel that incorrectly pressed key sequence and start again.

As you gradually learn Emacs, you will see the key bindings are really systematically organized and mnemonic. Whenever you see key bindings ending with **n** and **p**, it usually means **next** and **previous**; **o** means **open**; **h** means **help**; **C-h** is standard prefix for help commands; key bindings such as **o** and **C-o** are frequently used in many built-in tools such as *Dired*, *Ibuffer*, *Occur*...

Emacs Keys are easy to remember

The key bindings have a few simple and easy to remember rules:

- **C-x** prefix is for default and global binding that come with Emacs.
- **C-c** prefix is for users to define.
- **C-u** is for altering behaviors of commands. That is, one command can behave differently depending on how many **C-u** you pressed first before executing a command. Mostly you just have to hit **C-u** once.
- **C-<number>** like **C-1**, **C-2**... is similar to **C-u**, but passing a number to a command. Usually, the number specifies how many times you want to repeat a command.

You will learn about **C-u** and **C-<number>** in `Prefix Arguments` section.

Most commands can be organized in an easy to remember way. For example, command like `helm-do-grep` (the command belongs to `Helm`, a 3rd party extension to Emacs) can have a key binding like **C-c h g**. The **h** stands for `Helm` and **g** stands for `grep`. So, key bindings are not difficult to remember.

Ask for help - from Emacs

Built-in help system

I will describe some most useful commands based on my experience. I will not list all, so you have to rely on Emacs to get your information:

C-h m runs `describe-mode` to see all the key bindings and documentation of current major mode and minor modes of a buffer.

C-h w runs `where-is` to get which keystrokes invoke a given command.

C-h c runs `describe-key-briefly` to find out what command is bound to a key. For example, after **C-h c**, run **C-x C-f** gives you **find-files**.

C-h k runs `describe-key` to find out what command is bound to a key, along with the documentation of the command. Use this if you want to know how to use a command.

C-h e runs `view-echo-area-messages`, allow you to see the logging of echo area messages.

C-h v runs `describe-variable`, and asks you for a variable; you can **TAB** to complete a variable. This command is important, because aside from describing a variable, it allows you to customize the behavior of Emacs and 3rd party packages. But for now, you don't need it.

C-h C-h runs **help-for-help**. Use this command if you want to see a list of available help commands. Remember, if you partially remember a key binding, just press as much as you can remember and then press **C-h**, Emacs

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will list available commands for that prefix. Prefix **C-h** is no exception. **C-h C-h** simply returns all key bindings and commands of prefix **C-h**.

Info

`M-x info` or **C-h i** to see all the Info manual in Emacs. If you want to learn more about Emacs, after reading my series of manuals, the official Emacs manual in Info.

`M-x info-emacs-manual` or, **C-h r**, or **<f1> r** to see manual section for Emacs.

Use Info often whenever you need to learn something in Emacs. Use it early to create a good habit of reading documentation, and this is beneficial not only for Emacs.

Man

You can view man pages with two commands:

- `M-x man`: Get a UNIX manual page and put it in a buffer.
- `M-x woman`: Browse UN*X man page for TOPIC (Without using external Man program). It means, you can view man page without having the `man` program installed, while the `man` command above invokes external `man` program.

Point

Point is your current cursor position. From now on, instead of saying "current cursor", I say "point".

Opening files

Let's learn one especially handy command. `M-x find-`, then press **TAB**. You will see Emacs offers you a list of possible commands with prefix `find-`. Select the command `find-file`, either by clicking on it in the list; or keep typing a few more characters, and pressing **TAB** until the command is completed. After `find-file` is in your prompt, press **RET**. For quickly running `find-file`, you can use key binding **C-x C-f**.

You can use **wildcard expression** to select more than one file. For example, if your directory contains these file:

- `file_a_1.c`
- `file_a_2.c`
- `file_a_3.c`
- `file_b_1.c`
- `file_b_1.h`
- `file_b_2.c`

Then in **find-file** prompt, you can open all file with extension `.c` like this: `file*.c`. Or if you only want to select file with character `a` in it: `*a*.c`. Or if you only want to select file with `1` and extension `.c.` in it: `*1.c`. Basically, wildcard expression `*` accepts anything.

During the exercise, if something happens, for example, you press the wrong keys and Emacs is behaving weird, just press **C-g**.

The command you have just executed is for browsing and opening files in Emacs, similar to `Open With` in regular editors, except that instead of navigating with the mouse, you navigate with keyboard, which is much faster.

If you use `find-file` to navigate to an existing file in a deep directory and press **RET**, it opens that file. Otherwise, if the file does not exist and you press **RET**, you create a new file. Woot, two features in a single command, so convenient. If you intend to open a file at first, but then realize that you want to create a file there, `Open With` doesn't allow you to do that. You have to navigate all the way back with typical **New File** feature in regular editors.

Another interesting command in Emacs is `find-file-at-point`. What this function does is that if you have a path to a directory or file under point, `M-x ffap` opens that directory or file directly!

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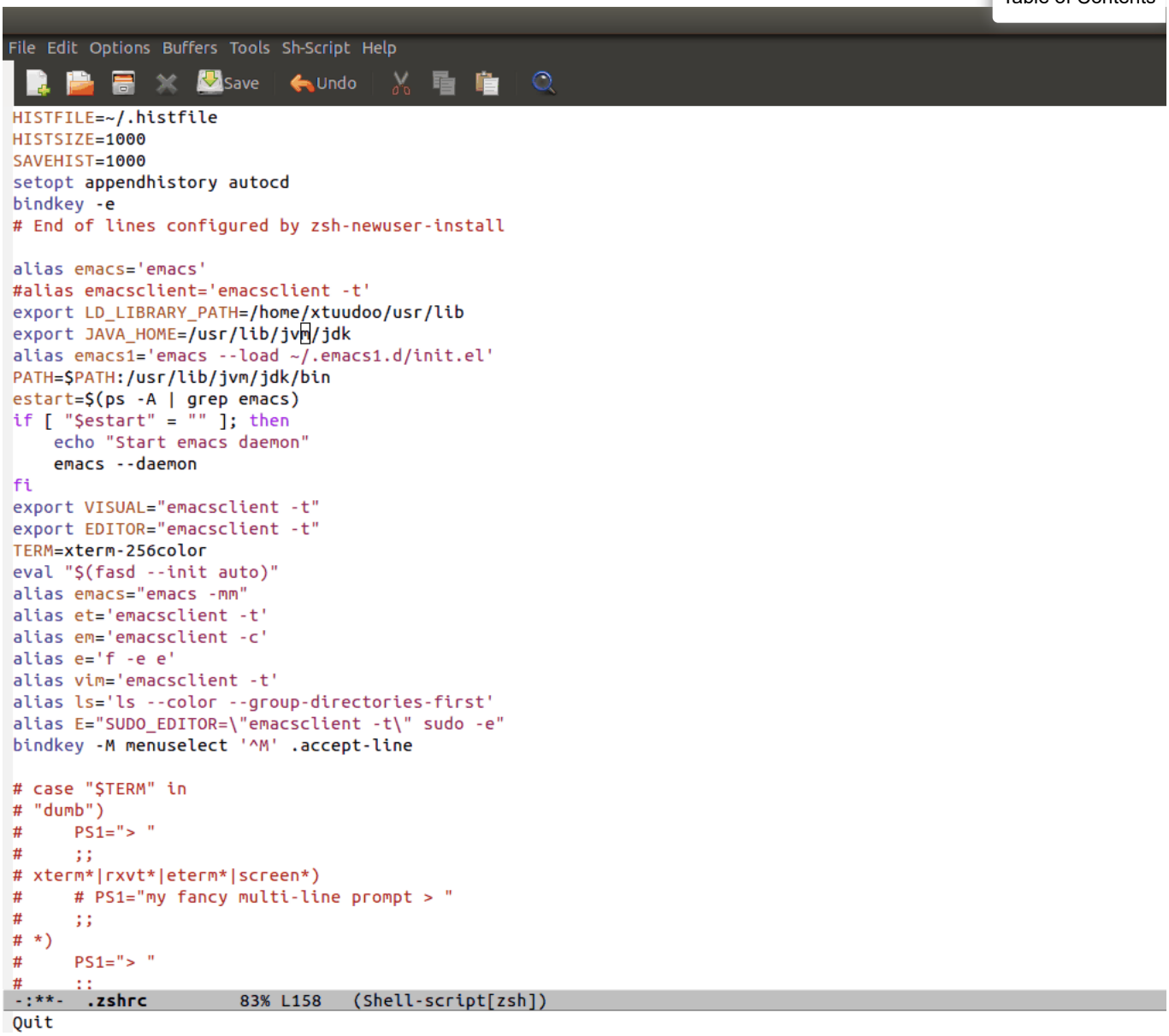

As you see in the demo, if for some reason, the directory at point does not exist, `ffap` tries the parent directory until one exist. In the example, only `/home/` exists and got fed into the prompt.

Ido mode

Emacs has an interesting feature called **Ido**, short for **Interactively Do Things**. In essence, **Ido** is a superior interface to interactively select things in Emacs compared to a plain prompt.

To activate **Ido**, `M-x ido-mode`. Let's open a file with **C-x C-f**. Do you find this:

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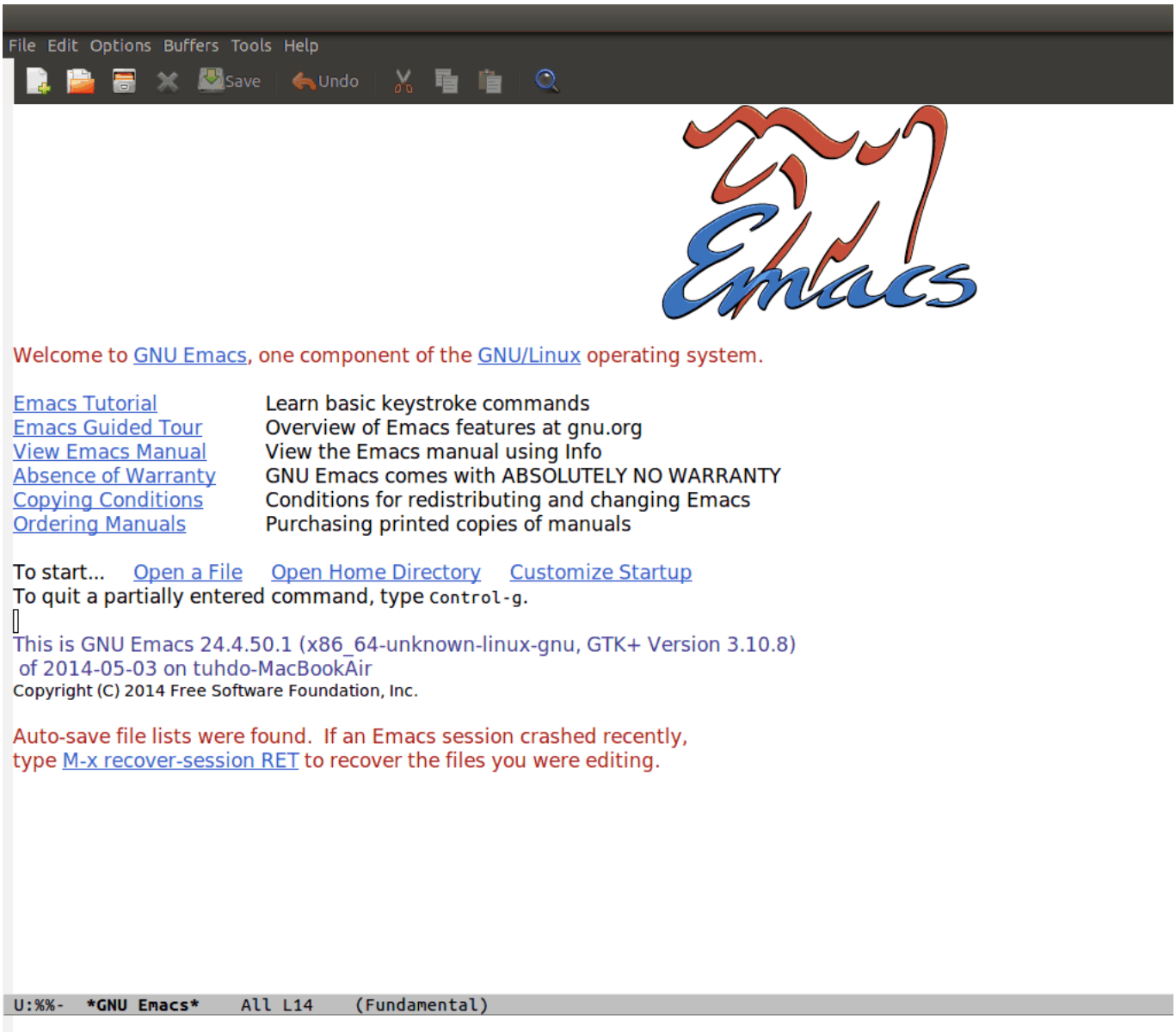
```
U:%%-  linux            [linux]   Bot L40    (Dired by name GG Compiling)
Quit
```

Or this:



Which is better?

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Once enabled, Ido is used for most commands that require you to select something from a list.

A few things to note for when using **Ido**:

- If you want to use wildcard expression, you have to temporary revert to ordinary `find-file` via **C-f**.
- If you want to select the current directory, **C-d**. This invokes **Dired** file manager to open the directory and list the files in current directory. You will learn Dired in later section. For now, if you open the directory, close the current listing by **C-x k** and press **RET**.
- You select a directory in `find-file` prompt by pressing **RET**, not **TAB** like ordinary `find-file`.

Regardless, an alternative interface for completion and narrowing exists, arguably more powerful, but you have to install a 3rd party package. The package is called Helm. However, let's stick with **Ido** through the rest of this manual.

Buffer

Buffer is where you edit your file content. Buffer holds content of a file temporarily. Anything you write into the buffer won't make it into file until you explicitly save it with `save-buffer` command. **C-x C-s** executes the command `save-buffer`, so you can **C-x C-s** your files. You can also execute this from `M-x*`

To save a buffer as other file ("Save As" in other editors), **C-x C-w**, which runs the commands `write-file`.

To kill a buffer, **C-x k**. If you want to kill the current buffer, **RET** immediately. Otherwise, type into the prompt the buffer name you want to kill.

In the previous section I said that point is in your file, well, actually point is not in a file but in a buffer. From now on, keep file and buffer two separate and distinct concepts. When I say file, I refer to physical file and when I say buffer, I refer to the temporary content of the file that is being displayed.

Exercise: Practice **C-x b** to get used to it.

Key	Binding
`C-x C-s`	**Command**: `save-buffer` Save the buffer at point
`C-x C-w`	**Command**: `write-file` Save the buffer to a different file
`C-x b`	**Command**: `switch-to-buffer` Switch to a different buffer
`C-x k`	**Command**: `kill-buffer` Kill a buffer. **RET** to kill the currently active one

Major mode

Major modes provide specialized facilities for working on a particular file type, such as syntax highlighting for a programming language. Major modes are mutually exclusive; each buffer has one and only one major mode at any time.

Emacs is bundled with many major modes for editing source code in different languages: C, C++, Java, Lisp, bash, asm... For example, when opening a file with `.c` extension, Emacs automatically recognizes it's a C file and selects the C major mode to highlight the buffer properly.

Minor mode

Minor modes are optional features which you can turn on or off, not necessarily specific to a type of file or buffer. For example, Auto Fill mode is a minor mode in which **SPC** breaks lines between words as you type. Minor modes are independent of one another, and of the selected major mode.

Basic buffer managements

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So, you learn how to open file and create buffer of that file. In other editors, you got something called "tabs". Every time you open a file, you get a file tab for selecting an "opening file" (which is called buffer in Emacs). It quickly becomes a nuisance once you have lots of file tabs. If you use multi-row support for file tabs, it eats up your editing space.

How do you switch between opening buffers? **C-x b** opens a prompt to enter a buffer name. You can **TAB** to complete the buffer name similar to how you complete file names in **C-x C-f**.

After you open a file, and if point is in that buffer, **C-x C-f** prompts the current directory, so you can open another file within this directory. For example, buffer A is from `~/dir1/` and buffer B is in `~/dir2/`, if point is in buffer A, **C-x C-f** starts in `~/dir1/`; if point is in buffer B, **C-x C-f** starts in `~/dir2/`.

In an Emacs session, you may have a lot of buffers, including non-file buffers such as shell buffers, email buffers... How do you manage buffers when it's getting large? **C-x C-b** executes `list-buffers`, provide you a list of buffer in which you can search. However, `list-buffers` is a simple command for buffer management. Emacs also provides `ibuffer`, which is a superior alternative. You will surely want to use `ibuffer`, but first let's replace `list-buffers` with `ibuffer` (by placing next directive to your `~/.emacs` file):

```
(global-set-key (kbd "C-x C-b") 'ibuffer)
```

Remember to save into `*scratch*` buffer and then `M-x eval-buffer` for the setup to take effect.

Let's play with **ibuffer**.

Exercise:

- First, open many files with different extensions. The Emacs source you used for installation is an great practice target. If you use a built binary, download it and unpackage. Let's assume you download and unpackage it at `~/Downloads/emacs-24.3`.
- **C-x C-f**, navigate to `emacs-24.3/lisp/` and open all Lisp files: `*.el`. If you use **Ido**, remember to **C-f** before type into the prompt
- **C-x C-f**, navigate to `emacs-24.3/src/` and open all C files: `*.c`.
- Open **ibuffer** by **C-x C-b**. You see a huge list of buffers.

Now the fun begins.

- Suppose that you want to work with C code. **/ m** and enter a major mode to select buffers that belong to this major mode. Prefix **/** in **ibuffer** groups filtering commands. **TAB** to see a list of major modes:

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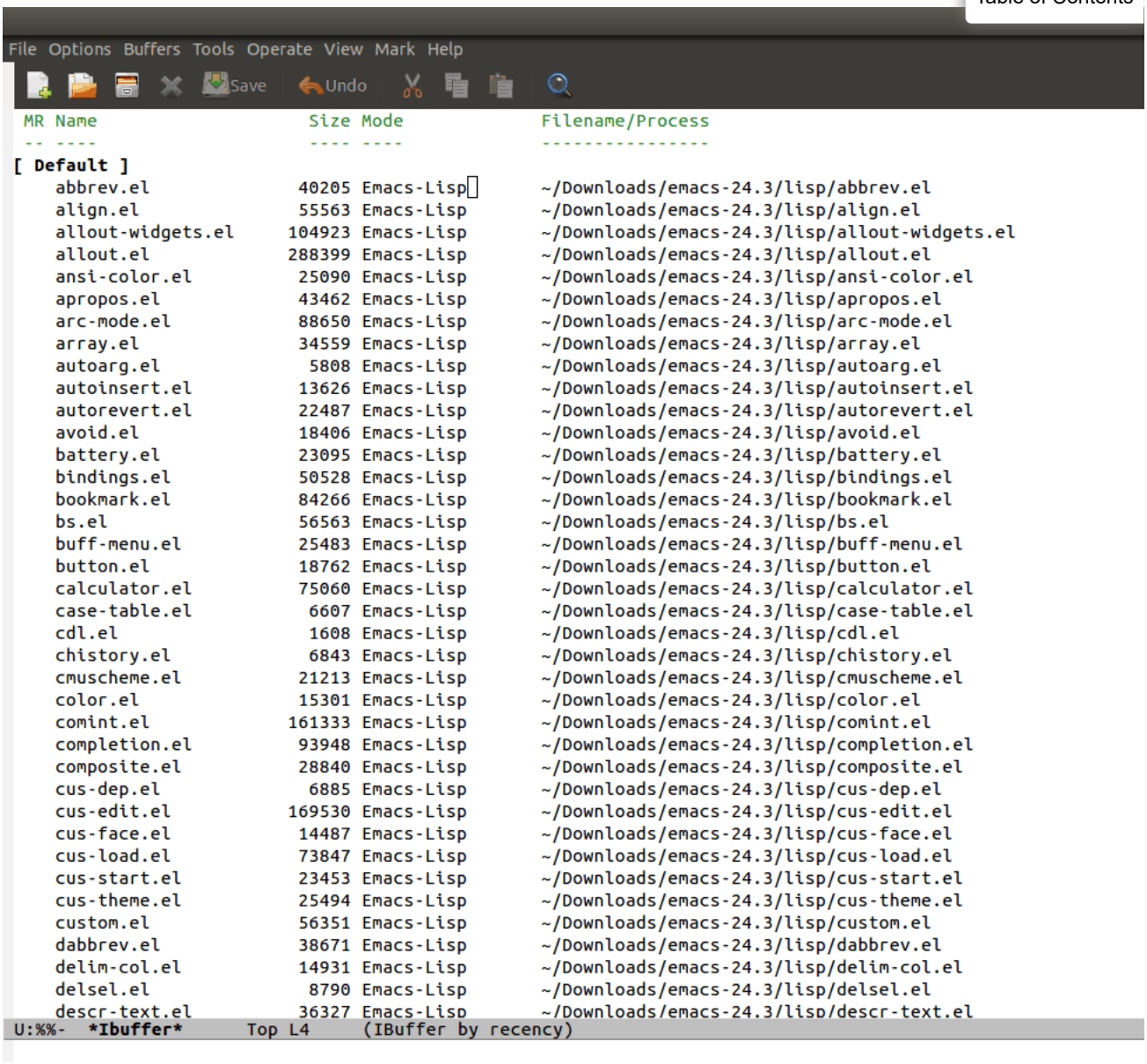

- Enter `c-mode`.
- Only C buffers remain. But you open buffers in two major modes: `c-mode` and `emacs-lisp-mode`. You can create each group for one by pressing **/ g**, and give the group a name. Only execute **/ g** after executing any filtering commands.
- Up to this point, the filtering is still applied. Press **/ /** to remove previous filter and return the full buffer list.
- Let's create another group based filtering. **/ m** and enter `emacs-lisp-mode`. Create another group with **/ g** and give it a name. Now, every time you open files that their buffers satisfy the filtering criteria, the buffers are put into appropriate groups.
- To open a buffer, **o** or **C-o**. **o** opens a buffer and switch point to it. **C-o** leaves point on the buffer list. Let's open a buffer with **o** and **C-o**. To switch back to the other buffer, do **C-x o**. **C-x o** executes `other-window` command, which cycles among the opening buffers (technically the buffers are in Emacs "windows", and you are cycling "windows", but we will get to that later).
- Either using **C-o** or **o** creates another buffer below, leaving you two horizontal buffers. You probably don't like the layout because you have a big screen. If you use **o**, **C-x o** to switch back to the list and **C-x 1** to close other buffer. If you have multiple buffers opened, **C-x 1** closes all others and leave the active buffer (the one with point, which is our buffer list) remains. To close an active buffer, **C-x 0**. **C-x 3** to create a vertical

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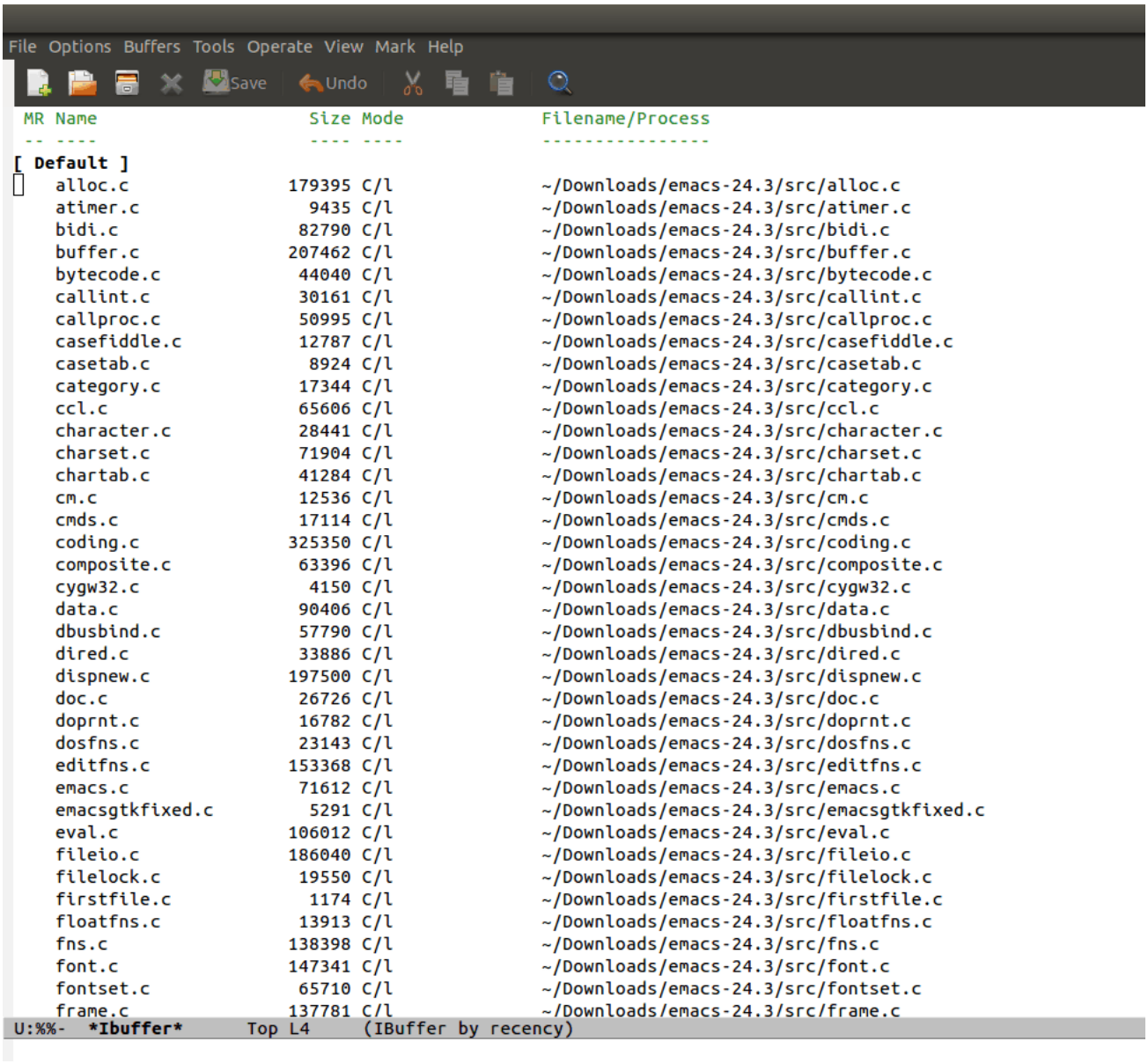
buffer to the right. It creates an exact duplicate of the active buffer. Now, **o** on any C buffer again, and point is in that buffer:



- Edit something in the buffer. Switch back to `ibuffer` and press **g**, which runs the command `ibuffer-update` to refresh the list. You will see an asterisk on the left of your just edited buffer. It indicates that buffer has been modified.
- You can also mark a buffer by pressing **m** on multiple entries to perform various operations:
  - **view**: press **A** to view the marked buffers
  - **save**: press **S** to save the marked buffers
  - **close**: press **D** to close the marked buffers
  - **revert**: press **V** to discard changes to the marked buffers

  To unmark a buffer, press **u** on the marked entries.
- Another way to open the buffer: **e** (*enter*), **f** (*find*) or **RET** to bury and replace the list with selected buffer. Switch back to the list using **C-x C-b** again.

