



A Guided Tour of Emacs

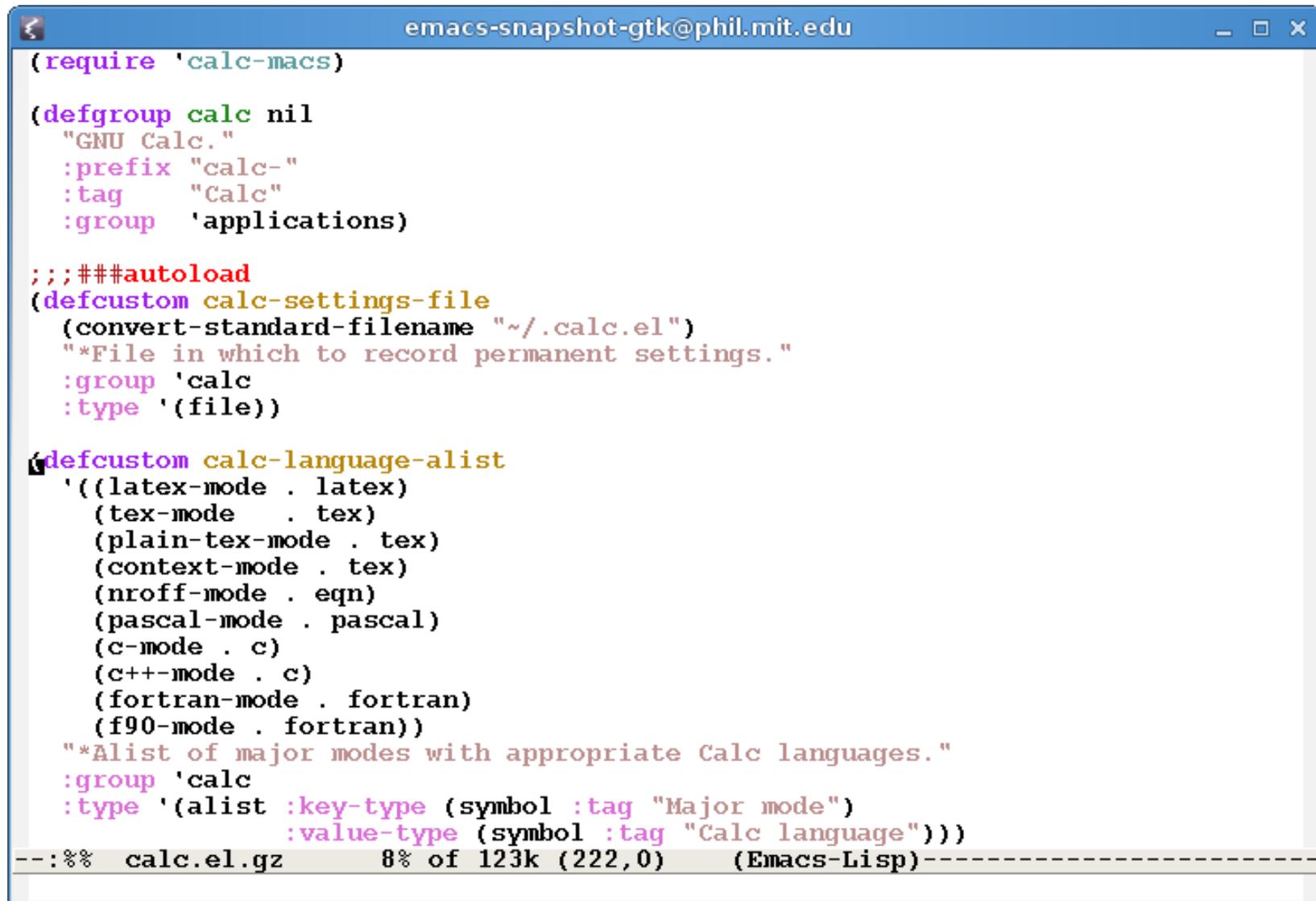
<http://stuff.mit.edu/iap/emacs>

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Special thanks to Piaw Na and Arthur Gleckler.

“**Emacs** is the extensible, customizable, self-documenting real-time display editor.”

The many faces of Emacs



The image shows a screenshot of an Emacs window titled "emacs-snapshot-gtk@phil.mit.edu". The window displays Emacs Lisp source code for a package named "calc". The code includes a requirement for "calc-macs", a defgroup for "calc" with a prefix of "calc-" and a tag of "Calc", and several defcustom functions for settings like "calc-settings-file" and "calc-language-alist". The "calc-language-alist" function lists various modes and their corresponding languages. The status bar at the bottom shows the file "calc.el.gz" is 8% of 123k (222,0) and the Emacs version is Emacs-Lisp.

```
(require 'calc-macs)

(defgroup calc nil
  "GNU Calc."
  :prefix "calc-"
  :tag "Calc"
  :group 'applications)

;;;###autoload
(defcustom calc-settings-file
  (convert-standard-filename "~/ .calc.el")
  "*File in which to record permanent settings."
  :group 'calc
  :type '(file))

(defcustom calc-language-alist
  '((latex-mode . latex)
    (tex-mode . tex)
    (plain-tex-mode . tex)
    (context-mode . tex)
    (nroff-mode . eqn)
    (pascal-mode . pascal)
    (c-mode . c)
    (c++-mode . c)
    (fortran-mode . fortran)
    (f90-mode . fortran))
  "*Alist of major modes with appropriate Calc languages."
  :group 'calc
  :type '(alist :key-type (symbol :tag "Major mode")
              :value-type (symbol :tag "Calc language")))
```

--:%% calc.el.gz 8% of 123k (222,0) (Emacs-Lisp)