To sum up, I will list the key bindings your used in this section along with other useful key bindings:

- **C-x C-b** to open `ibuffer`.

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- **o** or **C-o** to open a buffer at point.
- **e**, **f** or **RET** bury the buffer list and replace it with the buffer content.
- **=** to compare the current buffer content with its file.

Tip: When point is on an entry, **C-x C-f** starts at the current directory of buffer of that entry.

- Filtering commands:

Key	Bindings
`/ m`	Add a filter by a major mode
`/ n`	Add a filter by buffer name.
`/ c`	Add a filter by buffer content.
`/ f`	Add a filter by filename
`/ >`	Add a filter by buffer size
`/ <`	Add a filter by buffer size
`/ /`	Remove all filters in effect

- Filter group commands:

Key	Bindings
`/ g`	Create a filter group from filters
`TAB`	Move to next filter group
`M-p`	Move to previous filter group
`/ \`	Remove all active filter groups
`/ S`	Save the current groups with a name
`/ R`	Restore previously saved groups
`/ X`	Delete previously saved groups

- Sorting commands:

Key	Bindings
`,`	Rotate between sorting modes
`s i`	Reverse current sorting order
`s a`	Sort buffers by alphabet
`s f`	Sort buffers by filename
`s v`	Sort buffers by last viewing time
`s s`	Sort buffers by size
`s m`	Sort buffers by major modes

To quit `ibuffer`, press **q**.

Bookmark: save locations across Emacs sessions

When you read books, you usually cannot read all at once and place a bookmark to go back to continue reading later. Emacs allows you to bookmark too.

Key	Binding
`C-x r m`	**Command**: `bookmark-set` Set bookmark at point. After executing the command, a prompt asks for a name.

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Key	Binding
	Enter the name and **RET**.
`C-x r b`	**Command**: `bookmark-jump` Jump to a saved bookmark, specified by user. **TAB** for getting bookmark list.
`C-x r l`	**Command**: `bookmark-bmenu-list` Open the list of all bookmarks.

Remember that key bindings are easy. You just need to remember that **C-x r** is the prefix for bookmark related commands. **m** stands for **mark**, meaning you **mark** something in some place; **b** stands for bookmark, meaning you can switch to any bookmark quickly, similar to **C-x b** switches to buffers quickly. Finally, **l** means **list** for listing bookmarks, analogous to `ibuffer` for listing buffers. If you want to preserve the bookmarks across Emacs sessions, **C-x r l** to open the bookmark list and press **s** to save the list to file.

If you understand how to manage buffers, managing bookmarks is the same, with different but similar key bindings. Finally, you cannot only bookmark buffers that are associated with files, you can bookmark non-file buffers too:

- `Dired` buffers
- Info buffers
- Man pages

A few useful key bindings when in `bookmark-bmenu-list`:

Key	Binding
`RET`	Open a bookmark. After you opened the bookmark, you can go back to bookmark list by **C-x r l**.
`1`	Open a bookmark and close other buffers
`n`	Go to next entry
`p`	Go to previous entry
`s`	Save the current bookmark list to file.
`o`	Open bookmark in other window and move point to it. If you want to view side by side, **C-x 3** to create a vertical buffer and bookmark will be opened in the vertical buffer.
`C-o`	Similar to `o` but point remains on the bookmark list.
`r`	Rename bookmark at point.
`m`	Mark bookmark at point for displaying.
`v`	Display all marked bookmarks.
`d`	Flag bookmark for deletion.
`x`	Delete flagged bookmarks.
`u`	Unmark marked or flagged bookmarks.

Exercise:

- Open files and create a few bookmarks. **C-x r b** to switch between them.
- **C-h i** to open Info. Pick a node and enter as deep as you want. Then bookmark and kill current Info buffer.
- **C-x r l** to open the bookmark list and practice the key bindings in the table.

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Basic motion commands

These key bindings are also used by popular shells such as **bash** or **zsh**. I highly recommended you to master these key bindings.

- Move forward one char: **C-f** (f stands for **forward**)
- Move backward one char: **C-b** (b stands for **backward**)
- Move upward one line: **C-p** (p stands for **previous**)
- Move downward one line: **C-n** (n stands for **next**)

The above operations can also be done with arrow keys. If you don't like the above key bindings, the arrow keys offer equivalent features.

- Move to beginning of line: **C-a**
- Move to end of line: **C-e**
- Move forward one word, **M-f**.
- Move backward one word, **M-b**.

These key bindings are in Emacs only:

- Scroll forward one screen: **C-v**, **page down**
- Scroll backward one screen: **M-v**, **page up**
- Move to the beginning of a sentence: **M-a**
- Move to the end of a sentence: **M-e**
- Recenter a screen: **C-l**
- Re-position point to the top, middle and bottom of the current screen: **M-r**
- Move to top of the buffer: **M-<**
- Move to end of the buffer: **M->**
- Move to the nth character: **M-g c** (c stands for `character`)
- Move to the nth line: **M-g l** for Emacs < 23.2, **M-g g** for emacs >= 23.2) (l/g stands for `line`)

Recenter means making the current line point the center of your screen.

Exercise: execute the above commands using the key bindings at least 10 times or until you remember. You can perform these motion commands on any buffer.

Useful built-in key bindings for navigating pairs

- **C-M-f** binds to `forward-sexp`, move forward over a balanced expression. Demo:

```
;; you won't need any of the bar thingies
;; turn it off to save screen estate
(if (fboundp 'scroll-bar-mode) (scroll-bar-mode -1)) ; turn off scrollbar
(if (fboundp 'tool-bar-mode) (tool-bar-mode -1)) ; turn off toolbar
(if (fboundp 'menu-bar-mode) (menu-bar-mode -1)) ; turn off menubar

;; the blinking cursor is nothing, but an annoyance
(blink-cursor-mode -1)

(setq scroll-margin 0
      scroll-conservatively 100000
      scroll-preserve-screen-position 1)

(size-indication-mode t)

;; more useful frame title, that show either a file or a
;; buffer name (if the buffer isn't visiting a file)
;; taken from prelude-ui.el
(setq frame-title-format
      '("" invocation-name " - " (:eval (if (buffer-file-name)
                                            (abbreviate-file-name (buffer-file-name))
                                          "%b"))))
;; change font to Inconsolata for better looking text
```

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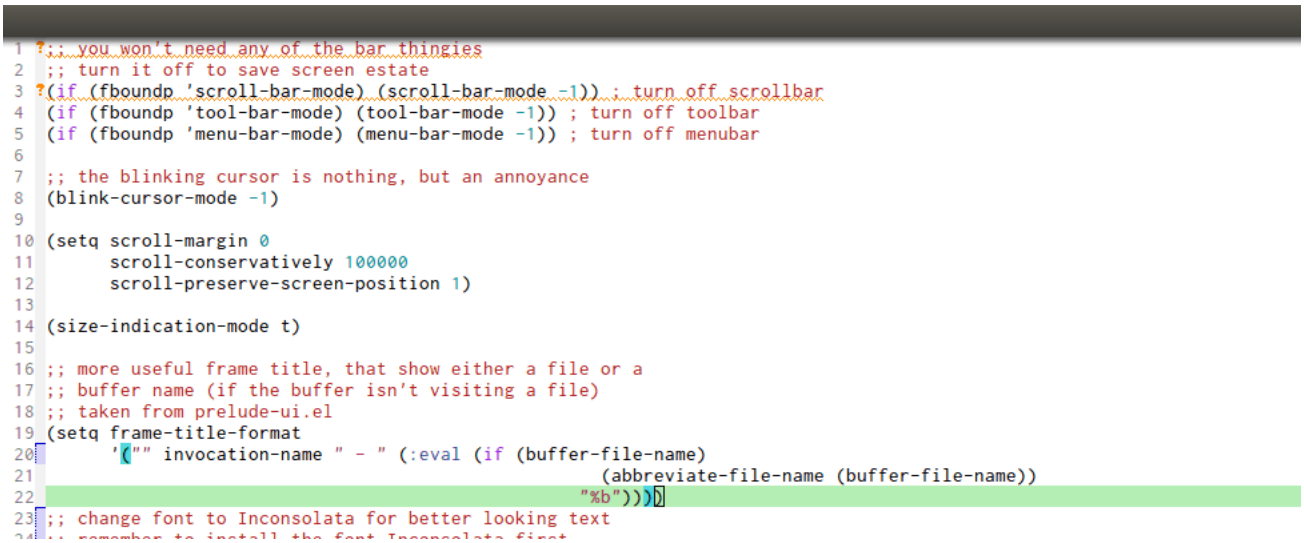
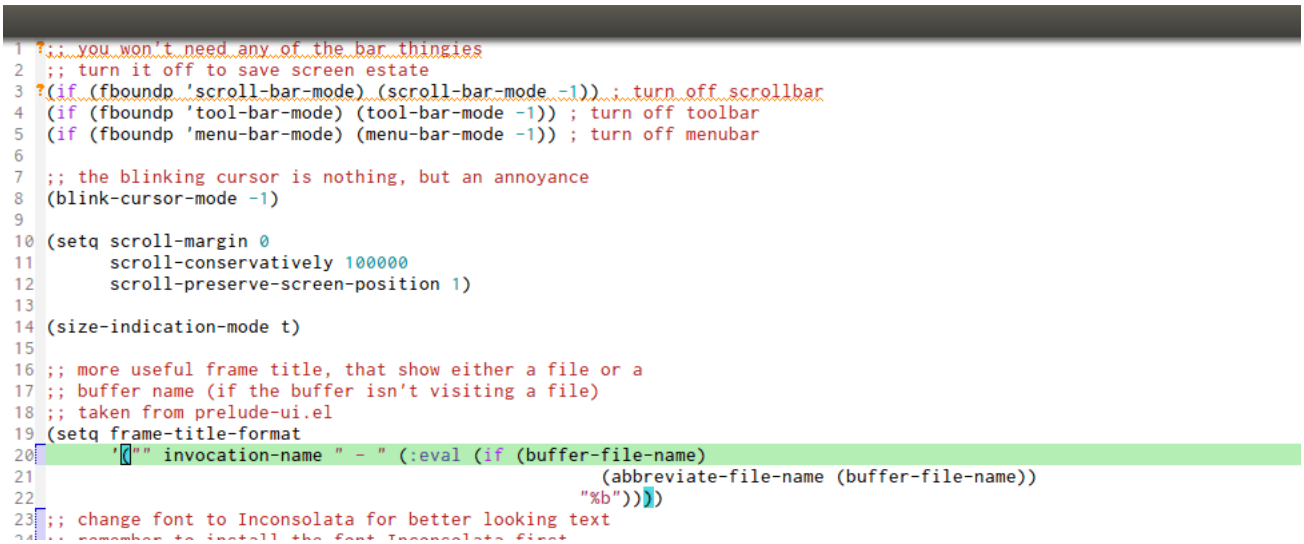
- **C-M-b** binds to `backward-sexp`, move backward over a balanced expression. Demo:



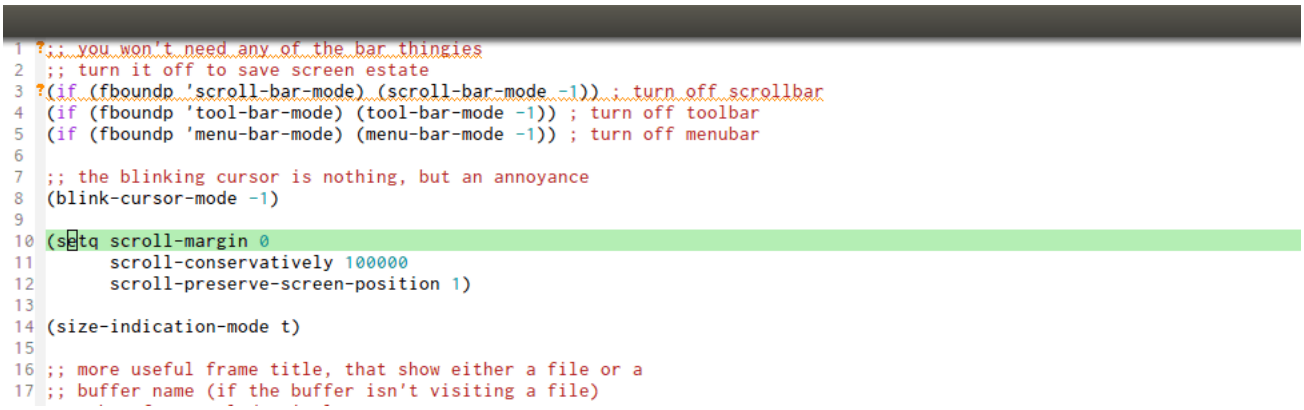
```
;; you won't need any of the bar thingies
;; turn it off to save screen estate
(if (fboundp 'scroll-bar-mode) (scroll-bar-mode -1)) ; turn off scrollbar
(if (fboundp 'tool-bar-mode) (tool-bar-mode -1)) ; turn off toolbar
(if (fboundp 'menu-bar-mode) (menu-bar-mode -1)) ; turn off menubar

;; the blinking cursor is nothing, but an annoyance
(blink-cursor-mode -1)

(setq scroll-margin 0
      scroll-conservatively 100000
      scroll-preserve-screen-position 1)

(size-indication-mode t)

;; more useful frame title, that show either a file or a
;; buffer name (if the buffer isn't visiting a file)
;; taken from prelude-ui.el
(setq frame-title-format
      '("" invocation-name " - " (:eval (if (buffer-file-name)
                                            (abbreviate-file-name (buffer-file-name))
                                          "%b"))))
;; change font to Inconsolata for better looking text
```

- **C-M-k** binds to `kill-sexp`, kill balanced expression forward. Demo:



```
;; you won't need any of the bar thingies
;; turn it off to save screen estate
(if (fboundp 'scroll-bar-mode) (scroll-bar-mode -1)) ; turn off scrollbar
(if (fboundp 'tool-bar-mode) (tool-bar-mode -1)) ; turn off toolbar
(if (fboundp 'menu-bar-mode) (menu-bar-mode -1)) ; turn off menubar

;; the blinking cursor is nothing, but an annoyance
(blink-cursor-mode -1)

(setq scroll-margin 0
      scroll-conservatively 100000
      scroll-preserve-screen-position 1)

(size-indication-mode t)

;; more useful frame title, that show either a file or a
;; buffer name (if the buffer isn't visiting a file)
;; taken from prelude-ui.el
(setq frame-title-format
      '("" invocation-name " - " (:eval (if (buffer-file-name)
                                            (abbreviate-file-name (buffer-file-name))
                                          "%b"))))
;; change font to Inconsolata for better looking text
```

- **C-M-t** binds to `transpose-sexps`, transpose expressions. Demo:



```
;; you won't need any of the bar thingies
;; turn it off to save screen estate
(if (fboundp 'scroll-bar-mode) (scroll-bar-mode -1)) ; turn off scrollbar
(if (fboundp 'tool-bar-mode) (tool-bar-mode -1)) ; turn off toolbar
(if (fboundp 'menu-bar-mode) (menu-bar-mode -1)) ; turn off menubar

;; the blinking cursor is nothing, but an annoyance
(blink-cursor-mode -1)

(setq scroll-margin 0
      scroll-conservatively 100000
      scroll-preserve-screen-position 1)

(size-indication-mode t)

;; more useful frame title, that show either a file or a
;; buffer name (if the buffer isn't visiting a file)
```

- **C-M-<SPC>** or **C-M-@** binds to `mark-sexp`, put mark after following expression. Demo:

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```
;; you won't need any of the bar thingies
;; turn it off to save screen estate
(if (fboundp 'scroll-bar-mode) (scroll-bar-mode -1)) ; turn off scrollbar
(if (fboundp 'tool-bar-mode) (tool-bar-mode -1)) ; turn off toolbar
(if (fboundp 'menu-bar-mode) (menu-bar-mode -1)) ; turn off menubar

;; the blinking cursor is nothing, but an annoyance
(blink-cursor-mode -1)

(setq scroll-margin 0
      scroll-conservatively 100000
      scroll-preserve-screen-position 1)

(size-indication-mode t)

;; more useful frame title, that show either a file or a
;; buffer name (if the buffer isn't visiting a file)
```

Basic editing commands

In Emacs, `kill` means `Cut` in other editors. These key bindings also work under the terminal.

- Kill a character at the point: **C-d**
- Kill entire line: **C-S-DEL** (remember, **DEL** is your **<backspace>** key)
- Kill forward to the end of a word from current point: **M-d**
- Kill backward to the beginning of a word from the current point: **M-DEL**
- Kill all spaces at point: **M-**
- Kill all spaces except one at point: **M-SPC**
- Kill to the end of line: **C-k**
- Kill a sentence: **M-k**

When you kill something, the killed content is put into the Kill Ring.

If you write code, you can also quickly add comments or comment/uncomment code with **M-;**:

- If you do not highlight a text region, **M-;** adds a comment to the end of line.
- If you highlight a region (i.e. with a mouse), **M-;** comments out the region.

Dynamic Abbreviations

Dynamic Abbreviations are a completion feature in Emacs, but work for text and is context-independent. After you type a word once, if you type that word again, you can type it partially and **M-/** to complete it. If you type a prefix that has many candidates, **M-/** cycles the candidates. This is a really cool feature and you ought to try it.

Exercise:

- Type "thisIsaVeryVeryVeryVeryLongWord" into a buffer of your choice.
- Add newline or whitespace.
- Type "thisIs" and **M-/**. Great, Emacs automatically completes for you.
- Type "random" into your buffer and **M-/**. You will see Emacs tell your that no dynamic abbreviations found.
- Type "randomWord" and add a whitespace. Now, type "random" and **M-/** again. Emacs can now happily complete "random" for you. Remember that to let Emacs remember your words, you have to type a complete word.

Kill ring

Kill ring is the list of previously killed contents. You can insert the most recently killed element by **C-y**.

If you supply a number, using **C-<number>** - **<number>** can be any number - before you **C-y**, to paste the nth entry in the kill ring. The most recent entry is 1st entry. **C-1 C-y** is the same as **C-y**; **C-2 C-y** is the 2nd most recent

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entry, make that entry the head of the list and so on...

Let's play with the kill ring for a while. Open a buffer and insert these 3 lines:

aaa
bbb
ccc

Then:

- Kill the three lines with **C-k**, from top to bottom.
- **C-y** or **C-1 C-y**, you will see `ccc` got inserted.
- **C-2 C-y**, you will see `bbb` got inserted; **C-y** again, you will see `bbb` got inserted again. `bbb` now becomes head of the list.
- **C-2 C-y**, you will see `aaa` got inserted; **C-y** again, you will see `aaa` got inserted again. `aaa` now bedcomes head of the list.
- Insert the 3 lines and kill all again.
- **C-3 C-y**, you will see `aaa` got inserted; **C-y** again, you will see `aaa` got inserted again. `aaa` now bedcomes head of the list
- ... and so on ...

C-<number> is called prefix argument. Basically it's for altering the behavior of you command. You will learn about prefix argument in later section.

Alternatively to the above sequence, you can use **M-y** which runs `yank-pop`. By default, when **C-y**, it inserts the most recent killed text. If you want to retrieve earlier kill texts, after **C-y**, **M-y** to cycle through the entries in `kill-ring`. You must first run **C-y**, otherwise **M-y** has no effect.

You may wonder, what happens if the kill ring getting really large, how can you remember where is which? That's right. It's a problem, and that's when the 3rd party plugins shine. However, you can view the kill ring with **C-h v**, then enter `kill-ring`. After this, you will see the `kill-ring` content, but in its code form, which is not really pretty and friendly.

Mark and region

Mark is a record of a position in a buffer. It's like when reading a book, you record various places in a book and these records are called bookmarks. It is similar, except it is buffer mark in Emacs (Emacs also has bookmark, but we will discuss later).

When you set mark between two points in a buffer, the text between two points are highlighted. We call the highlighted text a region. When the region is highlighted, we say the region is active; to deactivate a region, press **C-g** or move point around, just like in other text editors.

Exercise:

- Place a mark in buffer with **C-SPC C-SPC**. Let's call this mark **A**.
- Move to another place in the buffer, place another mark with **C-SPC C-SPC**. this is mark **B**.
- Move to another place and **C-SPC C-SPC** again. This is mark **C**.
- Now press **C-u C-SPC**. You can see point goes back to mark **B**.
- **C-u C-SPC** again. Point goes back to mark **A**.
- **C-u C-SPC** again. Point goes back to mark **C**.
- Let's create a region: **C-SPC**, then move point forward. What happened?
- The highlighted area is called a region. You can perform editing commands on the region:
  - **C-w** to kill the region
  - **M-w** to copy the region
  - **C-y** to yank (equivalent to paste) the region.
- Let's copy or kill a region; you should select a big region. Now yank (paste) it elsewhere. After yanking, you notice point is not at the original location anymore. If you want to return to the where you yanked, **C-u C-SPC** or **C-x C-x**.

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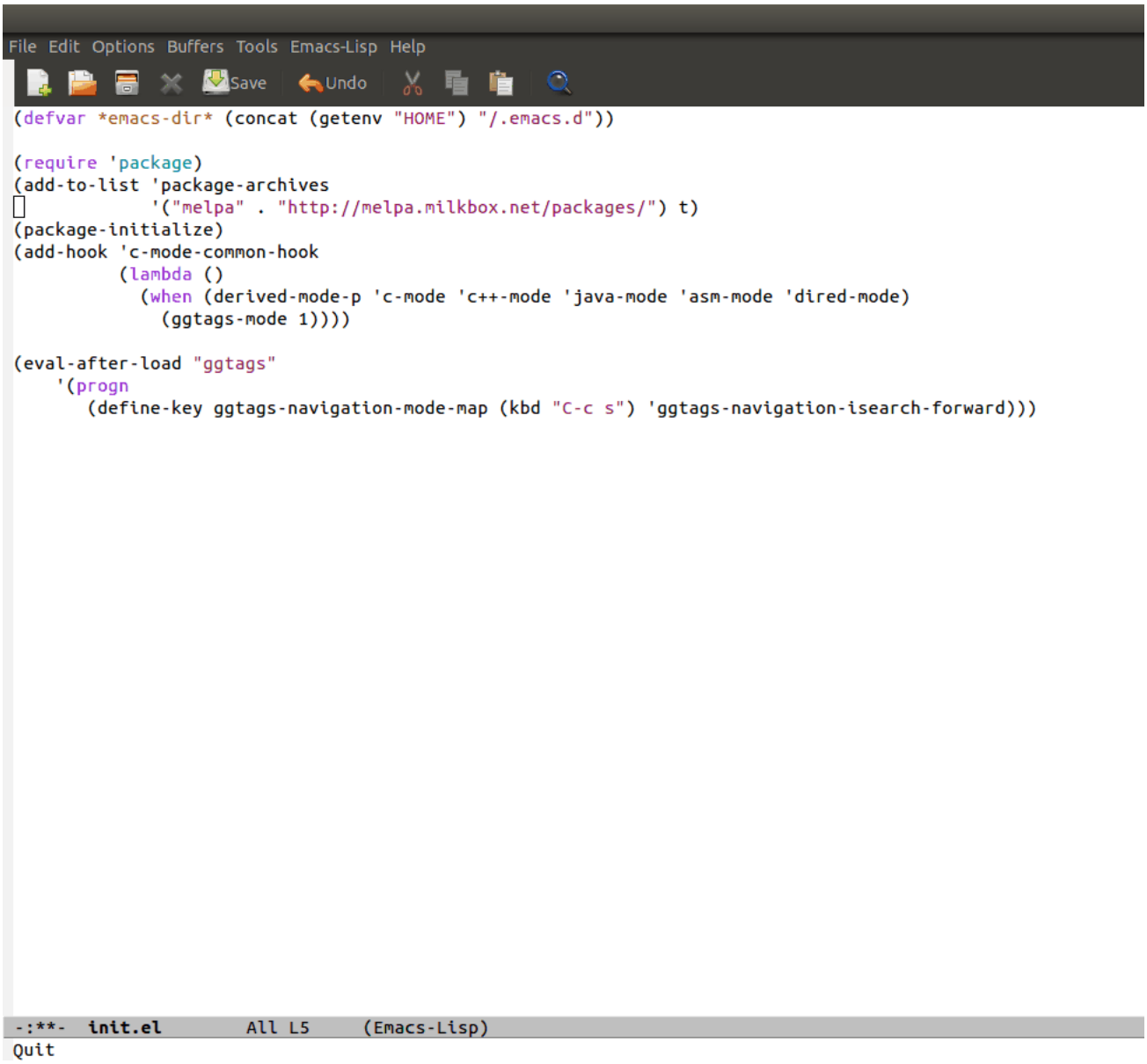
When you yank, you create a mark at point before the new content is inserted. After the content is inserted, point moves according to the size of the content. In general, most Emacs commands that create sudden displacement push marks, so you can go back to previous locations without having to tediously scroll the whole buffer.

C-x C-x executes the command `exchange-point-and-mark`, which exchanges the point and the mark created when you yank with **C-y**. Try and see. When this command is executed, region bounded by the mark and point is activated. Using **C-x C-x** is really convenient. Instead of highlighting line by line for `Copy` or `Kill`, you can do this:



Remember when you have to highlight a big region and for some reason, you lose the highlighting and have to do it all over again. **C-x C-x** saves you from that tedium.

C-u C-SPC simply returns you to previous mark location inserted when you **C-y**. This command won't activate region.

Practice until you get used to these two commands.

Mark ring

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Emacs stores buffer marks in a list, that's why you are able to cycle through various marks in the exercise above. You can cycle through the list to jump to a mark, or with extension packages, you can have a list and interactively select it. **Helm** is an excellent example of such an extension. We will discuss more on extension packages later.

Global mark ring

Mark ring is local to each buffer. If you switch to another buffer, you have a new local mark ring.

Global mark ring is like mark ring, but they persist across buffers. Each time you set a mark, that mark is set in global mark ring in addition to the buffer's mark ring.

You cycle the global mark ring by **C-x C-SPC**.

Undo/redo

To undo: **C-/** or **C-x u**

To redo, it's quite tricky to do because you have to understand how undo in emacs works. When you edit, emacs tracks changes in your current editing file. For example, you insert the following line in your file:

aaa
bbb
ccc

Then, Emacs tracks the history like this:

- insert: "aaa"
- insert: "bbb"
- insert: "ccc"

Now, execute undo twice. Your file becomes:

aaa

The history of the file changes:

- insert: "aaa"
- insert: "bbb"
- insert: "ccc"
- undo insert: "ccc"
- undo insert: "bbb"

How do insert back **bbb** and **ccc**. By undo your previous undos! ook closely at the above change history again. You see that Emacs keeps track your recent undo actions. execute some motion command, i.e **C-f**, then try **C-/** twice and see what happens.

Great, you get your old content, **bbb** and **ccc** back. That is because you have just undone the latest "undo insert: ..." entries in the file history.

When you was execute a series of undoing, *without any other commands in between*, Emacs keeps reverting to the older content. The series of **undo insert: ...** got inserted into your file history when you break the undo series with other commands.

Again, two features in one command, but a bit confusing this time.

Exercise: Practice undoing/redoing until you get used to.

Search for text

Content search is an essential feature in every editor. Emacs has many built-in tools for this problem.

Incremental search

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So, you want to look for something in the buffer? **C-s** invokes `isearch-forward`, allows you to look forward from the current point for something. After **C-s**, you are prompted to enter the content to search for. Enter the content, and press **C-s** repeatedly to travel through the matches forward.

Similarly, **C-r** invokes `isearch-backward`, allows you to look backward from the current point. Press **C-r** repeatedly to travel through the matches backward.

`isearch` can be invoked from any valid buffer. You can perform `isearch` on `ibuffer`.

Exercise:

Open a reasonably large text file of your choice for practicing.

C-s, then type the search content and repeatedly press **C-s**. After repeated a few times, press **C-r** repeatedly. What happened?

You can invoke **C-r** within **C-s** and vice verse to go to the next and previous match.

C-g to cancels the current search session.

Move point to a word. **C-s** then **C-w**, selects content from point to end of a word. For example, if point is on character 'e' of "Hello world" **C-w** feeds "ello" into current **C-s** prompt.

C-w again feeds " world" into current prompt to become "ello world" and so on.

C-g, then **C-s** again. You can select the old input to search again with:

- **M-p** moves to the previous input.
- **M-n** moves to the next input.

If you want to search with regexp, **C-u C-s**.

Now you get the basics of Isearch, it has more useful commands that are bound to **M-s** prefix key:

Key	Binding
`M-s .`	**Command**: `isearch-forward-symbol-at-point` Feed the symbol at point to **C-s** perform search
`M-s o`	**Command**: `occur` Run `occur`
`M-s h .`	**Command**: `highlight-symbol-at-point` Highlight the symbol at point
`M-s h l`	**Command**: `highlight-lines-matching-regexp` Highlight lines that match input regexp
`M-s h r`	**Command**: `highlight-regexp` Highlight according to regexp
`M-s h u`	**Command**: `unhighlight-regexp` Turn off highlighting strings that match regexp.

Occur

Command `occur` lists all line that match a string or a regexp and displays the search result in a buffer named `*Occur*`. `occur` is useful in situation where you have a large number of matches and need a better tool to manage rather than going back and forth with Isearch. For example, you have a match around line 1000, but you are currently at line 500. In between the two lines are many other matches. You cannot use Isearch to jump

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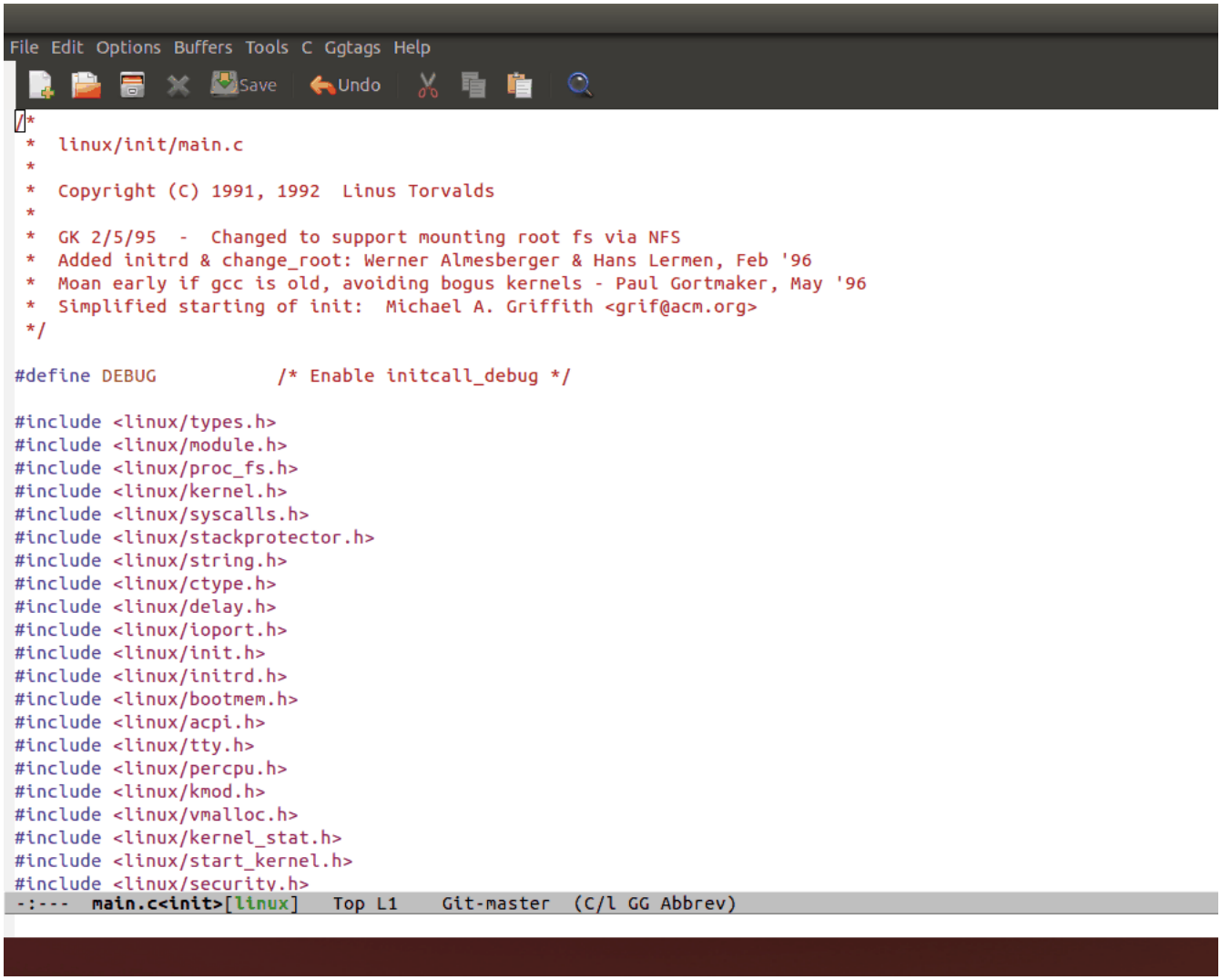
through them all. This is where `*Occur*` is handy. `*Occur*` is also useful for query and replace a string with another, and allow you to verify that you did indeed replace the correct string.

To invoke `occur`, run `M-s o`; if you `M-s o` in Isearch prompt, `occur` will get the text currently using. Quite convenient. You can use **M-g n** and **M-g p** to go to next/previous matches, or use the mouse to scroll. If you feel **M-g p** and **M-g n** to go back and forth is annoying, you can repeat it using **C-x z** which runs `repeat`:

- **M-g n** to go to next match.
- **C-x z** to repeat previous command.
- From now on, keep pressing **z** to repeat previous command until your press a different character.

Demo, notice how the inactive cursor at the `*Occur*` buffer moves as point in my main buffer moves:



You can operate directly on occur buffer. In `*Occur*` buffer, use **C-p** and **C-n** to go to previous and next entries. Press **o** jumps to the match at point and switch point to buffer that contains the match; **C-o** to open the match at point but not switching buffer. If you want to edit the matches, press **e** to enter `occur-edit-mode`; after that, you can edit anywhere in the `*Occur*` buffer and see your changes updated as you type on the other buffer. You can do any editing commands when in `occur-edit-mode`, such as commands for query replace in previous section to replace all matches.

Demo:

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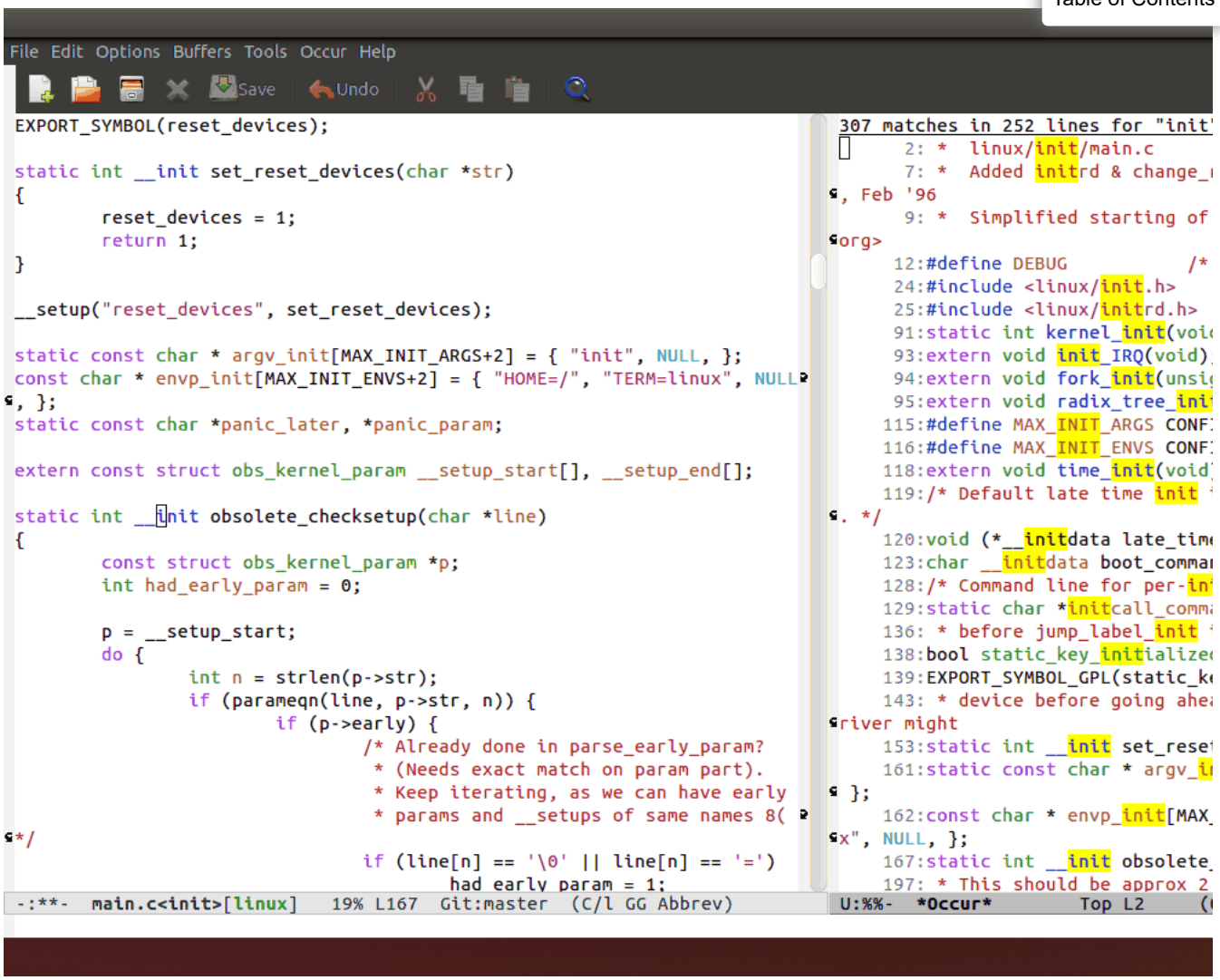

Here are key bindings in `occur`:

Key	Binding
`C-n`	Go to next line
`C-p`	Go to previous line
`<`	Go to beginning of buffer
`>`	Go to end of buffer
`e`	Edit current `*Occur*` buffer
`C-c C-c`	When finish with editing, `C-c C-c` to exit editing mode
`g`	If your searching file is updated, press `g` refreshes the `*Occur*` buffer to reflect the changes
`o`	Jump to the match and switch point
`C-o`	Jump to the match but point remain on `*Occur*`

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If you want to have this table (and more key bindings), in `*Occur*` buffer runs **C-h m** or press **h**. Finally, press **q** to quit `*Occur*` buffer.

Query replace

To replace something, **M-%** to execute **query-replace**. **M-%** asks you two inputs:

- A string to be replaced.
- A string to replace.

Supply the inputs and **RET**.

Emacs will ask your confirmation to replace a matched string. If you want to replace all, press **!** instead of answer yes or no (**Note:** it will replace ocurrences only **beneath** your current point).

If you want to query and replace with regexp, **C-M-%**. **Tip**: this command is a bit hard to press; to make it easy, use both of your hands:

- It can be that left hand presses **%** (or **S-5**) and right hand presses **C-M-**.
- It can be that right hand presses **C-** first, then left hand presses **M-%**.

Multi-occur

It is the same as `occur` except it asks user for multiple buffers.

- `multi-occur` asks for buffers to search. You enter buffer by buffer until you give it empty input.
- `multi-occur-in-matching-buffers` requires a regexp, and it searches for occurences in buffers that match the regexp.

Grep

`M-x rgrep` allows you to search for text with external `grep` command and displays the results in a buffer. The good thing about running `grep` in Emacs is that the raw output are processed. The end results are colored and clickable, so that you can quickly visit the matched location!

`rgrep` recursively greps for `regexp` in `files` in directory tree rooted at `dir`. You will be prompted for these three inputs when `rgrep` runs.

With **C-u** prefix, you can edit the constructed shell command line before it is executed. With two **C-u** prefixes, directly edit and run `grep-find-command` (this is a variable), which is the underlying command used for executing `rgrep`.

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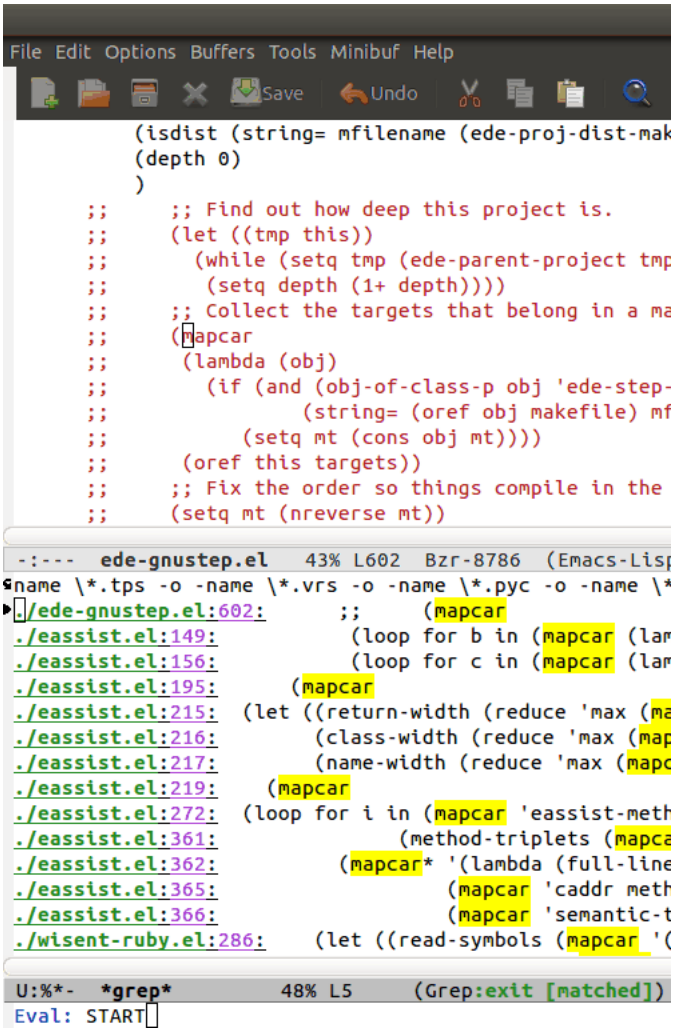

When you get a list of results displayed in a buffer named `*grep*`, you can click on the results or use **M-g p** and **M-g n** to back and forth between grep results, even if point is not active in `*grep*` buffer.

The following key bindings are available:

Key	Description
TAB	Go to next match, but **do not** display matched buffer
S-TAB	Go to previous match, but **do not** display matched buffer
{	Go to previous file, **do not** display matched buffer
}	Go to next file, **do not** display matched buffer
C-o	Display matched location, but **do not** switch point to matched buffer (Only available in Emacs > 24.3)
n	Display next matched buffer, but **do not** switch point
p	Display previous matched buffer, but **do not** switch point
M-g n	Display next matched buffer, switch point to matched position
M-g p	Display previous matched buffer, switch point to matched position
RET	Display matched location, switch point to matched bufer
SPC	Scroll down, equivalent to **C-v**

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Key	Description
S-SPC	Scroll up, equivalent to M-v
g	Refresh the `*grep*` buffer with previously executed command
q	Quit `*grep*` buffer

To get the list of key bindings, in `*grep*` buffer, type `?` or `h` or C-h m. Such a big list of key bindings, but worry not. These key bindings are quite common in other Emacs utilities. You can reuse many of these key bindings.

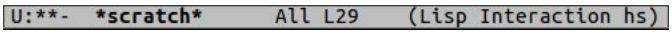
Modeline

The mode line is the empty area below the buffer. It has useful summary information about the buffer shown in the window.

The text displayed in the mode line has the following format:

```
cs:ch-fr | buf | pos line | (major minor)
```

For example, a modeline looks like this:



`cs` describes the character set of the text in the buffer. Do you see the character `U` in the picture? It means your text is represented by UTF-8 coding system.

If you type text in different human languages, and if the input method is on, to the left of the `U` appears the symbol of that language, i.e. `\U`, the backslash means `TeX input method`. C-\ prompts you to select a language. After selecting, subsequent C-\ toggles the selected input method on and off. You can set the input method again with `M-x set-input-method`.

`ch` describes editing state of current buffer:

- This shows two dashes (‘–’) if the buffer displayed in the window has the same contents as the corresponding file on the disk; i.e., if the buffer is “unmodified”.
- If the buffer is modified, it shows two stars (‘**’). For a read-only buffer, it shows ‘%*’ if the buffer is modified, and ‘%%’ otherwise. You can see that in the picture, the buffer is modified.

`fr` gives the selected frame name. A frame is a Emacs window in your OS. For example, these are two Emacs frames:

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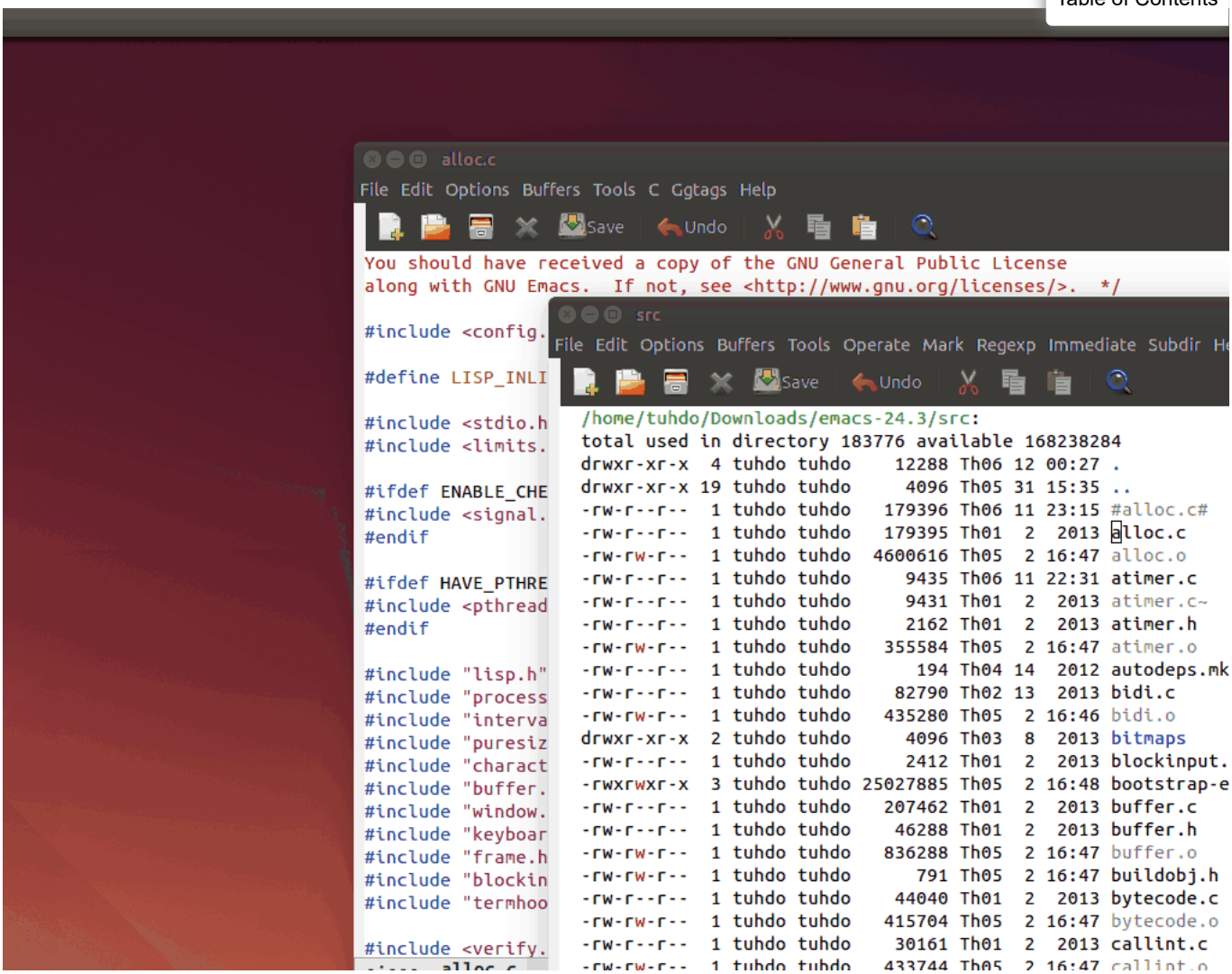

If you are using the GUI version of Emacs, it will always be a dash. However, if you use Emacs in terminal, you cannot have multiple frame window like the above screenshot. Instead, Emacs creates *virtual frames* with names like F1, F2..., Fn like this (notice my mouse pointer):

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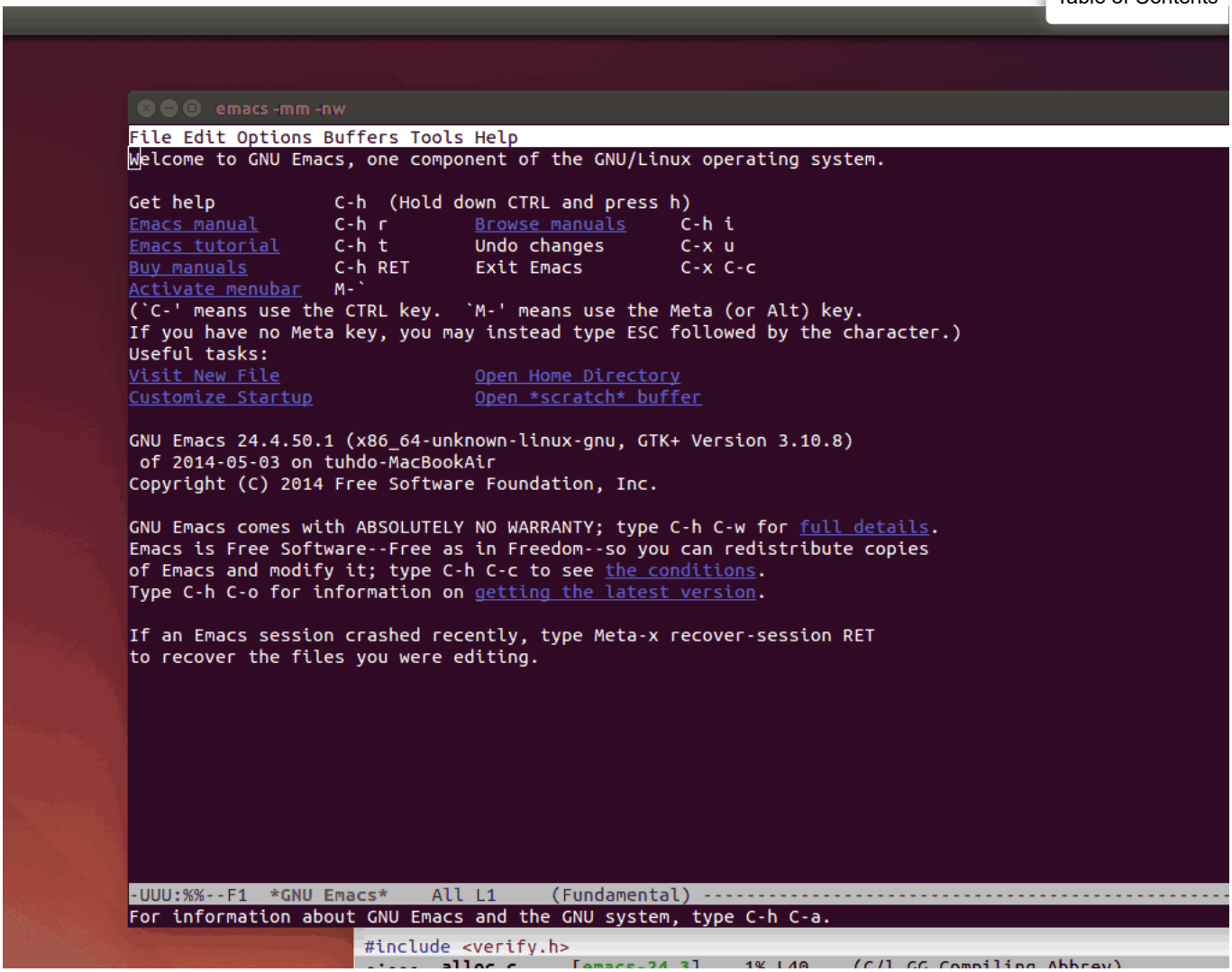

`buf` is buffer name. Buffer name is usually file name; but they can have different names.

`pos` is display the current position of your viewing screen. If your viewing screen starts from the first line, it displays as `Top`. If you viewing screen contains the last line of your buffer, it displays as `Bottom`. Otherwise, it displays **%** position, i.e. 20% means you viewing screen is 20% away from the top.

`line` displays the current line number.

`major` displays the current major mode.

`minor` displays the current minor mode.

Minibuffer

`Minibuffer` is the small area at the bottom of your Emacs screen.

The `Minibuffer` is where Emacs commands read complicated arguments, such as file names, buffer names, Emacs command names, or Lisp expressions. When you execute `find-file`, it asks for your file from the `Minibuffer`, which is one of `find-file` required argument. Remember I said earlier that in Emacs, everything is a function. `find-file` is a command, in other words, it's an interactive function. As a function, it also takes arguments. `Minibuffer` is where users can feed arguments to the interactive functions.

Minibuffer has an input history. If you enter anything into the minibuffer and **RET**, minibuffer remembers the input and you can access the input again with:

- **M-p** moves to the previous input in minibuffer history.

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- **M-n** moves to the next input in minibuffer history.
- **M-r** searches for an input that matches the supplied regexp.

It works on any command that get input from the minibuffer, as you already used **M-p** and **M-n** to get old inputs in Isearch.

Echo area

`Minibuffer` can be used for output as well. The echo area is used for displaying messages made with the message primitive, and for echoing keystrokes.

Both `Minibuffer` and `Echo Area`, although serve different purposes, share the same physical space. You should not be confused between the two.

Frames

An application window in an operating system is called a **Frame** in Emacs. So, you execute **Emacs** from the command line and open Emacs, that's a frame that contains your Emacs session. Emacs can have multiple frames to hold different parts of Emacs, such as a separate frame to hold the minibuffer.

Personally, I only use a single frame. However, frames can be useful if you want to organize buffers into different groups. For example, each frame can be a project: frame F1 holds buffers related to my C programming projects, frame F2 holds buffers related to customizing Emacs, frame F3 holds buffers related to emails and reading, newsgroups...

As stated earlier, multiple frames under the terminal have names F1, F2 .... Fn for each frame.

These are the key bindings for manipulating frames:

Key	Binding
`C-x 5 C-f`	**Command**: `find-file-other-frame` Open file in a different frame
`C-x 5 f`	**Command**: `find-file-other-frame` Same as **C-x 5 C-f**
`C-x 5 C-o`	**Command**: `display-buffer-other-frame` Open buffer in a different frame and move point there
`C-x 5 .`	**Command**: `find-tag-other-frame` Find tag at point in a different frame
`C-x 5 0`	**Command**: `delete-frame` Delete the current frame point is in
`C-x 5 1`	**Command**: `delete-other-frames` Delete other frames except the one at point
`C-x 5 2`	**Command**: `make-frame-command` Create a frame
`C-x 5 b`	**Command**: `switch-to-buffer-other-frame` Same as **C-x 5 C-o**
`C-x 5 d`	**Command**: `dired-other-frame` Open a Dired buffer in another frame
`C-x 5 m`	**Command**: `compose-mail-other-frame` Open another frame for composing email
`C-x 5 o`	**Command**: `other-frame`

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Key	Binding
	Cycle through available frames
`C-x 5 r`	**Command**: `find-file-read-only-other-frame` Open file for read only in another frame

Window

Unlike other editors, Emacs can split your frame area into multiple smaller areas. Each such area is called a `window`. You can divide a frame into as many windows as you want and each window can have anything in it, i.e. your current editing buffer, file management buffer, help buffer, a shell... Basically anything that Emacs can display. Let's try them out:

Exercise:

C-x 2 to split the current window into two horizontal windows. After splitting, you will have the exact duplicate of your current editing buffer. `split-window-below` is bound to **C-x 2**.

C-x 3 to split your current window into two vertical windows. After splitting, you will have the exact duplicate of your current editing buffer. `split-window-right` is bound to **C-x 3**.

Now, after you execute the two commands above, you will have three windows: two above and one below. Each window can hold a buffer. With the above two commands, you can create arbitrary window layout. In Emacs, a window layout is called a **window configuration**.

To navigate through the windows, use **C-x o** which runs the command `other-window`. Try cycle around the windows a few times to get used to it.

In Emacs, `<next>` is the **PageDown** key, `<prior>` is the **PageUp** key. **M-<next>** runs `scroll-other-window` and scroll the other window forward; **M-<prior>** runs `scroll-other-window-down` and scroll the other window backward. Other window is the window that you visit when **C-x o**.

C-x 0 closes the window at point.

C-x 1 closes all other windows except the current selected one. Create another window, then try **C-x 1**.

C-x 4 is a common prefix for opening things in other buffer. Things here can be files, shell, or a tree explorer. Here are standard **C-x 4** bindings:

Key	Binding
`C-x 4 C-f`	**Command**: `find-file-other-window` Just like **find-file** discussed earlier, except open file in new window. If the current frame only has one window, a new window is created.
`C-x 4 C-o`	**Command**: `display-buffer` Select a buffer from buffer list and display it in another window but not move point to that window.
`C-x 4 .`	**Command**: `find-tag-other-window` Open the tag at point in another window (more on this later)
`C-x 4 0`	**Command**: `kill-buffer-and-window` Just like **C-x 0** but kill the buffer in that window as well.
`C-x 4 a`	**Command**: `add-change-log-entry-other-window` Open another buffer and allow you to record the change of the current editing file. These days, you use version control system to manage file changes,and Emacs does this better.

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Key	Binding
	Probably this feature exists when thing like Git does not exist.
`C-x 4 b`	**Command**: `switch-to-buffer-other-window` Open a selected buffer in another window and move point to that window.
`C-x 4 c`	**Command**: `clone-indirect-buffer-other-window` Clone the current buffer in another window and give it a different buffer name.
`C-x 4 d`	**Command**: `dired-other-window` Open a **dired** buffer in another window. **Dired** is a built-int file manager in Emacs. We will discuss later.
`C-x 4 f`	**Command**: `find-file-other-window` Same as **C-x 4 C-f**
`C-x 4 m`	**Command**: `compose-mail-other-window` Write mail in other window. You can write email and send it directly from Emacs.
`C-x 4 r`	**Command**: `find-file-read-only-other-window` Similar to **find-file-other-window**, but open for read-only.
`M-<next>`	**Command**: `scroll-other-window` Scroll other window forward.
`M-<prior>`	**Command**: `scroll-other-window-down` Scroll the other window backward.

That's quite a long table, eh? If you forget, you can either:

- Visit my manual again :)
- Or much faster, access it directly from Emacs with it amazing help system. So, if you want to know all key bindings to prefix **C-x 4**, just **C-x 4** and then **C-h**. If you enter a prefix key and enter **C-h** after it, it will list all of the key bindings and commands start with that prefix. This is really nice, compare to other editors that hide all this information deep within layers of menus.

Help system will be discussed in later section.

Prefix Arguments

In Emacs, behind anything is a function. Functions can accept arguments. You can also pass arguments into Emacs commands to modify its behaviours. However, you don't have to write code that calls a function with its arguments and then compile or evaluate it. You can pass arguments interactively.

Exercise:

Earlier, you learned motion commands such as **C-f**, **C-b**, **C-p** and **C-n**, remember? But, you can only move forward 1 character with **C-f**, move backward 1 character with **C-b**, 1 line upward with **C-p** and 1 line downward with **C-n**.

Now, try **C-4** before any of those commands. See anything different? Great, instead of executing the commands once (i.e. Move forward 1 character ...), you repeat the commands 4 times (i.e. Move forward 4 characters...).

Many commands allow multiple repetitions with prefix arguments.

You can even pass negative prefix arguments. Try executing the above commands with **C–4**, that's right, **Control** and **-** and **4** (minus 4). You see that you also execute the commands 4 times, but in *reverse*. That is, with **C-f**, instead of moving forward 4 characters, you move backward 4 times. You might wonder, what does it differ

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from **C-4 C-b**? You are right, it is the same. But, many commands do not have their reversed versions, so negative argument is always useful in those circumstances.

Now, try executing **C-u 4 C-f**. You will see it does the same thing as **C-4 C-f**. Again, why do we need **C-u**? It is because in a terminal, you can not use **Control** with digit keys. **C-u** tells Emacs that you are about to enter a numeric argument, and it will be ready to accept the input. It's just a different way to do thing.

If you do not supply any prefix argument, such as you directly execute **C-u C-f**, then the numeric argument is default to **4**. Try **C-u C-f**, and see that it moves 4 characters forward. Try it a few times to get used to.

If you execute **C-u** consecutively, the numeric argument is a power of 4. If you press **C-u**, the resulting argument is 4^1; **C-u C-u**, the result is 4^2, which is **16**; **C-u C-u C-u**, the result is 4^3, or **64**. I know large powers are hard to calculate, but there is a plugin that displays the calculation and display these numbers. That plugin is Helm, but I will discuss that later in part 2.

Why number 4 for **C-u**? I don't know.

Basic file management with Dired

Emacs has a built-in one called Dired, short for `(Dir)ectory (Ed)itor`.

This section is a shortened version of Dired in GNU Emacs Manual. After you read and practice these commands, read the Dired Manual if possible.

Enter Dired

Key	Binding
`C-x d`	Select directory of your choice and start Dired in that directory
`C-x 4 d`	Select directory of your choice and start Dired in another windows.
`C-x C-f`	Select a directory to enter Dired

Exercise: Execute the above commands at least once to get used to it. What command do you like the most?

Navigation

Key	Binding
`n`	Move to next entry below point.
`p`	Move to previous entry above point.
`C-s`	Find text using Isearch; useful for searching entries in Dired

You can supply prefix arguments for these commands. i.e. `4 n` moves to the entry which is 4 lines below.

Exercise: Execute the above commands, with and without prefix argument.

Create files

To create a new file in Dired, you use the same **C-x C-f** and **C-x 4 C-f** variant.

Key	Binding
`+`	Prompts for a directory name and create one after **RET**.
`C-x C-f`	Create a new file. This is your regular `find-file`.

Exercise:

- Create a new directory called `dired_practice` or a name of your choice.
- Create a new file of your choice.

Visit files

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Key	Binding
`f` or `e` or `RET`	Open current file at point.
`o`	Open file at point in another window.
`C-o`	Open file at point in another window, but do not select that window.
`v`	Open file for read only.
`^`	Open parent directory and create another Dired buffer of parent directory

Exercise:

- Assume you are in your newly created directory in previous section.
- Go up to the parent directory using `^`.
- Open another directory. You will enter that directory, and a new buffer is created for listing the content of that directory.
- Go up to the parent directory using `^`.
- Repeat opening and go up parent directory a few times.
- **C-x b** and **TAB**. You will see a bunch of opened directory through your filesystem navigation. Whenever you open a file or directory, using Dired or other methods, you have a buffer of that directory.

  At this point, you may feel annoyed that Dired opens too many buffers and it will go out of control at some point. Worry not! That's why you have `ibuffer`.

- `M-x ibuffer` or `C-x C-b` if you've already replaced `list-buffers`.
- `/ m` and select `dired-mode`. `/ g` and name the group `Dired` and you have a separate group for managing directories. No more cluttered view with other buffers. You can stop worrying now.

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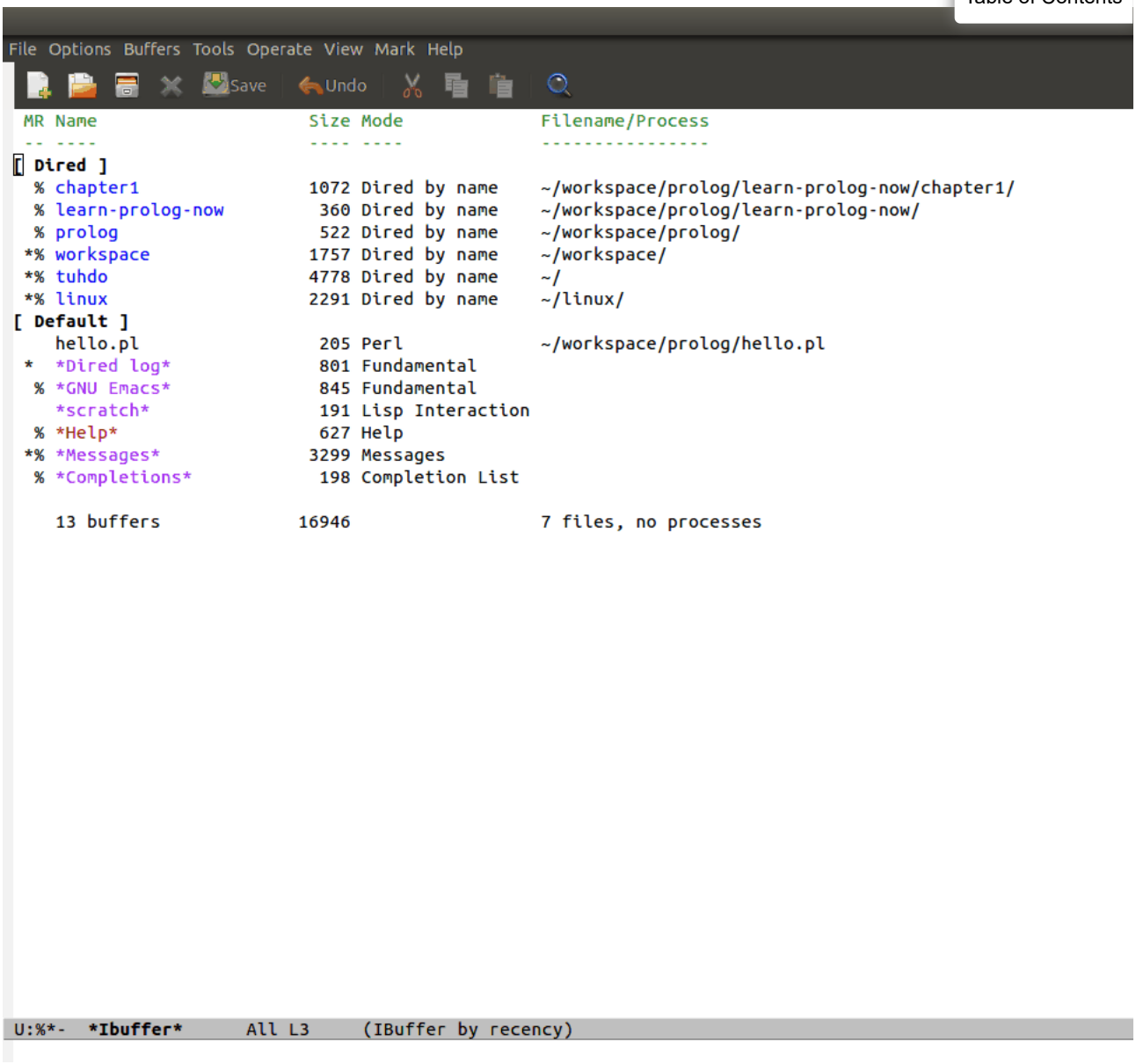

If you want to enter directory you visited, open `ibuffer` and look for it. This is efficient for a complex directory tree. For example, if you have to constantly work with these many directories:

- `directory_root/dir1/dir2/dir3/dir4/`
- `directory_root/dir2/dir2/dir3/dir4/`
- `directory_root/dir5/dir6/dir7/dir8/`
- ....

The layouts of top two directories are common when you have to create patches. Working in a normal file manager like File Explorer in Windows, you only have one directory view. Going back and forth is tedious and inefficient, and you have to remember different directory paths. To make it easy, you have to open multiple File Explorer manually. Under the terminal, you have to create symbolic links for those directories to save you time. However, you still have to manage the links manually, like delete when they are not used, or update when directory the links pointing to are moved.

Emacs does it all for you, *automatically*. With this feature, you can freely navigate the filesytem without having to remember the working directory to get back later, because you can easily go back to it quick and easy.

File Marking

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You flag files for deletion. You mark files for everything else (i.e. copy, move, link files...). There are many marking commands for specialized file types. Except for **m**, **% m** and **% g**, all marking commands have prefix `*`. I will list the most useful one; you can look up the other marking commands in Dired Manual.

Key	Binding
`m`	mark the entry at point. You can mark more than one, either downward or upward with prefix argument.
`% m`	mark all files whose names match supplied regexp.
`% g`	match all files whose contents match the supplied regexp. This is the same as using **Grep**.

Exercise: Practice the listed marking commands. Keep a few marked files/directories for the next section.

Operating on files

These commands use uppercase character. If you see an uppercase character for a command, it means **S-<character>**.

Key	Binding
`C`	Prompt for a location to copy the file at point (if no file is marked) or marked files.
`R`	Prompt for a location to rename or move file at point (if no file is marked) or marked files. This is the same as `mv` command in shell.
`H`	Prompt for a location to create a hard link.
`S`	Prompt for a location to create a symbolic link.
`M`	Change permission bits of file at point or marked files.

Exercise:

- Create a new directory at the current directory.
- Assume that your still keep the marked file in the above section; `C` and prompt for the directory you have created. **RET** to confirm copying.
- If you want to move marked files/directories, use `R`. If you want to rename, mark only a single file/directory and put a new name in the rename prompt.
- Enter the directory you have just copied the files.
- Move your cursor on a file and `H` to create a hard link. A prompt ask for destination and the link name. Create a link at the current location with different name from the original file.
- Move your cursor on a file and `S` to create a symolic link. A prompt ask for destination and the link name. Create a link at the current location with different name from the original file.
- Move your cursor on either the hardlink or symlink you created and `M` and change the bit permission; set it to something like `000`.
- After that, press `g` to refresh the Dired buffer. Look at the original files the links point to, you will see the permission attributes are cleared and you won't be able to access those files.

Deleting files

Key	Binding
`d`	flags file for deletion.
`u`	remove flagged files.

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Key	Binding
`#`	flag all auto-save files (files whose names start and end with '#').
`~`	flag all backup files
`% &*`	flag for deletion all files that match `dired-garbage-files-regexp`.
`% d`	flag files which matches a regexp.
`x`	confirm and delete flagged files.

Execute shell commands in Dired

Just like in a shell, you can execute commands in the current directory in Dired too.

Key	Binding
`!`	execute a command on selected file or files.
`&`	execute a command on selected file or files asynchronously.

Compare files

Key	Binding
=	compares the file at point with another file supplied by user from a file prompt in the minibuffer.

Subdirectories

This is an exciting feature of Dired. In other file explorers, you get a tree to browse your directory. If you have a deep directory structure, it will quickly become a nuisance.

Dired allows user to insert the content of a directory just below the current directory. You can search for file names with **C-s** easily in both directories. You can insert as many subdirectories as you want.

Move point on a directory in Dired and press **i**. You will see another directory insert below:

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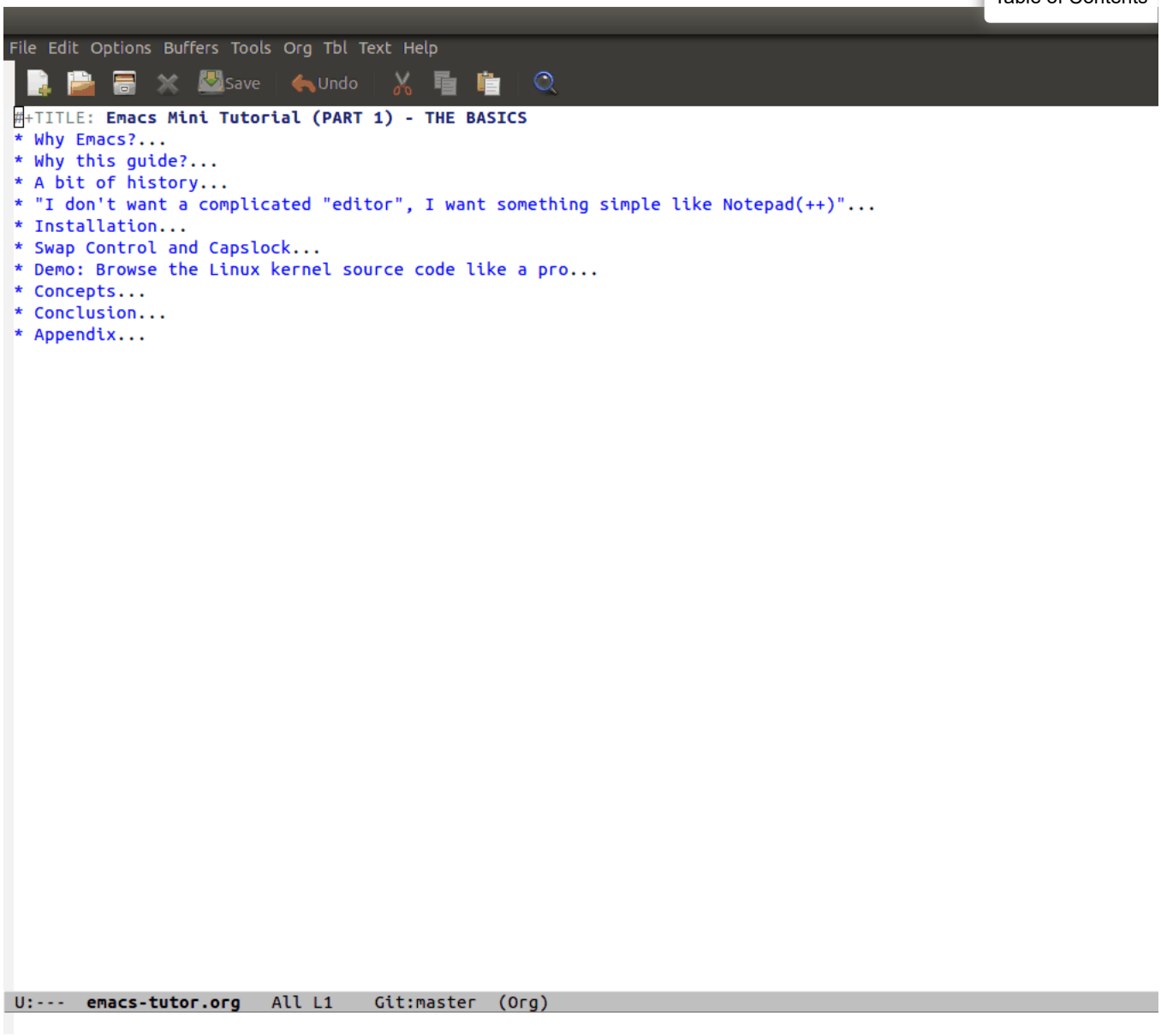

This is really efficient when you work on several related directories in a project frequently.

Exercise:

- Open a directory with subdirectories inside it.
- Insert subdirectories with **i**.
- Remember Bookmark? You can save Dired buffers with Bookmark for later access. **C-x r m** and save the current Dired buffer with subdirectories.
- Kill the current Dired buffer with subdirectories.
- Open the Dired buffer via the bookmark list **C-x r l**. You will see that not only your Dired buffer is fully restored, but your subdirectories too.

Registers

When I first heard about registers in Emacs, it scared me. I thought "Wow, what is this "register" thing? Am I going to work directly with CPU registers?" As it turned out, despite the name "Register", it's not something that complicated to understand. Although, an Emacs register is similar to a CPU register in the sense that it allows quick access to temporal data.

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Each register has a name that consists of a single character, which we will denote by *r*; *r* can be a letter (such as 'a') or a number (such as '1'); case matters, so register 'a' is not the same as register 'A'.

In Emacs, registers are for quick access to things. Things can be a position, a piece of text, a rectangle, a number, a file name, or a window configuration (yes, you can save how Emacs organizes its screens and restore it later!).

Saving different types of objects has different key bindings, but to jump to a register, you use a single command **C-x r j REG**; **REG** is a register of your choice.

The prefix key for register commands is **C-x r**. If you forget the key bindings, **C-x r C-h** to get the list of key bindings.

Save window configuration

One of the best uses of registers. It simply saves your current window configuration and restores the layout later.

For example, you are viewing four source code buffers, but want to open two Dired buffers side by side to for managing files, so you close two windows and switch the other two windows to Dired buffers. But this makes you lose the perfect layout you had, and later it would be tedious to restore the windows one by one to finally recreate the original layout you were working with. Then, later, you have to do something else, you have to break your window configuration, you have to manually restore your window configuration again, and have to remember exactly which buffers you were working with.

To free yourself from this burden, register is the answer. You can save a window configuration with four windows displaying four buffers, and another one having two Dired buffers for your project. You can more easily switch between them.

Key	Binding
C-x r w REG	**Command**: `window-configuration-to-register` Save the window configuration of current frame into register **REG**
C-x r f REG	**Command**: `frame-configuration-to-register` Save the state of all frames, including all their windows, in register **REG**
C-x r j REG	**Command**: `jump-to-register` Jump to a register **REG**.

REG can be a letter (such as 'a') or a number (such as '1'); case matters, so register 'a' is not the same as register 'A'.

Demo: In this demo, I saved two windows configurations in two registers **a** and **b**, using **C-x r w**. Register **a** stores the Dired buffer that contains two project directories. Then, I open two files in the two directories, create another smaller window and open another file. Then, suddenly I want to go back to my project roots. It's then when I execute **C-x r j**, get a prompt, enter **a** and Emacs switches back the Dired buffer. Then, I switch back to the files I was editing with **C-x r j**, get a prompt, enter **b**.

The demo starts when you see at the bottom a prompt with "Eval: START".

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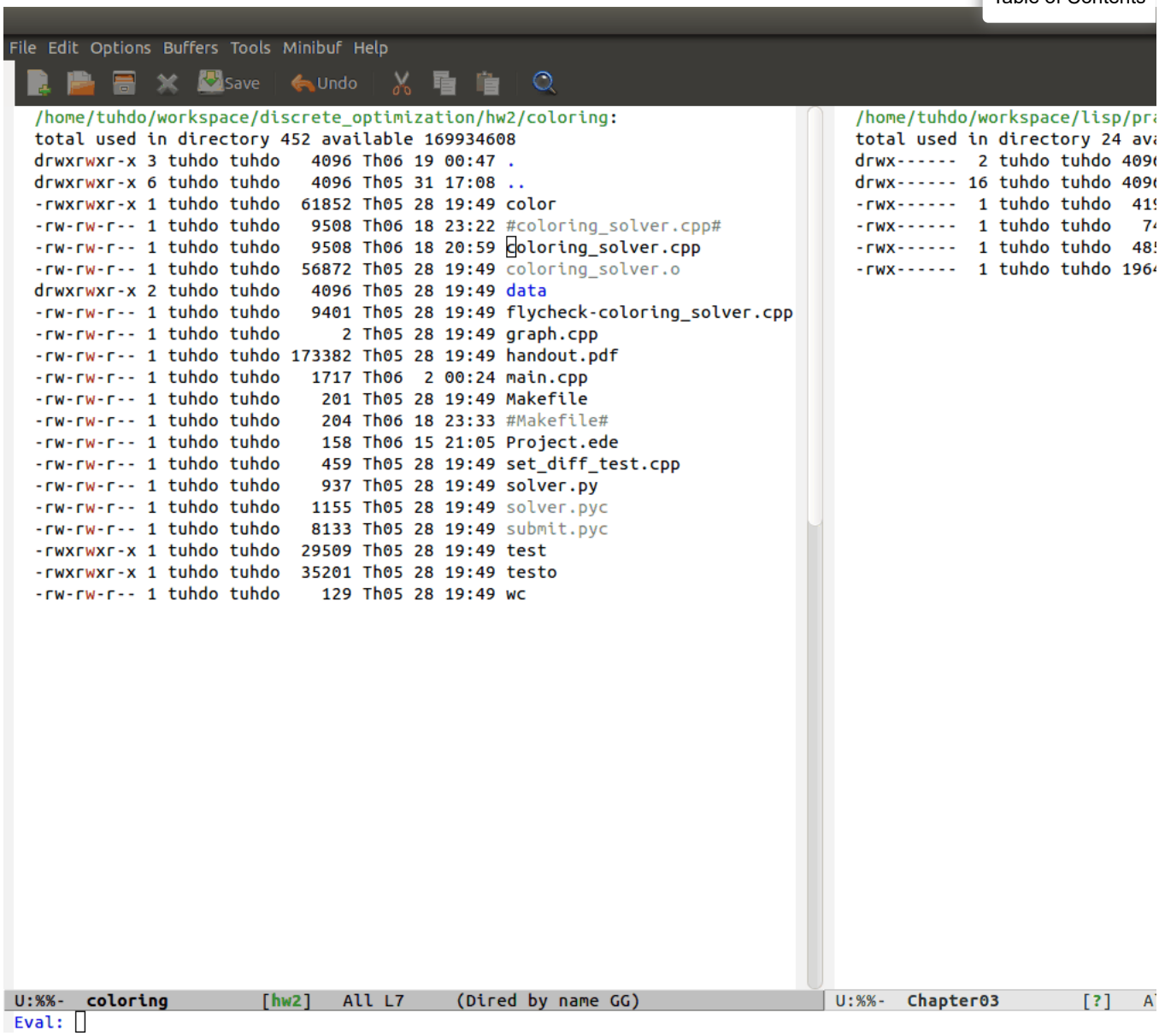

Exercise:

- Save a few window configurations into registers. I suggest that each window configuration should represent a workspace of a project. But it could be anything you like, up to your imagination.
- Go back and forth between window configurations by jumping into appropriate registers.

Save frame configuration

Key	Binding
C-x r f REG	Save current frame configuration into register **REG**

If you create multiple frames with frame commands (prefix **C-x 5**), then you may want to save your frames with different window configurations in it, for later use. For example, I can have a frame for reading documents and my main frame for writing and browsing code. When I finish working, I close the extra frame, leaving my main frame active. But later, when I need to have that exact frame setup, I can always restore with saved frameset in a register.

Exercise:

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- Create a few frames with **C-x 5 2**, **C-x 5 d**, **C-x 5 f**...
- Save the frameset into a register.
- Close all the frames except the main one.
- Restore the frames by jumping to the register that stores the frameset.

Save text

You can also save a region in registers.

Key	Binding
C-x r s REG	**Command**: `copy-to-register` Copy region into register **REG**
C-x r i REG	**Command**: `insert-register` Insert text from register **REG**

REG can be a letter (such as 'a') or a number (such as '1'); case matters, so register 'a' is not the same as register 'A'.

You may wonder, what's the point of storing text into register? Haven't you got a kill ring? Here are the reasons:

- As you already know, inserting past content from the kill ring makes the chosen content the head entry. This is inconvenient, and this is when registers are handy for storing many pieces of text without affecting the kill ring. For example, you read a manual (man page or info page), and you want to remember many keywords and paste it somewhere later. Registers can help you with this use case.
- You can also use registers to save many code templates. For example, you can save a for loop template into register **f**, if template into register **i**, function definition into register **F**... This is really handy when you are learning a new language and keep forgetting syntax all the time.

  For example, this C++11 code snippet would be hard to remember if you are new:

```
  auto it = find_if (vertices.begin(), vertices.end(), [&v_idx] (const Vertex& o) -> bool {
    return o.id == v_idx;
});
```

  I save it to a register, insert and modify it to fit my current need until I remember it. This is much faster than to go back to the previous source location to look it up again, and would be time consuming if your source code is large.

Exercise:

- Copy a few text snippets into registers.
- Re-insert it in a buffer.

Save rectangles

Key	Binding
C-x r r REG	Command: `copy-rectangle-to-register` Copy the region-rectangle into register **REG** With **C-u** prefix, delete it as well

Insert the rectangle in register **REG** by **C-x r i REG**.

Exercise:

- Save a few rectangles in registers a few times to get used to it.
- Insert the rectangles in the registers into some buffer.

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Save position

Key	Binding
C-x r <SPC> REG	Command: `point-to-register` Record the position of point and the current buffer in register REG
C-x r j REG	Command: `jump-to-register` Jump to the position and buffer saved in register REG. If the buffer is killed, revisit the file and open the buffer, then jump.

Saving positions are useful when it is used with Macro, which is discussed later.

Important Note:

When you jump to a position into a register, Emacs **always** jumps to that position, even if the content of the buffer is changed. That is, if you already saved a position into a register and when the buffer that holds that position changes, the saved position changes as well. For example, you save position 100 (it means the position of 100th character) and you add or remove a number of characters before the 100th character, then the position in the saving register also add or subtract according to that number.

Exercise:

- Save a buffer position into register **a** with **C-x r SPC a**.
- Move point else where.
- Jump back to previous position with **C-x r j a**.
- Move point backward a few characters.
- Add some characters.
- Jump back to position in register **a** with **C-x r j a**.
- You see that point does not jump to original position, but away from the original position a number of characters that is equal to the number of your added characters.
- Go to the beginning of line and **RET** to add a newline.
- Jump back to position in register **a** with **C-x r j a**.
- You see that point jumps to position in register **a**, but one line below.

Save numbers

Key	Binding
C-u number C-x r n REG	Command: `number-to-register` Store *number* into register **REG**
C-u number C-x r + REG	Command: `increment-register` If **REG** contains a number, increment the **number** in that register by number.

You can insert the number from a register **REG** with **C-x r i REG**. These numbers are handy when used with `Keyboard Macro`.

Exercise:

- Save a few numbers into registers.
- Add a number of your choice into numbers saved in the registers.
- Insert back the number in registers into a buffer, and see the result.

Macro

Macro records your actions in Emacs and play back later.

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Key	Binding
`f3` or `C-x (`	Start recording macro
`f4` or `C-x )`	Stop recording macro
`C-x e` or `f4`	Playback macro

Personally, I use `f3` and `f4` for recording/playback, so I don't have to press many keys. To repeat a macro many times, use prefix argument. For example, `C-u 10 <f4>` executes a macro 10 times. If you want to cancel recording, **C-g**.

Exercise 1:

Copy these lines into a buffer of your choice:

```
aaaaabbbbbbbccccccddddddd
aaaaabbbbbbbccccccddddddd
aaaaabbbbbbbccccccddddddd
aaaaabbbbbbbccccccddddddd
aaaaabbbbbbbccccccddddddd
aaaaabbbbbbbccccccddddddd
aaaaabbbbbbbccccccddddddd
aaaaabbbbbbbccccccddddddd
aaaaabbbbbbbccccccddddddd
aaaaabbbbbbbccccccddddddd
aaaaabbbbbbbccccccddddddd
aaaaabbbbbbbccccccddddddd
aaaaabbbbbbbccccccddddddd
aaaaabbbbbbbccccccddddddd
```

Now, you want to separate each line into different groups, each group contains their own character, like this:

aaaaa bbbbbbb ccccc ddddddd

In many editors, you have have to do it manually. In Emacs, you don't have to repeat yourself, using macro. Follow these steps:

- Place point at the beginning of the first line.
- Press **<f3>**.
- Use C-s to search-and-jump to the beginning of each character group (or C-f if you want something simple) and add whitespace.
- Return to the beginning of next line. Press **<f4>** to finish recording.
- Continuously press **<f4>** and see Emacs playbacks the whole action sequence you've just recorded.
- If you want to repeat more than 1 time, using prefix argument. If you want to repeat until the end of file, use prefix argument 0: **C-u 0 <f4>**. Alternatively, highlight the region of remaining lines, and **C-x C-k r**: run the last keyboard macro on each line that begins in the region (`apply-macro-to-region-lines`).

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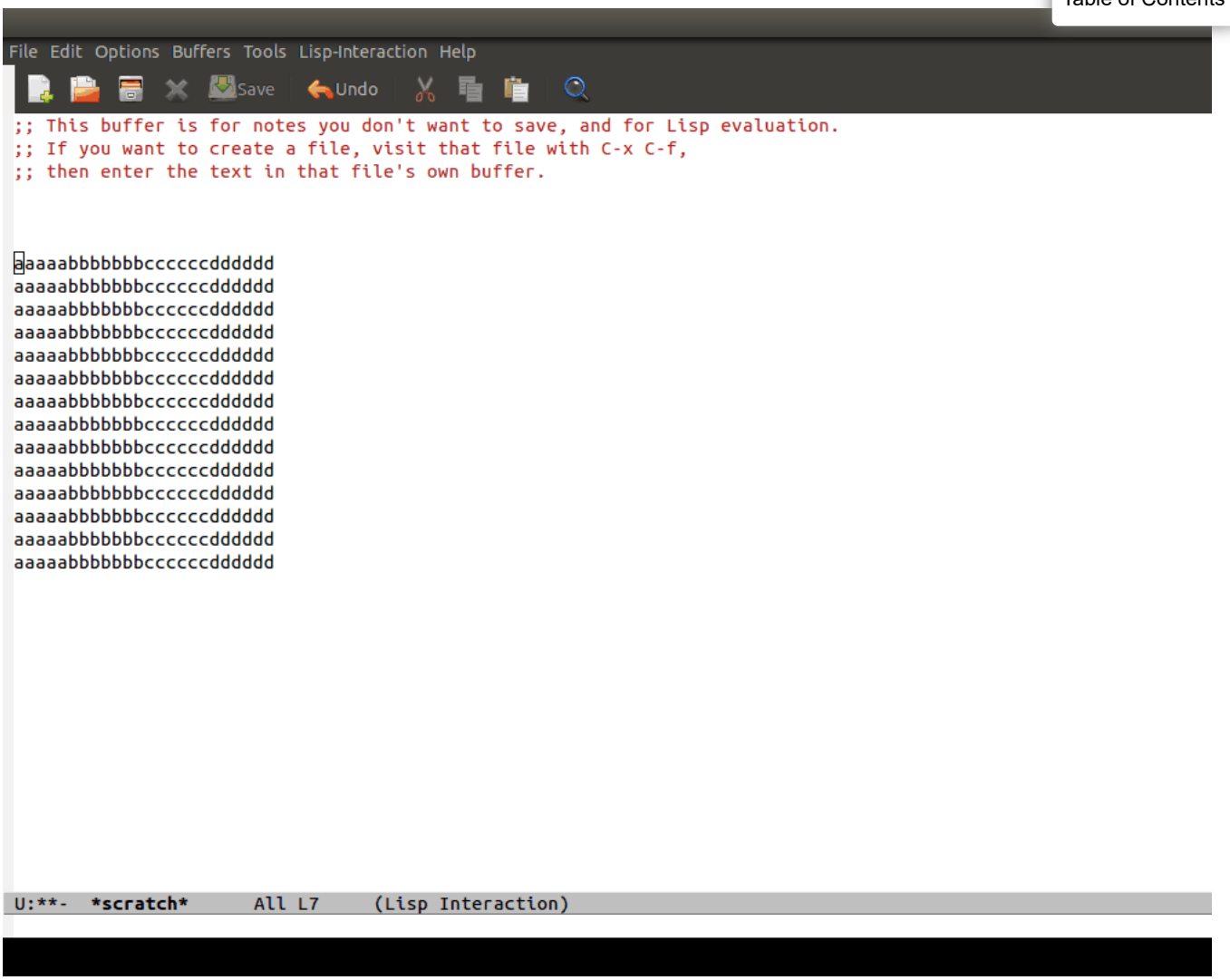

After a macro is defined, it is saved in the keyboard macro ring. There is only one keyboard macro ring, shared by all buffers. All commands which operate on the keyboard macro ring use the same **C-x C-k** prefix. Just remember the prefix **C-x C-k** = macro commands, and you won't find macro key bindings difficult to remember.

Exercise 2: Transform data from one format to another

For example, I have this table with some data:

```
machine1=(aa:bb:cc:dd:ee:a1 aa:bb:cc:dd:ee:a2 aa:bb:cc:dd:ee:a3)
machine2=(aa:bb:cc:dd:ee:b1 aa:bb:cc:dd:ee:b2 aa:bb:cc:dd:ee:b3)
machine3=(aa:bb:cc:dd:ee:c1 aa:bb:cc:dd:ee:c2 aa:bb:cc:dd:ee:c3)
machine4=(aa:bb:cc:dd:ee:d1 aa:bb:cc:dd:ee:d2 aa:bb:cc:dd:ee:d3)
machine5=(aa:bb:cc:dd:ee:e1 aa:bb:cc:dd:ee:e2 aa:bb:cc:dd:ee:e3)
machine6=(aa:bb:cc:dd:ee:f1 aa:bb:cc:dd:ee:f2 aa:bb:cc:dd:ee:f3)
```

Basically, each row contains the MAC addresses of Ethernet interfaces of a machine in the server cluster at my workplace. The data are stored in a plain text file. But then, we want to integrate these data inside our YAML file to do something else. I have to basically transform the data in the above format to the one below:

```
machine 1:
    mac1: aa:bb:cc:dd:ee:a1
    mac2: aa:bb:cc:dd:ee:a2
    mac3: aa:bb:cc:dd:ee:a3
```

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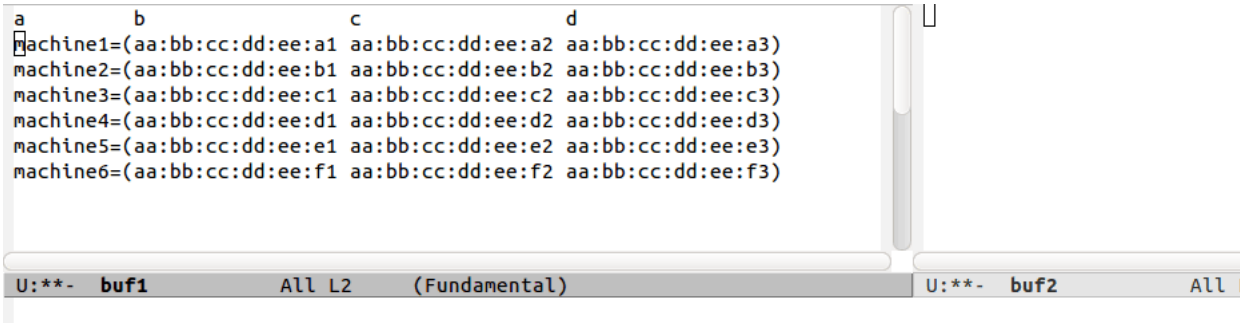
In the real data file, it contains around 50 entries. Manually transforming text would be tiresome. Thanks to Emacs, I solved this problem with a keyboard macro.

- Pre-recording setup: Before recording a macro to automate this transformation, we need to properly set things up:
  - Create two buffers side by side with **C-x b**. Name the left buffer `buf1` and right buffer `buf2`.
  - Yank the original data into `buf1`. Move point back to beginning of buffer.

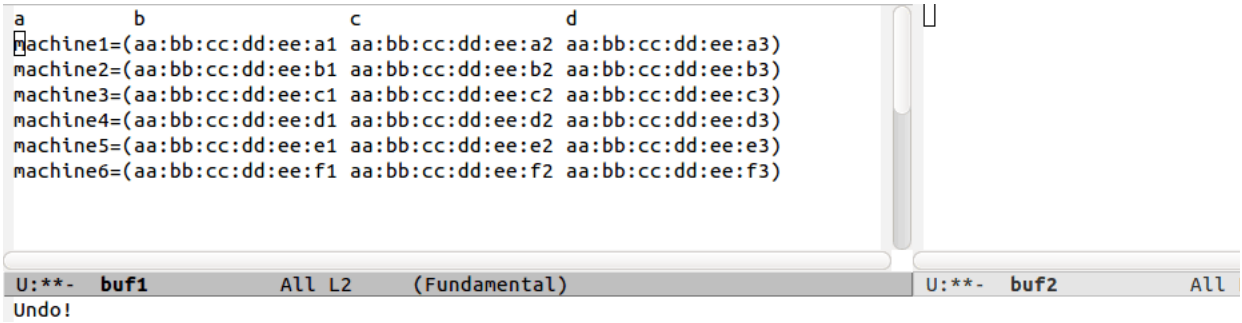
    That's set and done. Here is how it should look like:



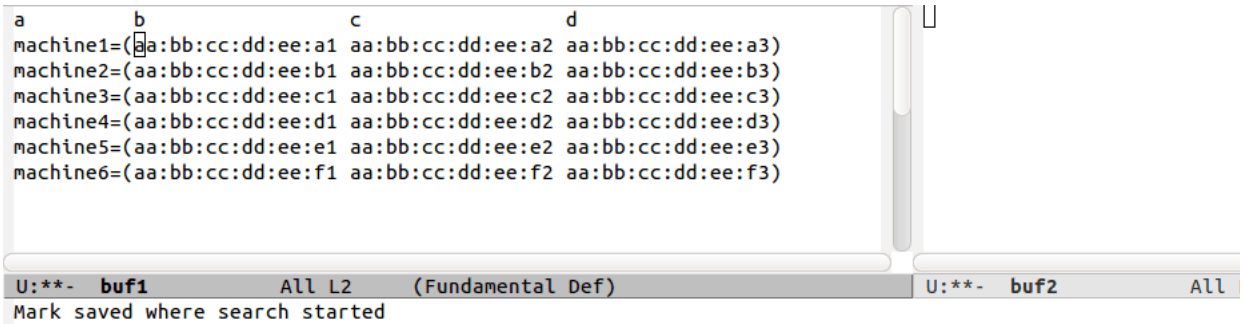
- Record:

  Point should be at `buf1`, at the first line of the data.

  - Press **<f3>** to start.
  - **C-SPC** then **M-f**. This marks the word `machine1`. Store this word into register `a` with **C-x r s a**.



  - Move point to the beginning of the first MAC address. **C-SPC** then **C-s** and search to the first delimiter, which is an empty space " " in this case. **C-b** to move back to the end of the first MAC address. Store this region into register **b** with **C-x r s b**.



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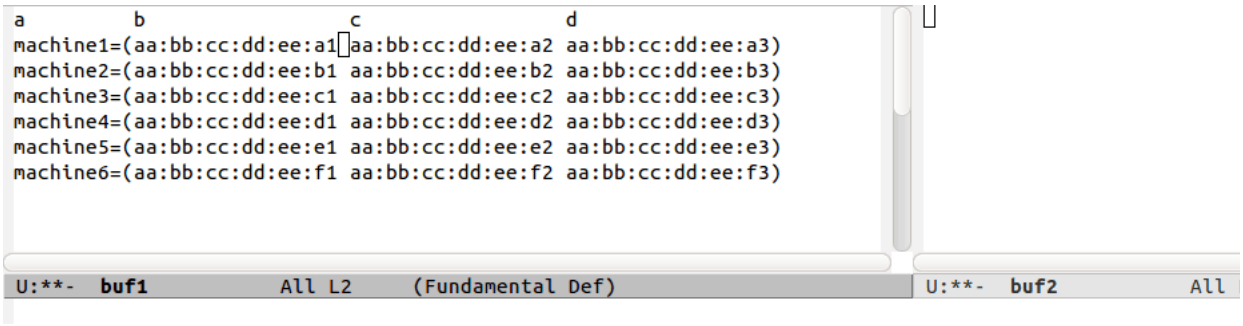
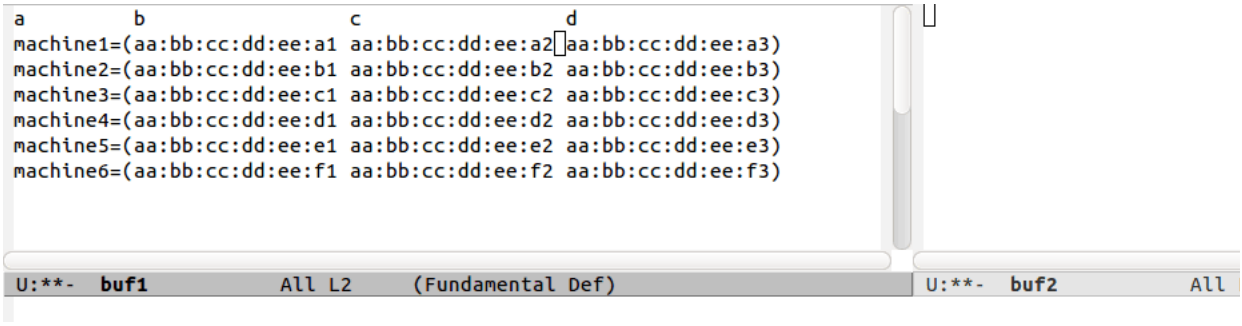
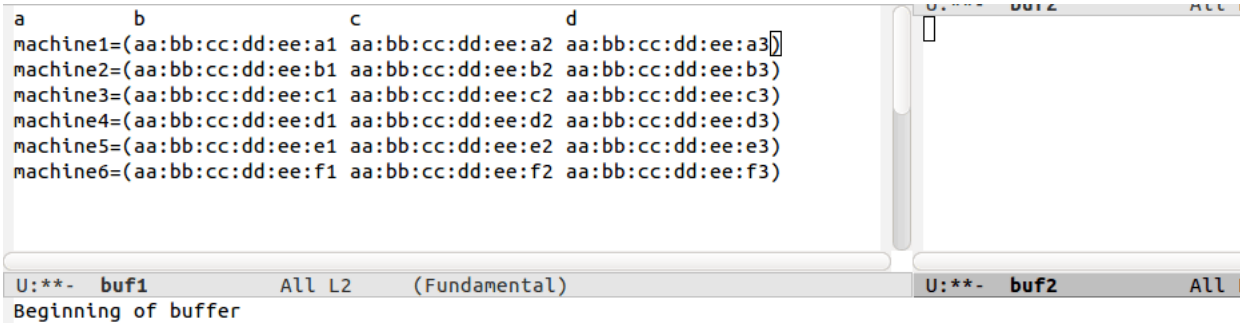
- After that, move point to the beginning of the 2nd MAC address, **C-s** to space and **C-b** to go back one character. Save the region into register **c** with **C-x r s c**.



- Repeat for the last MAC address and save it in register **d**.



- Switch to the second buffer with **C-x o**:
- Insert the register from `a` to `d` according to the template:



- After inserting, move point to the next empty line.
- Switch back to `buf1` with **C-x o**.
- Move to the beginning of next line.
- Press **<f4>** to stop.

- Play:

  Now you can play back your new keyboard macro to transform the remaining entries.

Here is the whole process:

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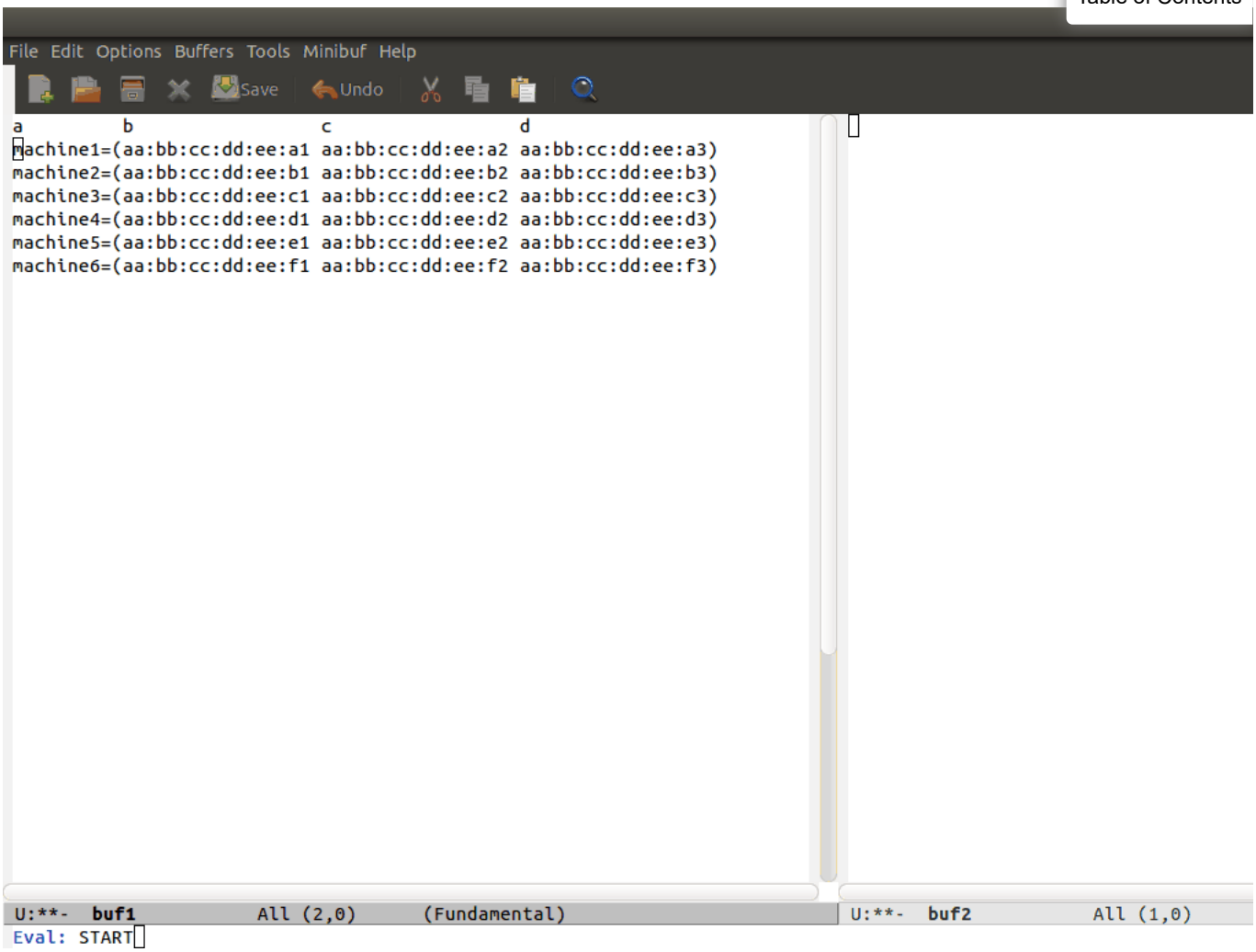

Keyboard macro ring

Key	Binding
C-x C-k C-k	Command: `kmacro-end-or-call-macro-repeat` Execute the keyboard macro at the head of the ring
C-x C-k C-n	Command: `kmacro-cycle-ring-next` Rotate the keyboard macro ring to the next macro (defined earlier).
C-x C-k C-p	Command: `kmacro-cycle-ring-previous` Rotate the keyboard macro ring to the previous macro (defined later)

Exercise:

Define a few more keyboard macros and practice the above commands.

The Keyboard Macro Counter

Each macro has a counter which is initialized to 0. Everytime a counter is inserted into the buffer, its value is incremented by 1.

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Key	Binding
<f3>	Command: `kmacro-start-macro-or-insert-counter` Insert the counter into the buffer and increase the counter by 1. This is only applicable when a macro is recording
C-x C-k C-i	Command: `kmacro-insert-counter` Insert the counter of current macro into the buffer
C-x C-k C-c	Command: `kmacro-set-counter` Change the counter value of current macro
C-x C-k C-a	Command: `kmacro-add-counter` Add a number to the current keyboard macro counter. C-u before running this command resets the counter back to previous value
C-x C-k C-f	Command: `kmacro-set-format` Specify the format for inserting the keyboard macro counter

Valid format specifications for C-x C-k C-f:

Specification	Description
`%o`	Insert base-eight representation of an integer.
`%d`	Insert base-ten representation of an integer.
`%x` `%X`	Insert base-sixteen representation of an integer. '%x' uses lower case and '%X' uses upper case.
`%c`	Insert the character which is the numerical value given.
`%e`	Insert exponential notation for a floating point number.
`%f`	Insert decimal-point notation for a floating point number.
`%g`	Insert notation for a floating point number, using either exponential notation or decimal-point notation, whichever is shorter.
`%%`	Insert a single '%'. This format specification is unusual in in that it does not use a value. For example, (format "%% %d" 30) returns "% 30".

The format must contain at least one of the valid specification above or combination with other text. For example, these are valid format:

- `0x%x`
- `Project %d:`
- `Plain text`

Exercise 1: Creating incremental header prefix

Format specification is useful for making formatted output with macro, combine with the counter, it is useful for appending numbered prefix at beginning of line. For example: We usually write code comment that describes sequential steps in a high level point of view like this:

```
- Step 1 of 5: ...
- Step 2 of 5: ...
- Step 3 of 5: ...
- Step 4 of 5: ...
- Step 5 of 5: ...
```

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Keyboard macro can help us generate such text pattern effortlessly.

- **C-x C-k C-f** and enter this format: `- Step %d of 5:`
- **<f3>** to start recording.
- **<f3>** again to insert the first counter value, which is `- Step 0 of 5:`
- **RET** to move to the next line.
- **<f4>** to stop recording.
- Now press **<f4>** as many time as you want and see header prefix got inserted with incremental values.
- You can insert the text any value by simply set the counter with **C-x C-k C-c**.

Remember to use this the next time you write comments for your code that need an ordered list to describe the steps of your algorithm.

Exercise 2: Generate a list of numbers

With macro counter, you can easily generate a list of number in supported base:

- **C-x C-k C-f** and enter a format like this: `%d` (or a base number of your choice).
- Initialize the macro counter to a number of your choice.
- **<f3>** to start recording.
- If you want the numbers to be 5 units (or any number greater than 1) apart from each other, **C-x C-k a** to add a number to the counter. If you only want to increase by 1, skip this step because the default is 1.
- **<f3>** to insert the first number.
- **SPC** to create a separator.
- **<f4>** to stop recording.
- Now **<f4>** repeatedly to see numbers getting generated.

Macros with Variations

Macro is excellent for repetitive editing tasks. However, sometimes you have a repetitive task that can make use of macro, but not always repetitive: a part of the task varies every time you repeat it. For example, you have a text template, with some blank fields for fitting in appropriate information. Keyboard macro supports this use case.

When in the process of defining a keyboard macro, **C-x q** marks the current point in the process, and when the keyboard macro is executed and reaches this point, it will ask to confirm:

Response	Action
Y	Finish this iteration normally and continue with the next.
N:	Skip the rest of this iteration, and start the next.
RET	Stop the macro entirely right now.
C-l	Redisplay the screen, then ask again.
C-r	Start editing at point. **C-M-c** to go back to macro execution

Exercise: Inserting interactive template

Suppose you practice Agile and have to write a lot of user stories like this:

As a <type of user>, **I want** <some goal> **so that** <some reason>.

Obviously, you do not want to repeat the template texts, such as "As a", "I want" or "so that". The only contents that varies are `<type of user>`, `<some goal>` and `<some reason>`. You can create a macro that stops and waits for your action at these checkpoints. **C-r** to start editing.

- First, copy this template:

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```
As a , I want , so that
```

- **<f3>** to start recording.
- **C-y** to yank the template.
- Move point to positions that need modifications, then **C-x q**.
- **<f4>** to stop recording.
- Now **<f4>** and you will see the macro stops at the positions where you pressed **C-x q** before and ask for your action.
- **C-r** to edit. After done editing, **C-M-c** to go back.
- You are asked the same question as before. If you still miss something, **C-r** to edit again. Otherwise, press **y** to proceed to the next point.
- Continue until the end of macro.

Naming and Saving Macro

Key	Binding
C-x C-k n	Command: `kmacro-name-last-macr` Give a command name (for the duration of the Emacs session) to themost recently defined keyboard macro.
C-x C-k b	Command: `kmacro-bind-to-key` Bind the most recently defined keyboard macro to a key sequence (for the duration of the session)

When macro has a name, it becomes a command and you can find it in **M-x** and can be saved with `M-x insert-kbd-macro`. After executing the command, you are prompted for a macro name (you can use **TAB** to complete the name); select a macro and the Lisp code of the chosen macro is inserted into the current buffer, then save the buffer. You should have a dedicated file for your own keyboard macros. You can reload this file for later Emacs session with the command `load-file`.

You can also bind a macro to any key sequence. However, to avoid clashing with existing key bindings, you should use the prefix **C-x C-k**. For example, you can bind a macro to **C-x C-k 1**, another to **C-x C-k 2**...

Exercise 1: Save your macro in a file

- Record some keyboard macros.
- Give the macros names with **C-x C-k n**.
- Bind the macros to **C-x C-k 1**, **C-x C-k 2**... with **C-x C-k b**.
- Create the file `~/.emacs.d/init.el`. If you do not have the directory and the file, create it with `find-file`.
- Create the file `~/.emacs.d/macros` with `find-file`. You should be inside the buffer of this file after creating it.
- Save the macros with `M-x insert-kbd-macro`.
- To save you trouble of reloading the macro file manually, put this Emacs Lisp code inside `~/.emacs.d/init.el`:

  ```
  (load-file "~/.emacs.d/macros")
  ```

  The above code essentially loads a file at a path. Only files that are Emacs Lisp source code are valid.

- Now, every time Emacs starts, it will automatically load the `macros` file. By default, Emacs loads any Emacs Lisp code at `~/.emacs.d/init.el` when it starts. Since you put the above code in `init.el`, your `macros` file is also loaded.

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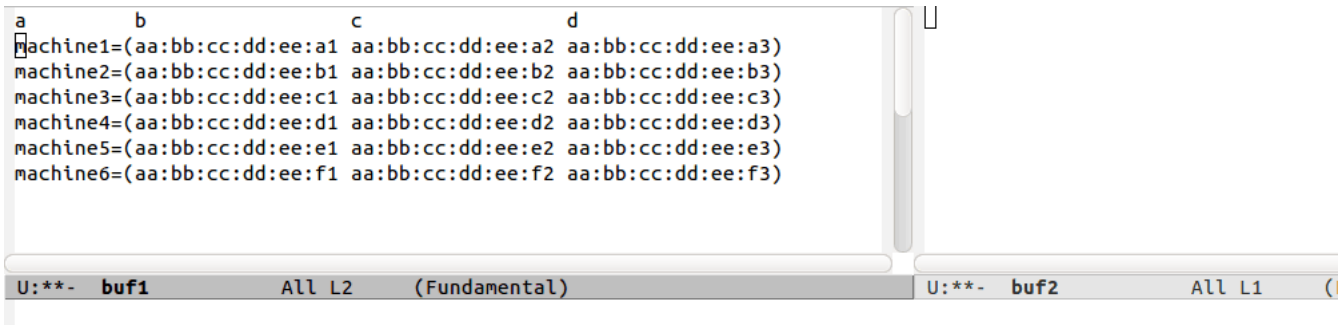
Exercise 2: Composite macros

Back to exercise 2 at the beginning of Macro section, do you remember you had to create a big macro to convert text structures? Certainly it can be done more comfortably by splitting it into smaller macros, saving these macros into Emacs commands and putting them all together in a macro.

- Pre-recording setup: Before recording a macro to automate this transformation, we need to properly set things up:
  - Create two buffers side by side with **C-x b**. Name the left buffer `buf1` and right buffer `buf2`.
  - Yank the original data into `buf1`, then move point back to beginning of buffer:

```
machine1=(aa:bb:cc:dd:ee:a1 aa:bb:cc:dd:ee:a2 aa:bb:cc:dd:ee:a3)
machine2=(aa:bb:cc:dd:ee:b1 aa:bb:cc:dd:ee:b2 aa:bb:cc:dd:ee:b3)
machine3=(aa:bb:cc:dd:ee:c1 aa:bb:cc:dd:ee:c2 aa:bb:cc:dd:ee:c3)
machine4=(aa:bb:cc:dd:ee:d1 aa:bb:cc:dd:ee:d2 aa:bb:cc:dd:ee:d3)
machine5=(aa:bb:cc:dd:ee:e1 aa:bb:cc:dd:ee:e2 aa:bb:cc:dd:ee:e3)
machine6=(aa:bb:cc:dd:ee:f1 aa:bb:cc:dd:ee:f2 aa:bb:cc:dd:ee:f3)
```

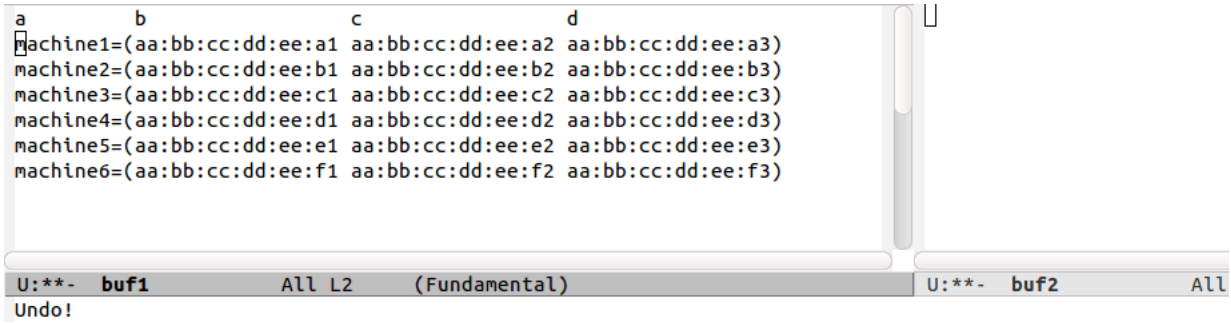
That's set and done. Here is how it should look like:



- Record:

  Point should be at `buf1`, at the first line of the data. Let's create the first macro command, `save-macs` that saves the information of each entry into registers a,b,c,d:

  - **<f3>** to start.
  - **C-SPC** then **M-f**. This mark the word `machine1`. Store this word into register `a` with **C-x r s a**.



  - Move point to the beginning of the first MAC address. **C-SPC** then **C-s** and search to the first delimiter, which is an empty space " " in this case. **C-b** to move back to the end of the first MAC address. Store this region into register **b** with **C-x r s b**.