Emacs edits source code

The many faces of Emacs

```
emacs@localhost
87654321 0011 2233 4455 6677 8899 aabb ccdd eeff 0123456789abcdef
00000000: 2320 4641 534c 0a20 2063 6f6d 7069 6c65 # FASL. compile
00000010: 6420 6672 6f6d 2022 2f68 6f6d 652f 7068 d from "/home/ph
00000020: 696c 2f70 726f 6a65 6374 732f 736c 7032 il/projects/slp2
00000030: 2f73 6c70 2e6c 6973 7022 0a20 2061 7420 /slp.lisp". at
00000040: 5475 6573 6461 792c 2044 6563 656d 6265 Tuesday, Decembe
00000050: 7220 3236 2c20 3230 3036 2030 323a 3438 r 26, 2006 02:48
00000060: 3a30 3420 504d 2045 5354 0a20 206f 6e20 :04 PM EST. on
00000070: 7068 696c 0a20 2075 7369 6e67 2053 4243 phil. using SBC
00000080: 4c20 7665 7273 696f 6e20 312e 300a ff03 L version 1.0...
00000090: 0000 0058 3836 4700 0000 2700 0000 283a ...X86G...'...(:
000000a0: 4745 4e43 4743 203a 5342 2d50 4143 4b41 GENCGC :SB-PACKA
000000b0: 4745 2d4c 4f43 4b53 203a 5342 2d55 4e49 GE-LOCKS :SB-UNI
000000c0: 434f 4445 2951 a207 5300 0000 4200 0000 CODE)Q..S..B...
000000d0: 2d00 0000 4900 0000 4d00 0000 5000 0000 -...I..M..P...
000000e0: 4c00 0000 0e52 010b 000d 2500 0000 4400 L...R...%..D.
000000f0: 0000 4500 0000 4600 0000 5000 0000 4100 ..E..F..P..A.
00000100: 0000 5200 0000 4100 0000 4d00 0000 4500 ..R..A..M..E.
00000110: 0000 5400 0000 4500 0000 5200 0000 51a2 ..T..E..R..Q.
00000120: 1043 0000 004f 0000 004d 0000 004d 0000 .C...O...M...M..
00000130: 004f 0000 004e 0000 002d 0000 004c 0000 .O...N...-...L..
00000140: 0049 0000 0053 0000 0050 0000 002d 0000 .I...S...P...-...
00000150: 0055 0000 0053 0000 0045 0000 0052 0000 .U...S...E...R..
00000160: 000e 5201 0b02 102a 0000 0053 0000 004c ..R...*...S...L
00000170: 0000 0045 0000 0045 0000 0050 0000 002d ...E...E...P...-
00000180: 0000 004c 0000 004f 0000 0047 0000 002d ...L...O...G...-
00000190: 0000 0050 0000 0041 0000 0054 0000 0048 ...P...A...T...H
000001a0: 0000 002a 0000 00a2 102f 0000 0068 0000 ...*.../...h..
000001b0: 006f 0000 006d 0000 0065 0000 002f 0000 .o...m...e.../..
000001c0: 0070 0000 0068 0000 0069 0000 006c 0000 .p...h...i...l..
--:-- slp.fasl Top of 419k (5,20) (Hexl)
```

Emacs is a hex editor

M-x hexl-find-file

The many faces of Emacs

```
ADPAgentC.java
public class ADPAgentC extends ADPAgentC {
  Random r;
  int[] fixedpolicy;
  double[] utilities;
  double[] reward;
  int numStates;
  int numActions;
  double discount;
  double[][][] TransModel;
  double[][] Nsa;
  double[][][] Nsasp;
  int[] statevisited;
  int prevState;
  int prevAction;
  PolicyEvaluation policyEval;
  public ADPAgentC(Mdp mdp) {
    super(mdp);
    this.r = new Random();
    this.numStates = mdp.numStates;
    this.numActions = mdp.numActions;
  }
}

public class ADPAgentC extends ADPAgentC {
  Random r;
  int[] policy;
  double[] utilities;
  double[] reward;
  int numStates;
  int numActions;
  double discount;
  double[][][] TransModel;
  int[][] Nsa;
  int[][][] Nsasp;
  int[] statevisited;
  int prevState;
  int prevAction;
  PolicyEvaluation policyEval;
  ExplorationFunction explorationFunction;
  final int threshold = 5;
  final double unexploredValue = 1000000.0;
}

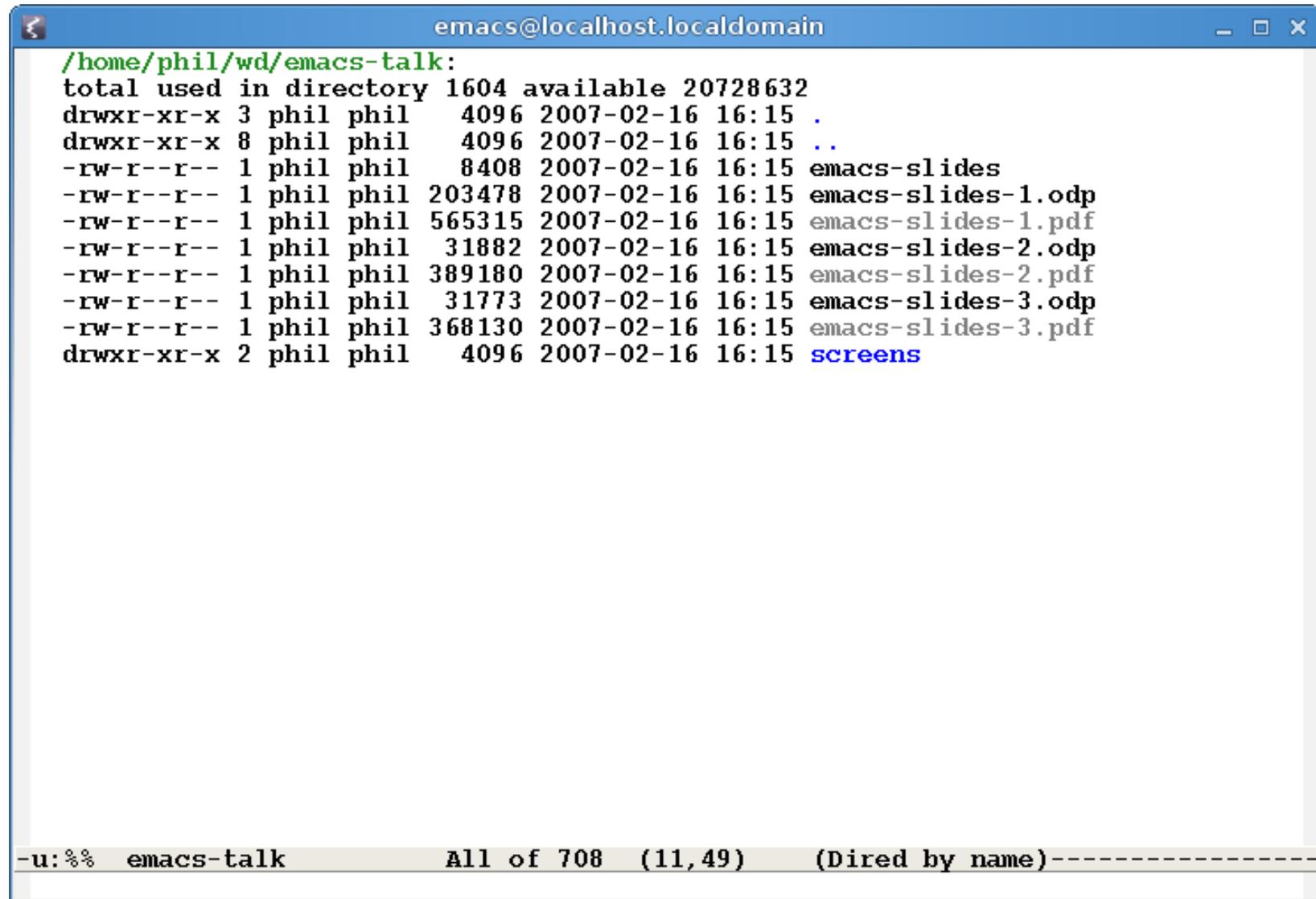
Ediff
Type ? for help
2/17

A: --:%% !home!phil!school!6.825!proj3! B: --:-- ADPAgentC.java 4% of 3.4k (
```

Emacs does diffs

M-x ediff-buffers

The many faces of Emacs



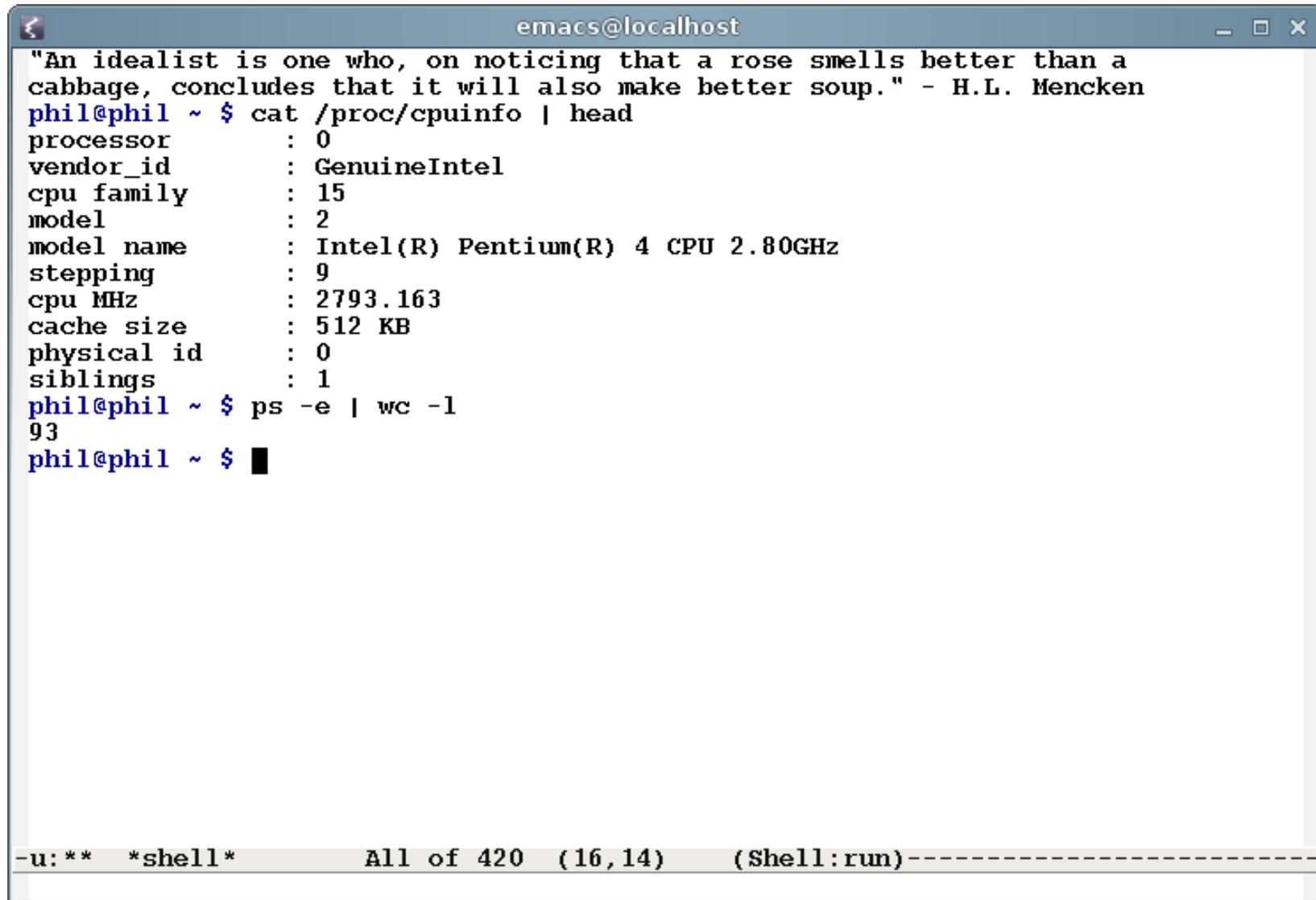
```
emacs@localhost.localdomain
/home/phil/wd/emacs-talk:
total used in directory 1604 available 20728632
drwxr-xr-x 3 phil phil 4096 2007-02-16 16:15 .
drwxr-xr-x 8 phil phil 4096 2007-02-16 16:15 ..
-rw-r--r-- 1 phil phil 8408 2007-02-16 16:15 emacs-slides
-rw-r--r-- 1 phil phil 203478 2007-02-16 16:15 emacs-slides-1.odp
-rw-r--r-- 1 phil phil 565315 2007-02-16 16:15 emacs-slides-1.pdf
-rw-r--r-- 1 phil phil 31882 2007-02-16 16:15 emacs-slides-2.odp
-rw-r--r-- 1 phil phil 389180 2007-02-16 16:15 emacs-slides-2.pdf
-rw-r--r-- 1 phil phil 31773 2007-02-16 16:15 emacs-slides-3.odp
-rw-r--r-- 1 phil phil 368130 2007-02-16 16:15 emacs-slides-3.pdf
drwxr-xr-x 2 phil phil 4096 2007-02-16 16:15 screens

-u:%% emacs-talk All of 708 (11,49) (Dired by name)-----
```

Emacs is a file manager

M-x dired

The many faces of Emacs

A screenshot of an Emacs window titled 'emacs@localhost'. The window displays a shell prompt 'phil@phil ~ \$' and shows the output of the command 'cat /proc/cpuinfo | head'. The output lists various CPU details such as processor, vendor_id, cpu family, model, model name, stepping, cpu MHz, cache size, physical id, and siblings. Below this, the command 'ps -e | wc -l' is executed, resulting in the output '93'. The shell prompt is now 'phil@phil ~ \$' with a cursor. At the bottom of the window, a status bar shows '-u:** *shell*' and 'All of 420 (16,14) (Shell:run)'.