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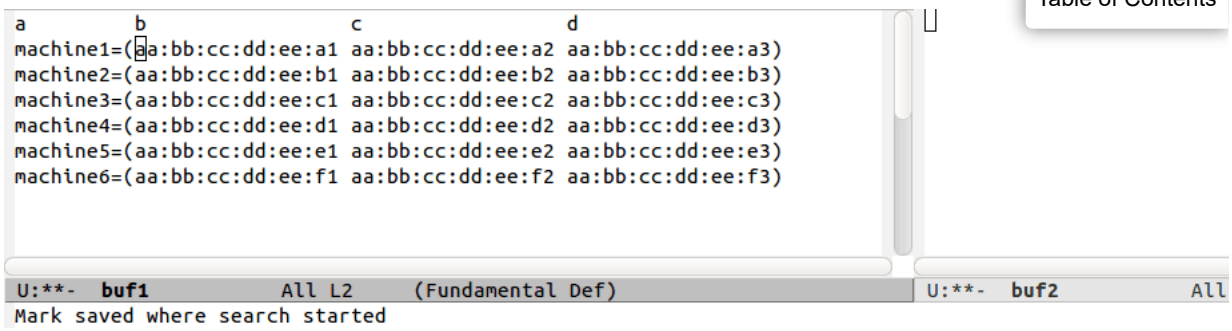
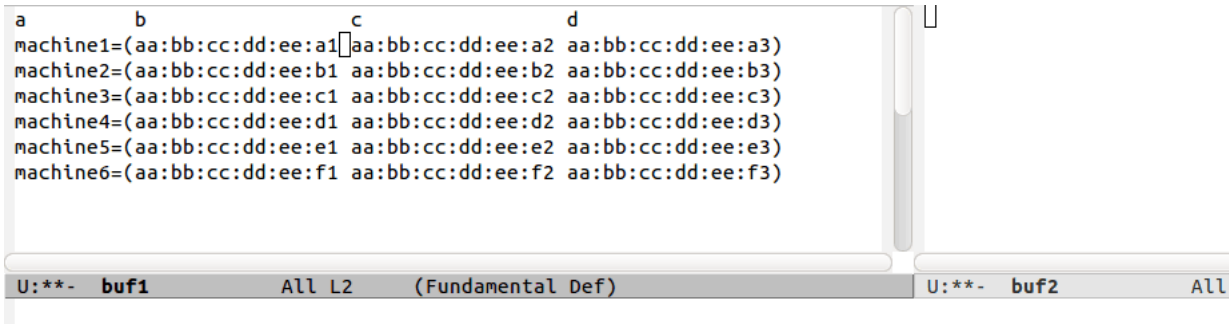
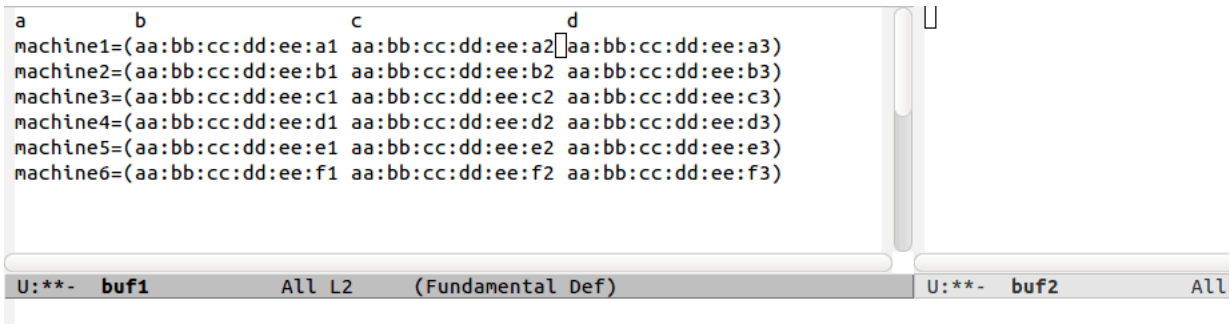


- After that, move point to the beginning of the 2nd MAC address, **C-s** to space and **C-b** to go back one character. Save the region into register **c** with **C-x r s c**.



- Repeat for the last MAC address and save it in register **d**.



- Move point to the beginning of next line.
- **<f4>** to stop. **C-x C-k n** and save the macro with the name `save-macs`.

Let's create the second macro command, `insert-macs`:

- Switch to the second buffer with **C-x o**:
- **<f3>** to start recording.
- Insert the register from `a` to `d` according to the template:

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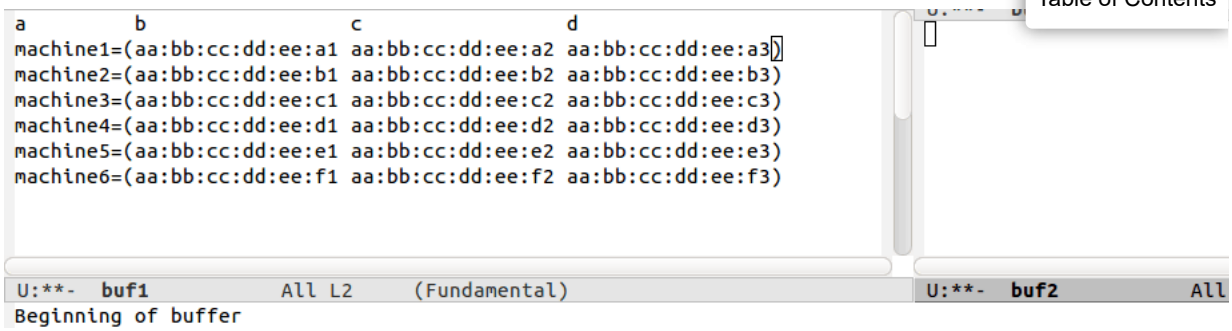

  - After inserting, move point to the next empty line.
  - **<f4>** to stop. **C-x C-k n** and save the macro with the name `insert-macs`.

  We have two important macros now. Let's put them back together:

  - Switch back to `buf1` with **C-x o**. Point should be on the second entry.
  - **<f3>** to start recording.
  - `M-x save-macs`; after executing this command, point moves to the next line.
  - **C-x o** to switch to `buf2`. Point should be after the first insertion of `machine1`.
  - `M-x insert-macs`; data get inserted into the buffer after this command.
  - **C-x o** to switch back to `buf1`.
  - Press **<f4>** to stop.

- Play:

  You can play back your new keyboard macro to transform the remaining entries.

Edit Keyboard Macro

Key	Binding
C-x C-k C-e	Command: `kmacro-edit-macro` Edit the last defined keyboard macro
C-x C-k e name <RET>	Command: `edit-kbd-macro` Edit a previously defined keyboard macro name
C-x C-k l	Command: `kmacro-edit-lossage` Treat the last 300 keystrokes as a keyboard macro

It is useful to edit a keyboard macro when you run an incorrect command. Instead of doing the whole thing again, you can edit the incorrect part. Note that, do not press **C-g** or you will kill your current recording macro; press **<f4>** instead to complete the macro, and edit it. After you're done editing, continue from the previous point where you left off with:

- **C-u <f3>**: Re-execute last keyboard macro, then append keys to its definition.
- **C-u C-u <f3>**: Append keys to the last keyboard macro without re-executing it.

Interactive Keyboard Macro Editing:

C-x C-k SPC runs `kmacro-step-edit-macro` that allows you to view commands of the last keyboard macro, one by one at a time, like a debugger. When you enter this mode, you have a set of predefined commands to apply on each command. Press **?** for a list of available interactive commands and play with it.

Tips for using macro effectively

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- Find a pattern: after going through all the exercises, you can see that a successful macro is a macro that is repeatable, when a certain condition is met. Basically, for text transformation, you need to create a loop, with proper initialization and end condition. If you data does not have a pattern, try to organize it in a repeatable way. As you can see in the exercises, data are laid out in a way that macro can be repeatable naturally: each line is an iteration.
- You can also use a macro for almost anything unrelated to text in Emacs. For example, you can create a macro to run `find-file` and to go to `~/Downloads`.
- Use registers: As you see in the exercises, macro is a fine way to store information. You can use registers as a temporary information holder and organize those information into an arbitrary structure later.
- Do it slowly and think before you do: Don't rush yourself. Do it slowly enough that you are sure when you press some keys and execute some commands, it is correct.
- Break large macro into smaller macros.

Version Control

This section is taken directly from GNU Emacs Tour, with improvements.

Emacs helps you manipulate and edit files stored in version control. Emacs supports CVS, Subversion, bzr, git, hg, and other systems, but it offers a uniform interface, called VC, regardless of the version control system you are using. The benefit of a unified interface is that even if you aren't familiar with some version control system (VCS), you can still work with that VCS quickly, without the burden of learning all the little details of a particular VCS.

Emacs automatically detects when a file you're editing is under version control, and displays something like this in the mode line: CVS-1.14 to indicate the version control system in use, and the current version.

`M-x vc-next-action` or **C-x v v** commits the current file (prompting you for a log message) if you've modified it. (Under version control systems that require locking, this command also acquires a lock for you.)

VC provides other commands for version control-related tasks:

Key	Binding
`C-x v =`	**Command**: `vc-diff` Displays a diff showing the changes you've made to the current files.
`C-x v ~`	**Commmand**: `vc-revision-other-window` Prompts you for a version number and shows you that version of the current file in another window.
`C-x v g`	**Command**: `vc-annotate` Displays an annotated version of the file showing, for each line, the commit where that line was last changed and by whom. On any line you can press `l` to view the log message for that commit or `d` to view the associated diff.
`C-x v l`	**Command**: `vc-print-log` Displays a log of previous changes to the file. When point is on a particular log entry, you can press d to view the diff associated with that change or f to view that version of the file.
`C-x v u`	**Command**: `vc-revert` Revert working copies of the selected fileset to their repository contents. This asks for confirmation if the buffer contents are not identical to the working revision (except for keyword expansion).

You can list more operations with **C-x v C-h**.

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If you use git, a more specialized package exists dedicated to Git only: Magit offers much better features than the general interface that Emacs provides, except for some features, such as **C-x v =**, **C-x v ~** and **C-x v u** .

The prefix key bindings for all VC related commands are **C-x v**. The above are just a few commands that I found most useful and used frequently, even when I use Magit.

Exercise: Let's practice this nice Emacs feature.

- First, download a random Git repository.
- Open any file in the repository.
- Edit that file and save. Do it in various places, so we have many hunks.
- **C-x v =** to know precise what changes you made.
- **C-x v g** to view who changes what line on what commit.
- **C-x v ~**, select a commit. After selecting, the version of that revision will be displayed in another buffer.
- **C-x v u** to revert the buffer back to its original state, after you done playing with it.
- Rinse and repeat until it becomes part of your workflow.

Shell

In Emacs, you have 3 types of shell commands: `shell`, `term` and `eshell`.

I will just quote a very good answer on StackExchange:

> shell is the oldest of these 3 choices. It uses Emacs's comint-mode to run a subshell (e.g. bash). In this mode, you're using Emacs to edit a command line. The subprocess doesn't see any input until you press Enter. Emacs is acting like a dumb terminal. It does support color codes, but not things like moving the cursor around, so you can't run curses-based applications.
>
> term is a terminal emulator written in Emacs Lisp. In this mode, the keys you press are sent directly to the subprocess; you're using whatever line editing capabilities the shell presents, not Emacs's. It also allows you to run programs that use advanced terminal capabilities like cursor movement (e.g. you could run nano or less inside Emacs).
>
> eshell is a shell implemented directly in Emacs Lisp. You're not running bash or any other shell as a subprocess. As a result, the syntax is not quite the same as bash or sh. It allows things like redirecting the output of a process directly to an Emacs buffer (try echo hello >#<buffer results>).

What is the difference between shell, eshell, and term in Emacs?

I suggest you to use eshell, since you can use any Emacs commands within Eshell as well. However, in Eshell, to send an interrupt signal, instead of `Ctrl+C`, you need to press twice: `Ctrl+C Ctrl+C`.

Project: Browsing Linux kernel source code like a pro

Setup

You have learned quite a bit about Emacs. Now, you can immediately use Emacs to do practical thing like jumping around a big source tree like Linux kernel. However, this is just a demo. You can do much more if you learn Emacs properly.

First, you have to install GNU Global.

- Linux:

  Click here and download the latest stable GNU Global. Then change to the directory where you have just downloaded and follow these steps:

  - `tar xvf global-<version>.tar.gz`
  - `cd global-<version>/`
  - If you have ctags installed, add the option `--with-exuberant-ctags` and supply the installed path: `./configure [--with-exuberant-ctags=/usr/local/bin/ctags]`
  - `make`
  - `sudo make install`

- Windows:

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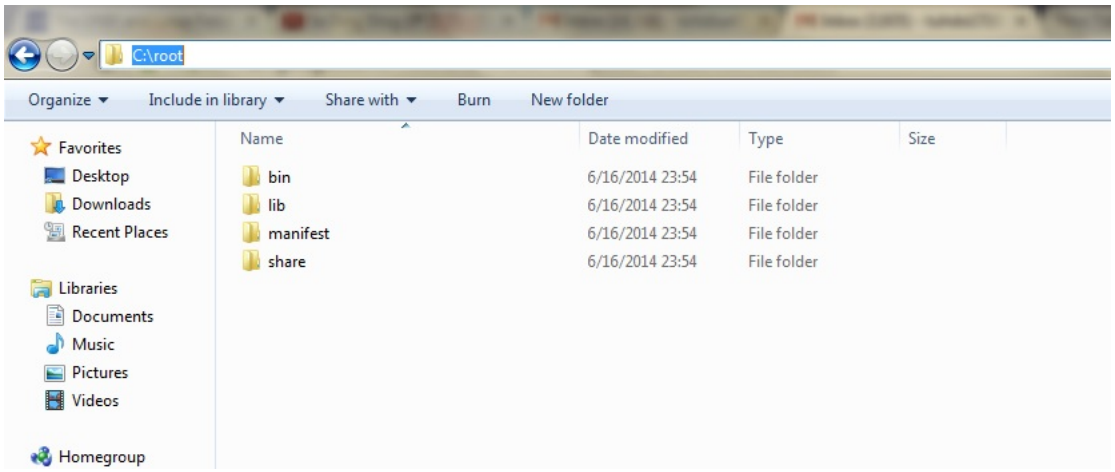
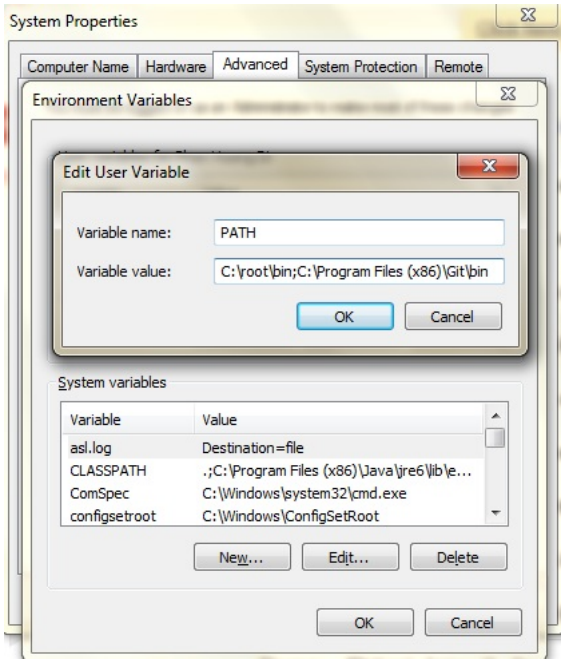
Click here and click "DOS and Windows 32 version" to download the binary archive.

After your download the archive, create a directory **C:\root** and unzip the package into that folder:



Right click on **Computer** -> **Properties** -> **Advanced System Settings** -> **Environment Variables**.

If PATH variable does not exist, click New. Then in "Variable Name", enter `PATH`; in "Variable Value", enter `C:\root\bin`. From now on, if you use ggtags, Emacs knows where to find GNU Global programs. `$PATH` is the variable where Emacs search for executable programs. If you want more executable programs, add more path to $PATH variable. Each path is separated by `;` like this:



- **Mac OSX**: Mac OSX version is distributed by MacPorts.

Then, start Emacs, and press **C-x b** and switch to `*scratch*` buffer. A buffer is an editing area; an editing area may or may not has a file behind it (i.e. A buffer for holding a shell). I will explain more about this later.

Paste the following code into the `*scratch*` buffer:

```
(require 'package)
(add-to-list 'package-archives
       '("melpa" . "http://melpa.milkbox.net/packages/") t)
```

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The above code you see is Emacs Lisp.

Then, `M-x eval-buffer` and press **RET**.

After runs `eval-buffer`, the whole `*scratch*` buffer is processed. Then, `M-x list-package`. Wait a few seconds and you will see of list of plugins for Emacs. In Emacs, a plugin is called a `package`. Press **C-s**, and type `ggtags` and press **C-s** again. Your cursor will move to the package `ggtags`. Be sure to select one from `melpa`; you should see a column written `*melpa` and select the row that has `melpa` in it. Press **Enter** to stay at that position. As you see, **C-s** is used for searching text inside a buffer.

On the `ggtags` entry, press **i** key, which stands for `install`. Then press **x** to execute the installation. Emacs will ask you to confirm the installation. Type `yes` and press **Enter**. Wait for Emacs to finish its installation.

After installation is done, close the status buffer by pressing **C-x 1**, switch back to `*scratch*` buffer by **C-x b**. Paste the following code using **C-y**:

```
(add-hook 'c-mode-common-hook
    (lambda ()
      (when (derived-mode-p 'c-mode 'c++-mode 'java-mode 'asm-mode)
  (ggtags-mode 1))))
```

You may worry that you have to write Emacs Lisp every time you install something. Don't worry. Most package authors provide code snippets to setup their package properly. All you need to do is copy and paste. The above code is taken from `ggtags` homepage at configuration section. The configuration is meant to activate `ggtags` only in a few programming modes.

That's it. Now you can browse kernel easy and fast in Emacs (instant result display).

Browsing the kernel source tree

You can enjoy exploring the kernel source tree by following these steps:

- Clone the kernel source: `git clone https://git.kernel.org/pub/scm/linux/kernel/git/torvalds/linux.git ~/linux`
- **C-x d** and navigate to `~/linux`, then press **Enter**.

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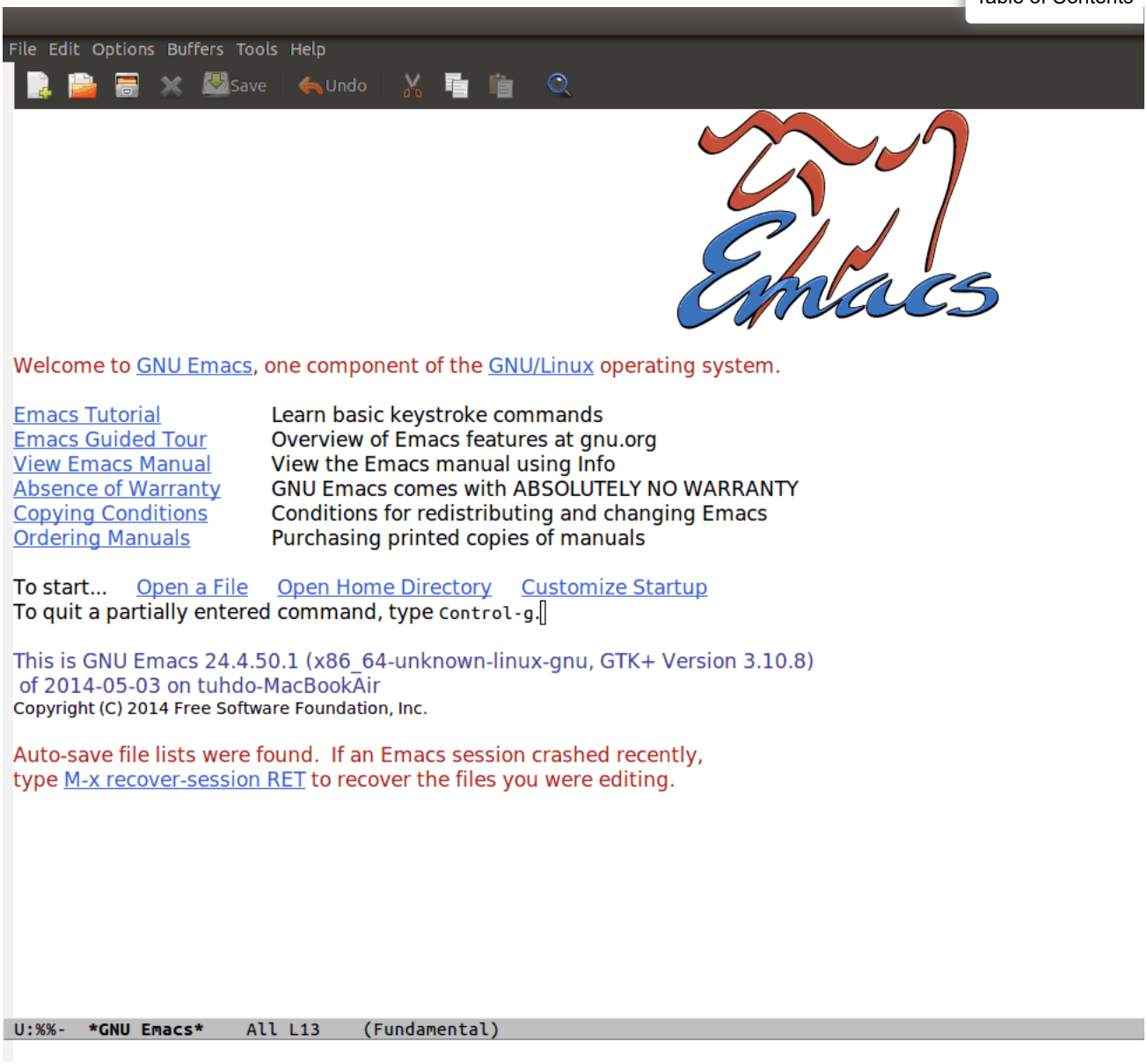

Then, turn on ggtags: `M-x ggtags-mode` .

- Emacs has a file explorer, as you've seen above, called `Dired` , short for `(Dir)ectory (Ed)it` .
- Before start browsing the kernel, you need to create a database for quick searching. Press `M-x` , type `ggtags-create-tags` . It asks for a directory; since you're in the root directory of Linux already, press **Enter**; `ggtags` asks whether you use `ctags` (which is another tag generating program, works with more languages but has less features). Type `no` , press **Enter** and wait for `ggtags` to generate the database.