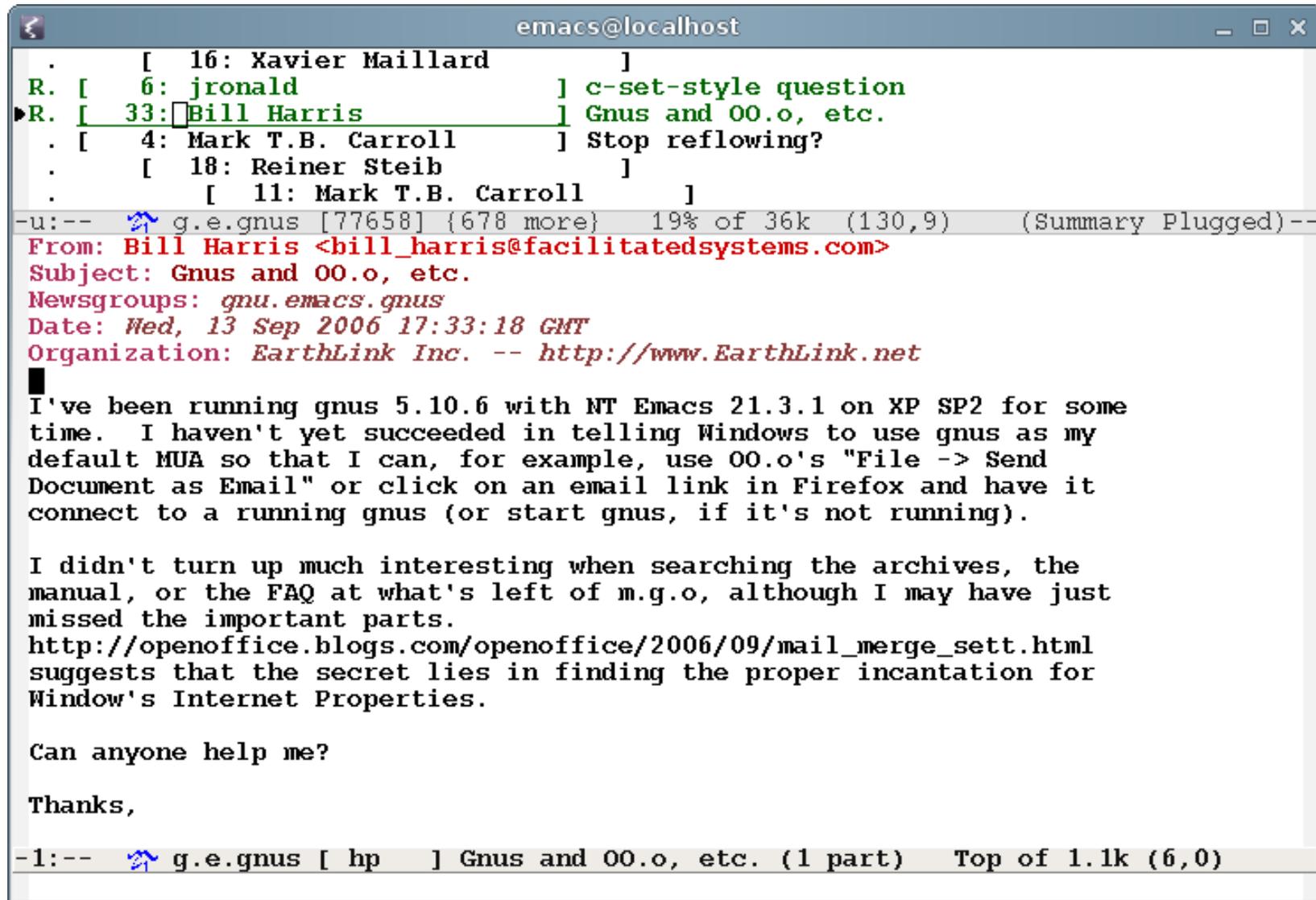
```
emacs@localhost
"An idealist is one who, on noticing that a rose smells better than a
cabbage, concludes that it will also make better soup." - H.L. Mencken
phil@phil ~ $ cat /proc/cpuinfo | head
processor       : 0
vendor_id     : GenuineIntel
cpu family    : 15
model         : 2
model name    : Intel(R) Pentium(R) 4 CPU 2.80GHz
stepping      : 9
cpu MHz       : 2793.163
cache size    : 512 KB
physical id   : 0
siblings      : 1
phil@phil ~ $ ps -e | wc -l
93
phil@phil ~ $ █

-u:** *shell*          All of 420 (16,14) (Shell:run)
```

Emacs is a shell

M-x shell

The many faces of Emacs



```
emacs@localhost
. [ 16: Xavier Maillard ]
R. [ 6: jronald ] c-set-style question
▶R. [ 33: Bill Harris ] Gnus and OO.o, etc.
. [ 4: Mark T.B. Carroll ] Stop reflowing?
. [ 18: Reiner Steib ]
. [ 11: Mark T.B. Carroll ]

-u:-- g.e.gnus [77658] {678 more} 19% of 36k (130,9) (Summary Plugged)--
From: Bill Harris <bill_harris@facilitatedsystems.com>
Subject: Gnus and OO.o, etc.
Newsgroups: gnu.emacs.gnus
Date: Wed, 13 Sep 2006 17:33:18 GMT
Organization: EarthLink Inc. -- http://www.EarthLink.net

I've been running gnus 5.10.6 with NT Emacs 21.3.1 on XP SP2 for some
time. I haven't yet succeeded in telling Windows to use gnus as my
default MUA so that I can, for example, use OO.o's "File -> Send
Document as Email" or click on an email link in Firefox and have it
connect to a running gnus (or start gnus, if it's not running).

I didn't turn up much interesting when searching the archives, the
manual, or the FAQ at what's left of m.g.o, although I may have just
missed the important parts.
http://openoffice.blogs.com/openoffice/2006/09/mail_merge_sett.html
suggests that the secret lies in finding the proper incantation for
Window's Internet Properties.

Can anyone help me?

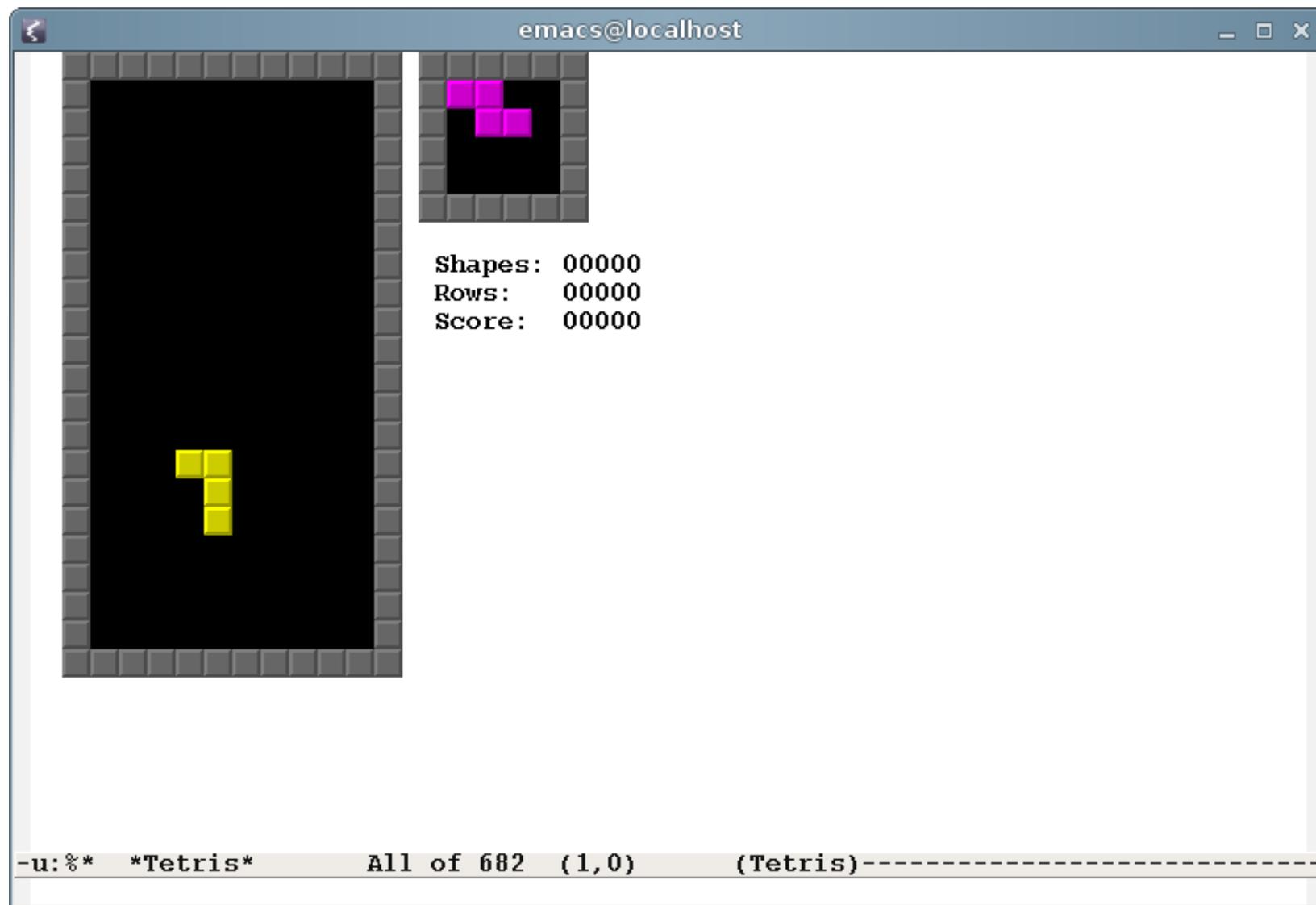
Thanks,

-1:-- g.e.gnus [ hp ] Gnus and OO.o, etc. (1 part) Top of 1.1k (6,0)
```

Emacs is a mail/news client

M-x gnus

The many faces of Emacs



Emacs plays tetris
M-x tetris

Why Emacs?

- Provides an integrated environment
 - Same editing commands available everywhere
 - Large set of tools available at all times
 - Move text around among tasks easily

Why Emacs?

- Easy to extend
 - Use Elisp for customizing or adding new features
 - Your extension code has the full power of Emacs
 - Dynamic environment: no restarting or recompiling
- Portable
 - Emacs is available on almost any operating system

Goals of this Tour

■ Give a taste of Emacs

- Getting started with Emacs
- Editing tips
- Demos of useful features
- Common Emacs concepts

Examples tested in
GNU Emacs 22

Prerequisites

- Emacs basic concepts
 - Files, buffers, windows
 - Opening and saving files

- Keyboard commands

- "C-f" means type **Ctrl+f**
- "M-q" means type **Alt+q** (on most keyboards)
- "C-x C-s" means type **Ctrl+x** followed by **Ctrl-s**
- "M-x foo" means type **Alt+x** then **foo** then **RET**

**Take the tutorial
to brush up:**

C-h t

(type "Ctrl-h" followed by "t")

Tutorial recap

■ Files

- Open a file with `C-x C-f`
- Save with `C-x C-s`

Take the tutorial:

`C-h t`

Ctrl-x followed by Ctrl-f

Ctrl-x followed by Ctrl-s

■ Buffers

- Any text being viewed or edited is stored in a buffer
- Buffers are often (not always) associated with a file
- Change to another buffer with `C-x b`

Ctrl-x followed by b

Tutorial recap

Take the tutorial:

`C-h t`

■ Windows

- Tiled spaces which display buffers (not to be confused with "windows" in modern terminology)
- Split current window into two with `C-x 2` (horizontally) or `C-x 3` (vertically)
- Remove current window with `C-x 0` (does not delete the current buffer)
- Move to another window with `C-x o`

Emacs is about text manipulation

- **Text in files**

- grocery lists, HTML, code, ...

- **Text outside of files**

- shell, debugger, ...

- **Text as a metaphor**

- dired, gnus, ...

Text as a metaphor: dired

M-x wdired-change-to-wdired-mode
after opening any directory

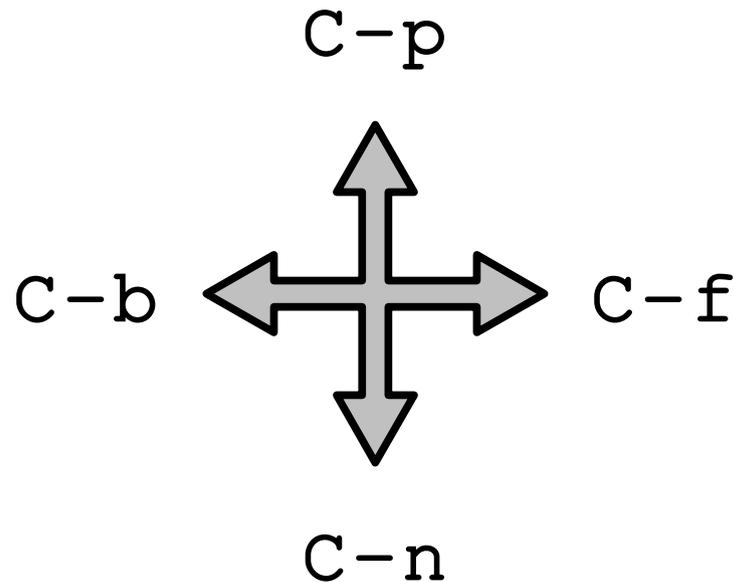
```
emacs@localhost.locald
/home/phil/projects/emacs-talk:
total used in directory 296 available 28869812
drwxr-xr-x  3 phil phil   4096 2007-02-17 17:54 .
drwxr-xr-x 12 phil phil   4096 2007-03-23 15:06 ..
-rw-r--r--  1 phil phil   8408 2007-02-17 17:54 emacs-slides
-rw-r--r--  1 phil phil 199108 2007-03-07 22:29 emacs-slides-1.odp
-rw-r--r--  1 phil phil  33740 2007-02-17 18:37 emacs-slides-2.odp
-rw-r--r--  1 phil phil  33101 2007-02-17 18:37 emacs-slides-3.odp
drwxr-xr-x  2 phil phil   4096 2007-02-17 17:54 screens

-u:--  emacs-talk          All of 516 (7,50) (Editable Dired)-----
```

After editing names in this buffer, C-x C-s ("save") renames the modified files!