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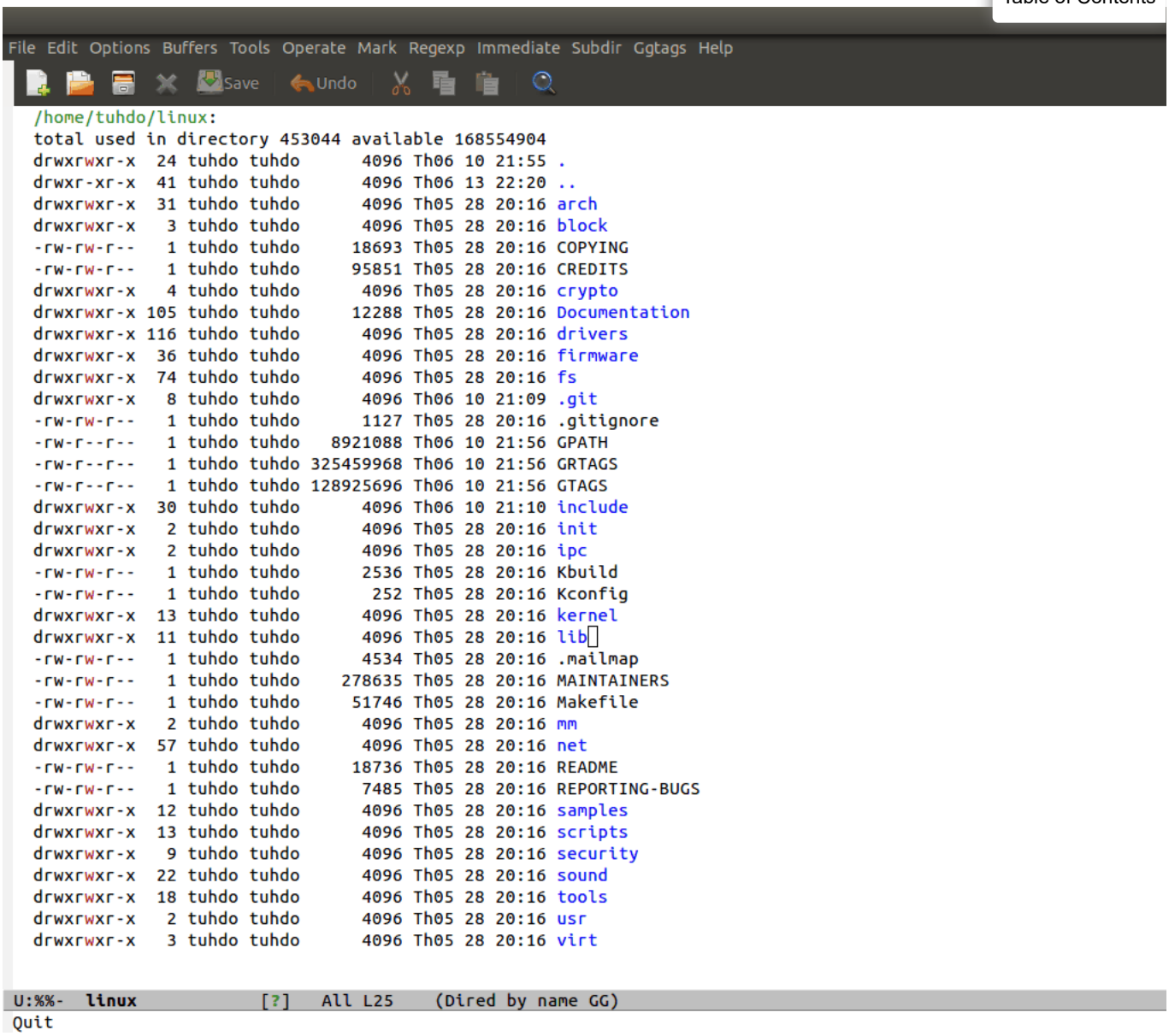

- After the tag database is done generating, a message at the bottom of your Emacs prints a message `GTAGS generated in ~/linux`. Now you can start going anywhere in Linux source tree in an instant instead of spending hours to grep!
- Let's find a file in Linux. Every C program, whether large or small must have a `main()` function, and a file containing the function. Let's find out where the `main()` of Linux kernel is.
- `M-x`, type `ggtags-find-file`. **C-c M-f** also executes `ggtags-find-file`. A prompt ask for a file to find. You can also invoke `ggtags-find-file` with `C-c M-f`.
- Enter `main.c` to the prompt and press **Enter**.
- You will see a list of `main.c` files below in various directory:

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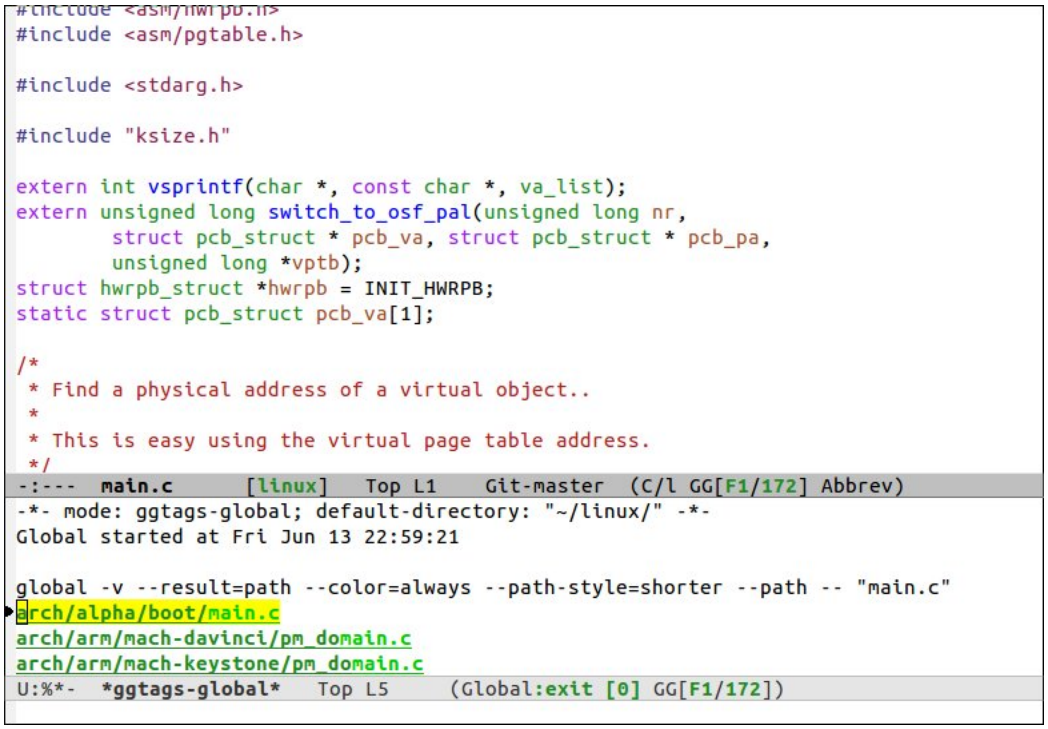

You can visit each file by pressing **M-n** (**n** means *next*) to go down or **M-p** to up (**p** means *previous*).

Press **M-s s**. A prompt appears waiting for something to search; type `init/main.c`. As you type, the candidate buffer got highlighted gradually.

- Finally you get into the correct file. This is where Linux starts after the bootloader stage.
- Now, you see a lot of names in this file: variable names, function names... Now, you want to find where all of these names are defined and where they are used. Let's scroll down a bit, either with **Page Down** key or scrolling with the mouse or search for it. If you want to search, press **C-s** and type `kernel_init` and press **C-s** repeatedly. **C-s** is available everywhere in Emacs. **M-s s** is just available in **ggtags**. You see a function declaration like this:

```
static int kernel_init(void *);
```

This is the whole process of finding the file:

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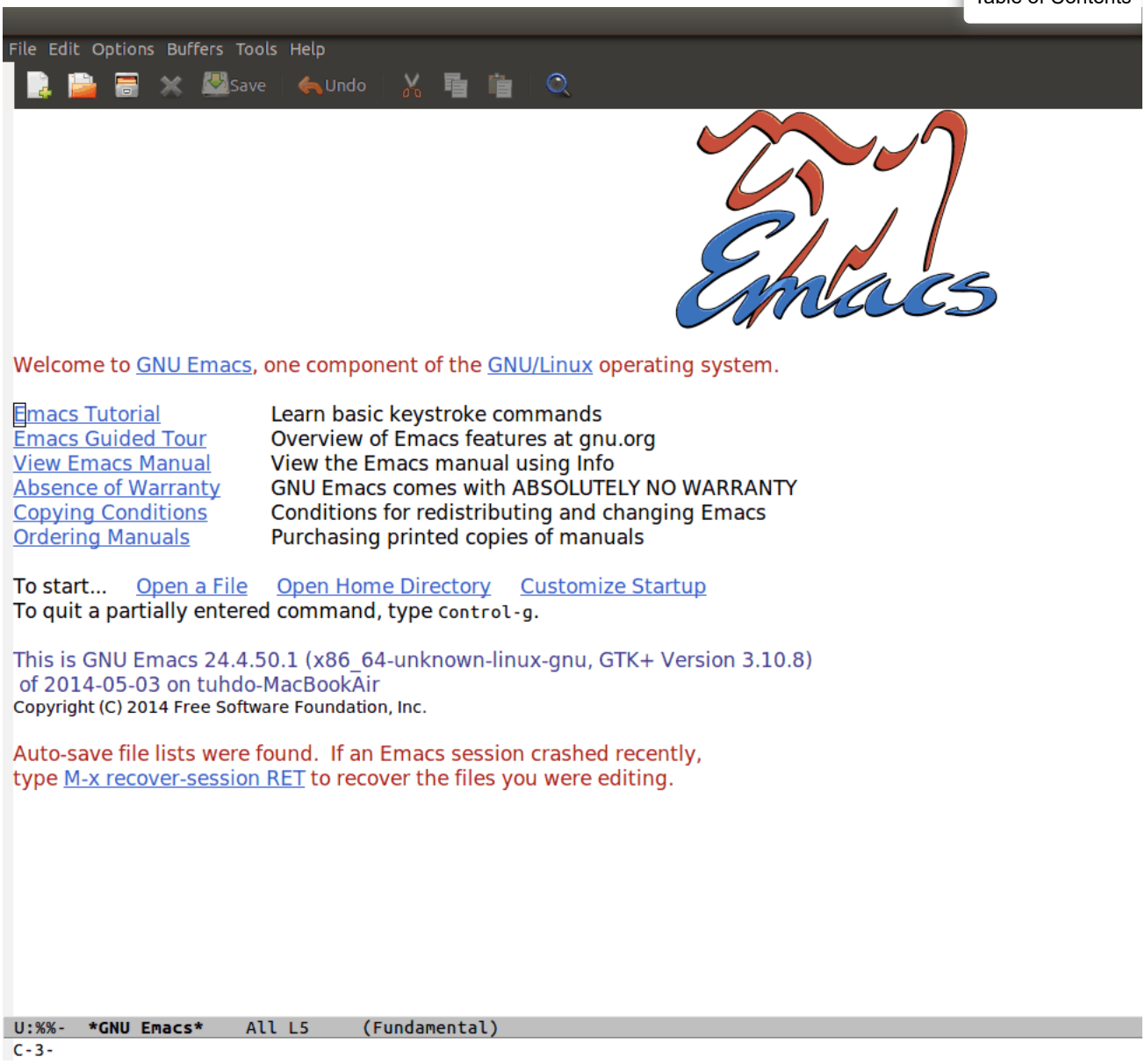

You can find definitions or references of a tag easily. Now, let's go back to the declaration `static int kernel_init(void *);` again. Move your cursor on `kernel_init`.

Press **M-.** jumps to its definition. **M-.** again jumps to its references, where the function is called. **M-.** again jumps to the definition again. Basically, if the current view is definition, pressing **M-.** switches to references and vice verse. Usually, you will also see a list of candidates similar to the one you saw using `ggtags-find-file` above. Use **M-n** or **M-p** to select next/previous match.

If you want to go back to where you were, press **M-*** (or **M-Shift-8**) brings you back to the previous place where you jumped.

If you want to jump to a C header file, for example:

```
#include <linux/kernel.h>
```

Move your cursor onto that line and press **M-.**.

Again, you can search for candidates using **M-s s**.

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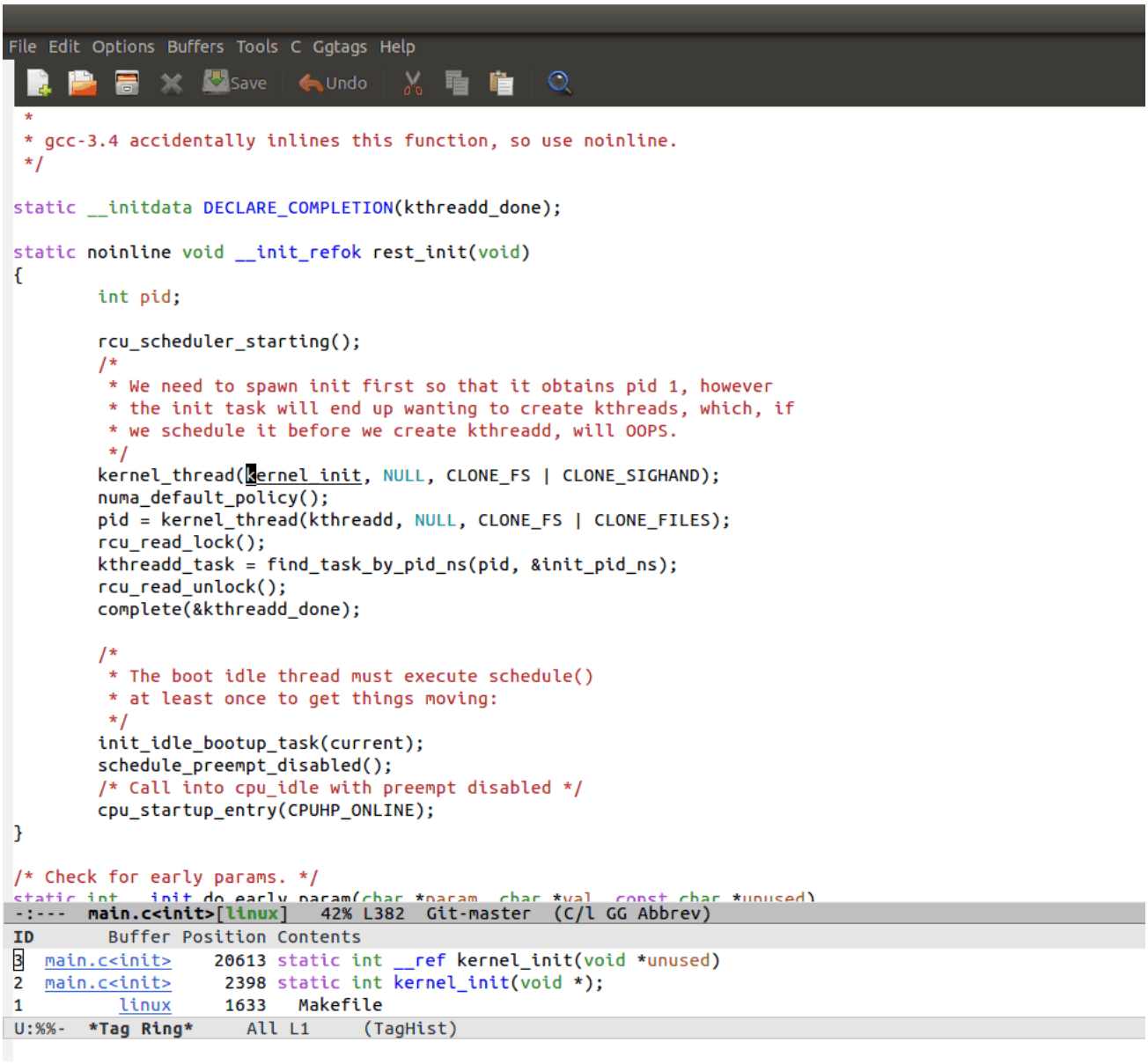
After navigating for a while, you may have jumped to many places. To view the history of where you were, press **C-c M-h**:



If you want to have a list of all the tags you visited, press **C-c M-/**. The different between this command and the above command is that, **C-c M-h** stores the places in files you visited, while **C-c M-/** stores the tag operations you performed. After press **C-c M-/**, if you select an entry in the result list, it displays the result list of the tag in the selected entry, along with your match candidate you selected in the past:

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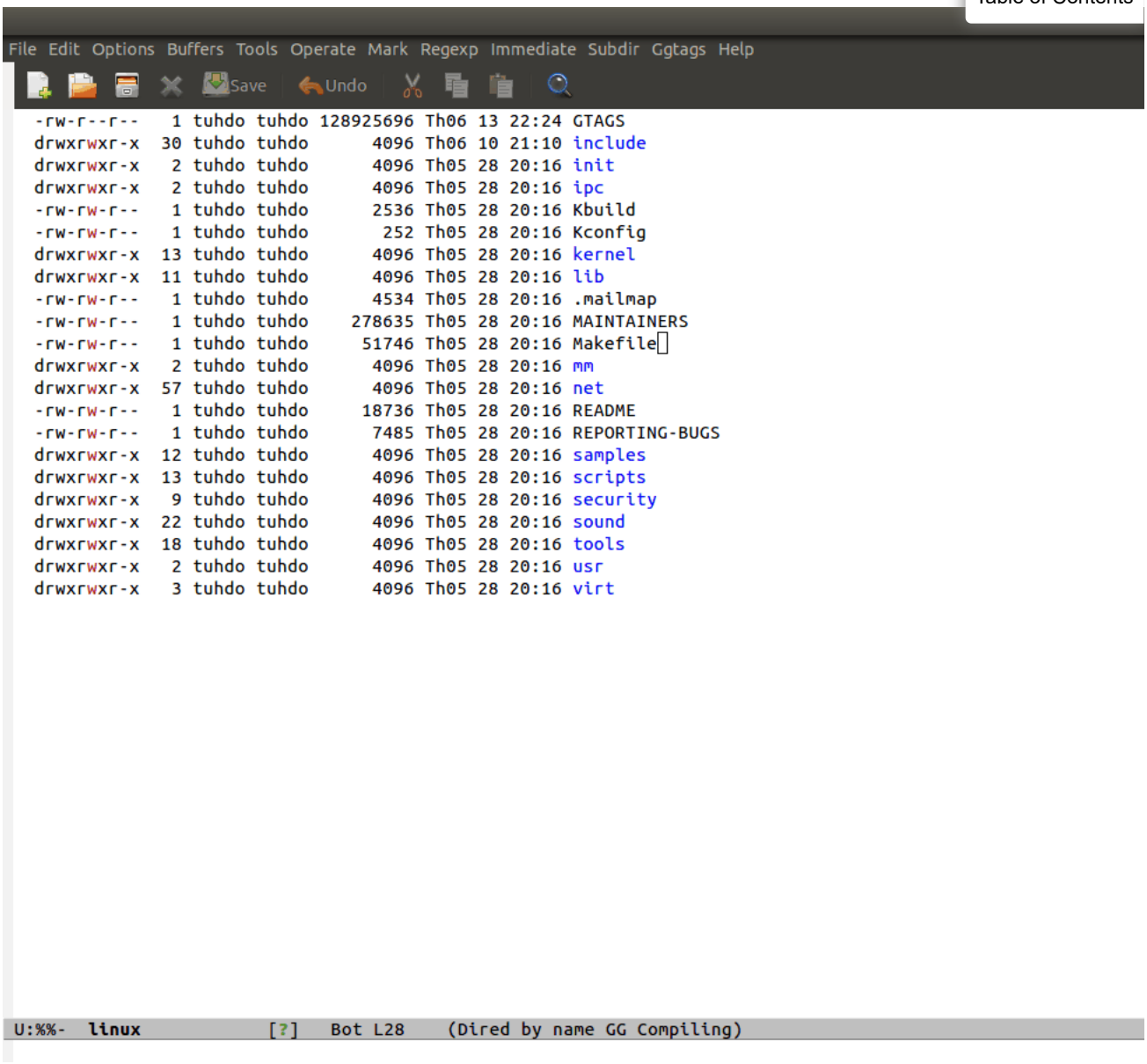

If you create, edit or delete a source file in your project, upon saving `ggtags` automatically updates the database of your project. How convenient!

That's it for **basic** navigation. Yes, it's just the basic. This is just the tip of the iceberg. In Emacs, you have a toolchain called CEDET, short for `Collection of Emacs Development Environment Tools`, which offers features such as highlighting, project, smart jump, context-sensitive completion, symbol references, code generation... And Emacs includes CEDET by default from Emacs 23.2. CEDET is also a language framework for language writers to create such tools within Emacs for their languages, but currently the best supported language in CEDET is C/C++.

`ggtags` solves your navigation need, but does not offer the above features. However, with `ggtags` alone, it's far enough for your C/C++ projects, thanks to GNU Global for working nicely on large source tree like the Linux kernel.. After all, many people write C/C++ source code on a bare minimum editor and waste a lot of time doing things manually instead of focusing on their problems.

After this demo, are you convinced now? If you want to harness the power of Emacs even further, you need to learn Emacs properly. Finally, close everything you don't need with **C-x k**

Extending Emacs Primer

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To let Emacs automatically load your configuration, save it to either of these three files:

`~/.emacs` `~/.emacs.d/init.el` `~/.emacs.d/init`

Now you know how to open and save files, it's time to save your Emacs configuration you have been using in the `*scratch*` buffer. After you finish the Linux kernel browsing project, you have these configurations:

```
(require 'package)
(add-to-list 'package-archives
       '("melpa" . "http://melpa.milkbox.net/packages/") t)

(add-hook 'c-mode-common-hook
    (lambda ()
      (when (derived-mode-p 'c-mode 'c++-mode 'java-mode 'asm-mode)
  (ggtags-mode 1))))


(add-hook 'dired-mode-hook 'ggtags-mode)
```

If you like Ido, put the following configuration inside your `init.el`:

```
(setq ido-enable-flex-matching t)
(setq ido-everywhere t)
(ido-mode 1)
```

You should use `~/.emacs.d/init.el` because you can upload your `~/.emacs.d` along with `init.el` on GitHub or Bitbucket, and it's more organized since Emacs saves many things under `~/.emacs.d/`.

The steps:

- Create a new file `~/.emacs.d/init.el` with **C-x C-f**. After this, the buffer is created for this new file.
- **M-w** (copy) the above code snippet from `*scratch*` buffer and **C-y** (paste) into the `init.el` buffer.
- **C-x C-s** to save the buffer into file.
- Restart Emacs and test if it is effective. Try `list-package` to see if **melpa** is available. Try **M-.** in any source file in your linux kernel directory to see if it works properly.

Conclusion

That's it. Now you can start using Emacs for many things, from editing source code to managing files and reading documentation. I hope you find my manual useful for helping you get the hang of Emacs in as little time as possible, and I am really help if you do.

Remember, this is just the tip of the iceberg. There are more things Emacs is capable of. If you like, follow my other Emacs manuals on specific topics.

Finally, thanks to Worg for this awesome CSS.

Appendix

Why Emacs? (Extended)

Emacs allows you to do much more than just editing. Emacs is not a mere editor like others, either in terminal or in GUI. Emacs is a development **platform**. Emacs is a **virtual machine** that interprets its own bytecode.

You can write all sorts of programs in Emacs to add more features using its own language - Emacs Lisp - in an **easy** way. With this extensibility, Emacs can be many things: an editor, a file manager, an email client, a news reader, a shell...

You can think of Emacs as an enhanced interpreter and evaluate any valid Emacs Lisp code anywhere in Emacs, as long as the code is visible on your screen. To illustrate my point, here is an example:

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```
(defun hello ()
  (interactive)
  (message "Hello World"))
```

You can paste that code snippet **anywhere** - yes, **anywhere** - in Emacs and tell Emacs to execute that code. If the code snippet has valid syntax, Emacs executes successfully and you will have command to print "Hello World" at the bottom of screen.

A great advantage of this approach is, if you want to change the behaviour of Emacs, you write some Emacs Lisp code, execute it and immediately see the results, right inside Emacs. Emacs is beyond an editor. Emacs is a programming platform that has an editor. Don't confuse Emacs with other *real editors*, which can **only be used for editing**.

In practice, Emacs also offers many editing interfaces: built-in Emacs, Ergoemacs and Evil - or Vim inside Emacs - key bindings. Emacs has internal tools and interfaces to external tools for many programming languages. Learning Emacs means you can use the same editor for different languages. Otherwise, you will have to learn a different editor when you learn a random language.

Other people's "Why Emacs?"

"Why Emacs?" by Fabrice Popinea. He is the maintainer of Emacs 64 bit on Windows.

"Why Emacs?" by Bozhidar Batsov. He is the author of Emacs Prelude, an Emacs distribution with convenient packages for new people to get start with Emacs.

Why I use Emacs by Vincent Foley-Bourgon.

Why I Still Use Emacs, also by Vincent Foley-Bourgon.

Emacs is sexy.

More on Emacs history

Ever heard of a computing system called **Lisp Machine**? I bet many of you don't. Me, too, until I started using Emacs and gradually learned enough to know such a thing ever existed. This old article is an interesting read: The Ghost in the Lisp Machine

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> A friend of mine used to say that Emacs fills our yearning for a Lisp Machine. I tend to agree with him: Emacs is not just an editor, but a full integrated environment where you can perform virtually any imaginable task; and, most importantly, the inner workings of the system are open to you to explore and extend. Using, for extra fun, Lisp. No, i don't think that Elisp is the nicest Lisp incarnation around, but is far better than, say, C, and i still prefer it to other scripting languages. Moreover, the awesome range of libraries at your disposal makes up for many of the deficiencies in the language.
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> Living in Emacs is addictive. Imagine an operating system where you can switch from writing code to browsing the web or chatting without leaving a consistent environment, with the same set of commands and shortcuts. Imagine a set of integrated applications where data is seamlessly shared, where any single functionality can be tweaked, extended and adapted to your particular needs. Where everything is easily scriptable. Imagine, in addition, that the environment provides powerful and complete interactive self-documentation facilities with which the user can find out what is available. I have yet to find an operating system providing such an integrated environment. Not even Mac OS X, where AppleScript support is often lacking and system services are underused.
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> Of course, the key ingredient here is Emacs' extensibility. Far from being an afterthought or simply one of its features, extensibility is the central aspect of Emacs' architecture. Actually, the whole point of this post is to recommend you reading Richard Stallman's 1981 essay EMACS: The Extensible, Customizable Display Editor, which explains much better than I could the strong points of Emacs design, i.e., those traits that make Emacs more, much more, than just an editor. From the horse's mouth:
>
> *Extensibility means that the user can add new editing commands or change old ones to fit his editing needs, while he is editing. EMACS is written in a modular fashion, composed of many separate and independent functions. The user extends EMACS by adding or replacing functions, writing their definitions in the same language that was used to write the original EMACS system. We will explain below why this is the only method of extension which is practical in use: others are theoretically equally good but discourage use, or discourage nontrivial use.*
>
> […]
>
> *User customization helps in another, subtler way, by making the whole user community into a breeding and testing ground for new ideas. Users think of small changes, try them, and give them to other users–if an idea becomes popular, it can be incorporated into the core system. When we poll users on suggested changes, they can respond on the basis of actual experience rather than thought experiments.*
>
> The article goes on explaining the organization of the Emacs system, how it depends on its interpreter, Elisp's main features and how built-in self-documentation is provided. Also interesting is the list of related systems at the end of the essay: Lisp machines, LOGO, MacLisp and Smalltalk.

We're definitely in good company!

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Emacs is a miniature of a Lisp Machine. You can take a tour at the Lisp Machine online museum.