Moving around in buffers

- Move point (the cursor) by characters or lines:



Moving around in buffers

- Beginning, end of line
 - C-a, C-e
- Next, previous word
 - M-f, M-b
- Next, previous sentence
 - M-a, M-e
- By screen
 - C-v, M-v
- Beginning, end of buffer
 - M-<, M->
- Go to line #
 - M-g g

Moving around in buffers

- Move multiple lines forward, backward
 - Example: `C-u 10 C-p` (back 10 lines)
 - `C-u` prefix generalizes to other commands
- Search for text
 - `C-s`, `C-r`
- Exchange point (cursor) and mark
 - `C-x C-x`

Killing ("cutting") text

- Kill line
 - C-k
- Kill many lines
 - C-u 10 C-k (10 lines)
 - C-u C-k (4 lines)
 - C-u C-u C-k (16 lines)

Killing ("cutting") text

- Kill region
 - C-w
- Save without killing
 - M-w
- Kill sentence
 - M-k
- Kill ("zap") to next occurrence of character
 - M-z CHAR

Yanking ("pasting") text

- Yank
 - $C-y$
- Yank earlier killed text
 - $M-y$ (once or more after $C-y$)
- The kill ring
 - Almost all commands which delete text save it for possible later retrieval

The mark

- The mark remembers a previous cursor position
 - `C-x C-x` to swap point (cursor) and mark
- When you... the mark is set to...
 - `C-spc`
 - where you are
 - `M-<` or `M->`
 - where you were
 - Search for text
 - where you started
 - Yank text
 - start of inserted text
 - Insert a buffer
 - start of inserted text

The mark

- The mark ring

Use **C-x C-x** or **C-u C-SPC** to return to places you've recently been in the buffer

- Move to a previous mark: **C-u C-SPC**

- Mark and point are also used to delineate 'the region'

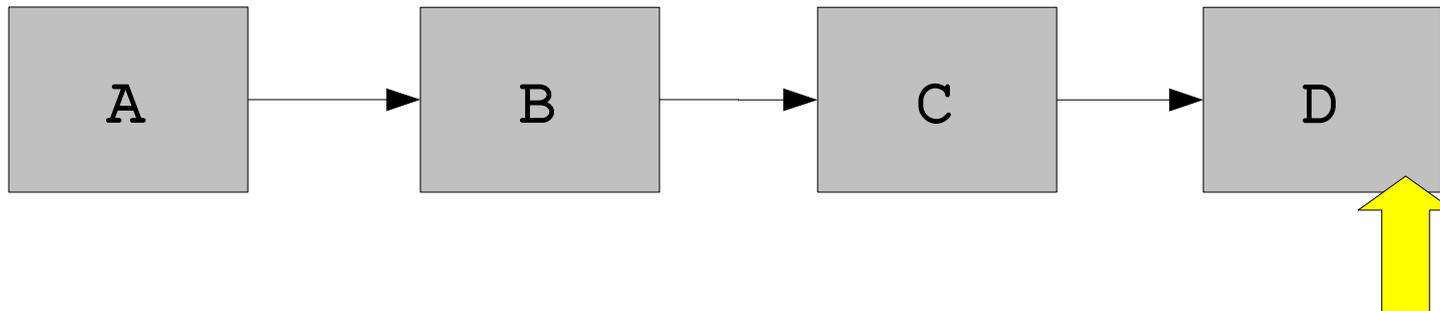
- Many commands operate on the text in the region (e.g. **C-w**)
- Set region by setting mark, then moving point

Undo

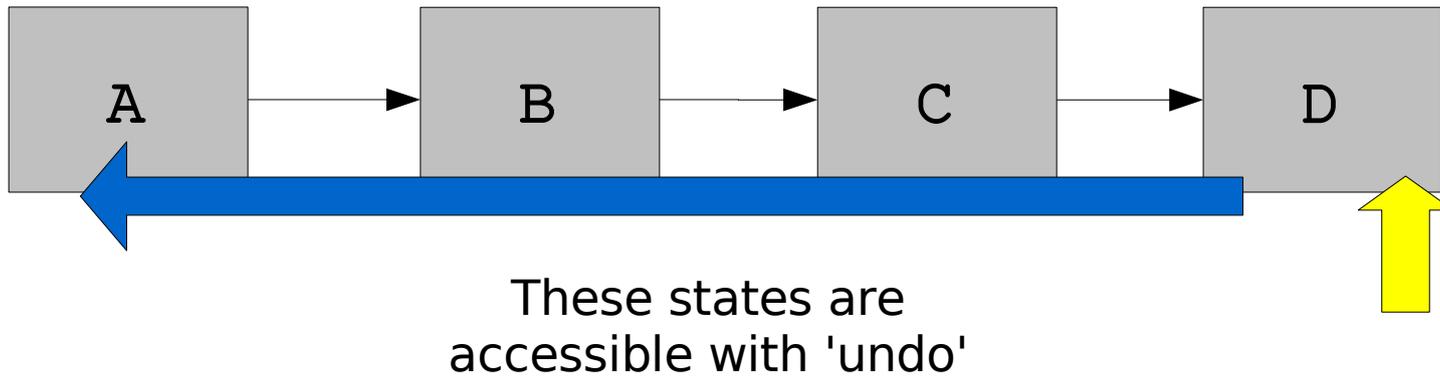
- Undo previous actions
 - C- / or C- _ or C-x u
- Undo within current region
 - C-u C- /

The undo model, illustrated

Consider a document or buffer that you've modified in four steps...



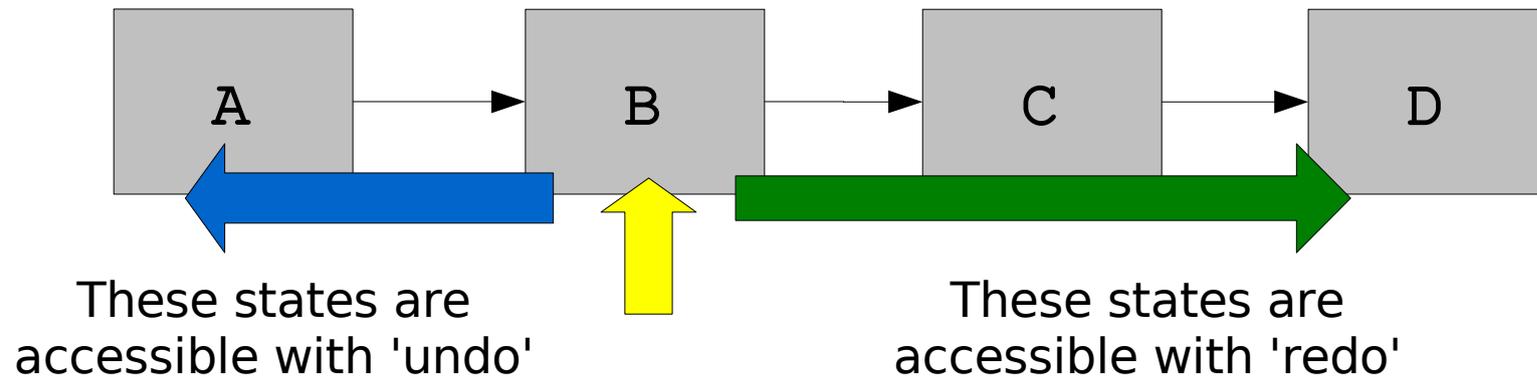
The undo model, illustrated



The undo model, illustrated

Try undoing some of your actions...

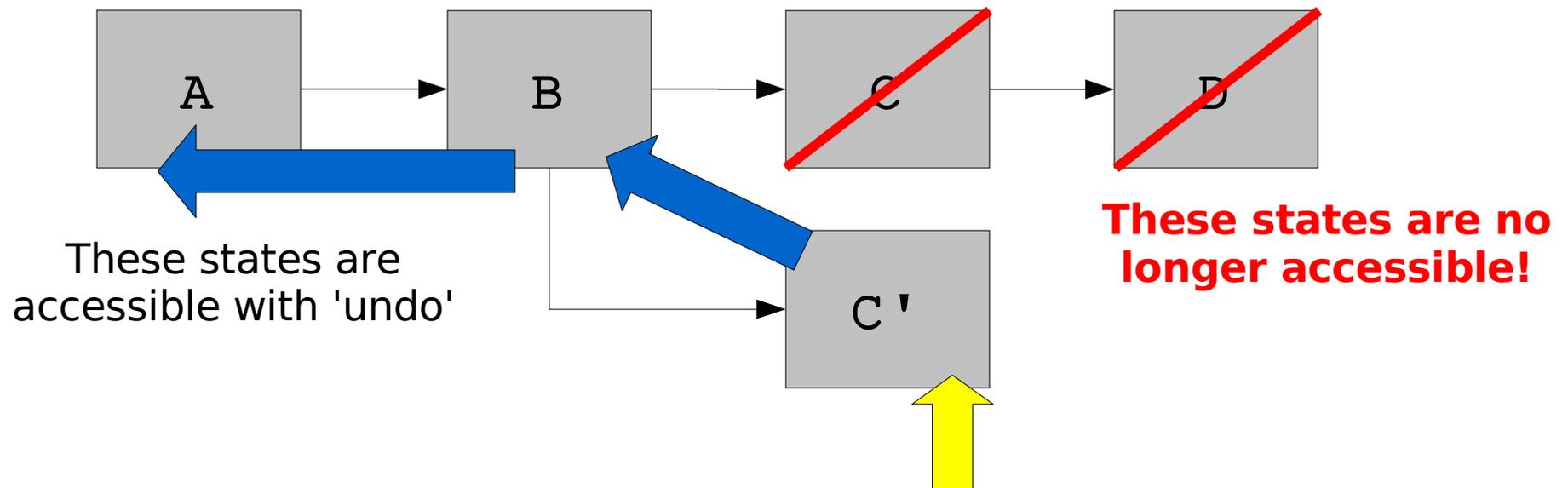
This is how most editors other than Emacs work:



The undo model, illustrated

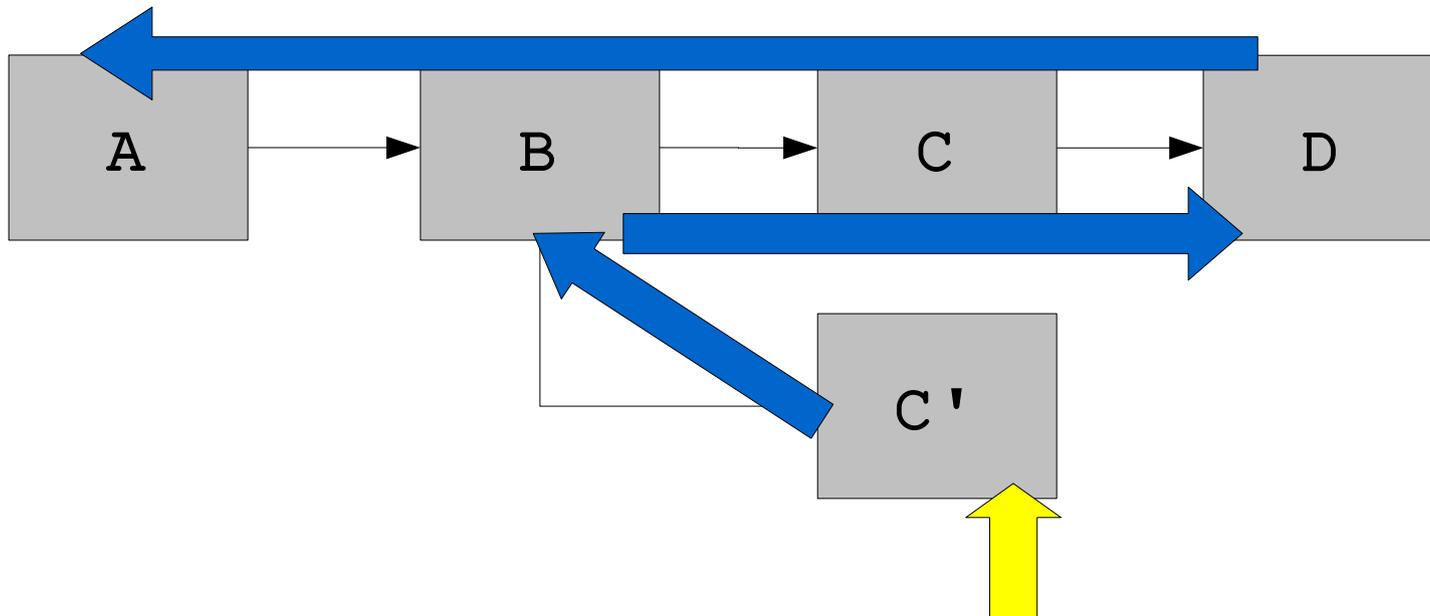
Now do something else...

This is how most editors other than Emacs work:



The undo model, illustrated

Emacs handles this situation
by 'folding' the list of states



In Emacs, **all** previous actions,
including undos, are undoable

Incremental search

- Search for text (like Firefox's "find as you type")
 - `C-s text`
 - ◊ `C-s` again to find next occurrence
 - ◊ `RET` to stop at found occurrence
 - ◊ `C-g` to cancel and go back to start of search
 - ◊ Many options available inside search;
`C-h k C-s` to learn more
 - `C-r` to search backwards

Search history

- Search for previously searched string
 - C-s C-s
- Browse and edit previous queries
 - C-s then M-p or M-n

Incremental search

- Search for regular expressions (regexps)
 - C-M-s *regexp*
 - Emacs regexps are a superset of Perl regexps
 - M-x `re-builder` can help you test complex regexps

Searching and replacing

- Search and replace, asking for confirmation
 - `M-%` or `M-x query-replace`
 - `y` (or `n`) to replace (skip) current match
 - `q` to quit
 - `!` to replace all remaining matches without asking
 - `?` for help with these and other options
- Display all lines matching regexp
 - `M-x occur`

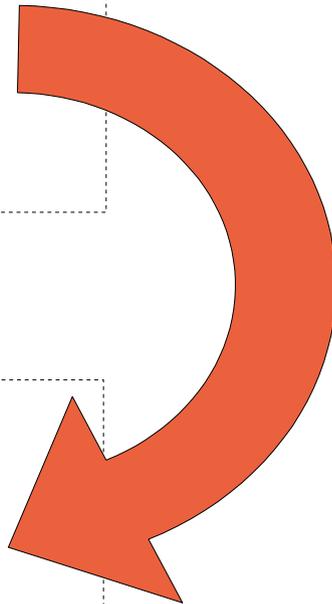
Regex search and replacement

- `M-x replace-regex`
 - Replacement text can depend on found text
- Replacement text gets these substitutions:
 - `\&` (the matched string)
 - `\1`, `\2`, etc. (sub-parts of matched string)
 - `\#` (number of matched lines so far)
 - `\?` (prompt user for what to enter)
 - `\, (lisp-expression ...)`

Regexp replacement example

George Washington
John Adams
Thomas Jefferson
James Madison

WASHINGTON, George
ADAMS, John
JEFFERSON, Thomas
MADISON, James



```
M-x replace-regexp  
  \(\w+\) \(\w+\)  
      with  
  \, (upcase \2), \1
```

Integration with useful tools

- Shell
 - `M-x shell`
- Compile (invoke make)
 - `M-x compile`
- Debug
 - `M-x gdb`

All these commands
display output in
a new buffer

Integration with useful tools

- Grep

- `M-x grep`, `M-x rgrep`

- Man page reader

- `M-x woman`

- Invoke shell commands

- `M-x shell-command`,
`M-x shell-command-on-region`

Integration with useful tools

- Calculator
 - `M-x calc`
- Calendar
 - `M-x calendar`
- Moon calendar
 - `M-x phases-of-moon`

More helpful features

- Open remote files over SSH (TRAMP)
 - `C-x C-f /user@host:~/remote/file`
- Emacs interface to CVS, SVN, etc. (VC)
 - Automatically detects version control system in use
 - `M-x vc-next-action` to commit modified file
 - `M-x vc-diff` to view changes to current file
- Name search/completion in source code (etags)

Emacs server

- Use a single Emacs session for all editing
- Do this once: `M-x server-start`
 - or put `(server-start)` in your `.emacs` file
- To edit a file:
 - `prompt% emacsclient FILE`
 - File opens in an existing Emacs frame
 - `C-x #` when done editing

Macros

- Remembers a fixed sequence of keys for later repetition
 - Start recording macro: C-x (
 - Stop recording macro: C-x)
 - Replay macro: C-x e
 - Replay macro repeatedly: C-x e e e . . .

Macro example

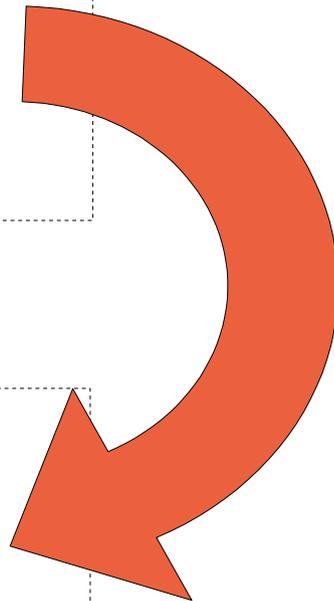
Define macro:

```
M-d C-d M-u , [SPC]  
C-y C-n C-a
```

"Remove first word and space, uppercase next word, insert comma and space afterward, reinsert first word, move to beginning of next line"

```
George Washington  
John Adams  
Thomas Jefferson  
James Madison
```

```
WASHINGTON, George  
ADAMS, John  
JEFFERSON, Thomas  
MADISON, James
```



Run macro four times:

```
C-x e e e e
```

Narrowing

- Restricts view/editing in a buffer to a certain region
 - `C-x n n` or `M-x narrow-to-region` to narrow to region
 - `C-x n w` or `M-x widen` to restore ('widen')

Registers

- Store current window configuration
 - `C-x r w REGISTER`
- Restore window configuration
 - `C-x r j REGISTER`
- Registers can also store positions, text, numbers, file names...

REGISTER may be any letter or number

Prefix arguments

- Sometimes used to indicate repetition
 - `C-u 10 C-f` (forward 10 characters)
 - `C-u C-o` (make 4 new lines)
- Sometimes modifies following command
 - `C-/` (undo) vs. `C-u C-/` (undo within region)
 - `M-x shell` vs. `C-u M-x shell`
- A command's documentation (`C-h f` or `C-h k`) describes the effect of the prefix argument, if any

Major modes

- Alters behavior, key bindings, and text display
- Switch mode in existing buffer:
 - `M-x java-mode`
 - `M-x python-mode`
 - `M-x fundamental-mode`
 - Emacs can usually detect the correct mode to use
- Or use another command to create buffer:
 - `M-x shell`, `M-x dired`, etc.

Language major mode features

- Language-specific indentation, syntax coloring
- Examples of language-specific commands:
 - Lisp: commands for manipulating s-expressions
 - Python: commands for (un)indenting blocks
 - HTML: insert/close tags; preview in web browser
- Modes can define or redefine keys

Minor modes

- Extra functionality you can turn on or off
 - Any number of minor modes may be active at once
 - Independent of major mode functionality
- `M-x auto-fill-mode`
- `M-x flyspell-mode`
- `M-x follow-mode`

Global minor modes

- Offer completions for buffers, commands, etc.
 - `M-x icomplete-mode`
- Show all buffer names during `C-x b`:
 - `M-x iswitchb-mode`

Minibuffer input

- Common interface whenever Emacs prompts you for input
 - e.g. in `M-x eval-expression`, `M-x find-file`, `M-x switch-to-buffer`, ...
 - Most editing, movement commands work in the minibuffer
 - Browse previous inputs with `M-n`, `M-p`
 - Tab-completion is often available

Customizing Emacs

- `M-x customize`
 - Point-and-click interface for browsing and altering customizable aspects of Emacs

Getting help with Emacs

- Help with key
 - C-h k
- Help with function
(includes anything invoked with M-x ...)
 - C-h f
- Help with mode
 - C-h m
- Show key bindings
 - C-h b
- Help about help
 - C-h C-h

C-h k and **C-h f** give a complete description of a command if you know either the key command or the full command name.

Getting help with Emacs

- Apropos (search for command)
 - `C-h a`
- Help with prefix key
 - `C-h` (after prefix key)
- Manuals
 - `M-x info`, then select **emacs** or **efaq**
 - A thorough and coherent overview of features

"In the event of an emergency"

- Cancel command in progress
 - C-g (repeatedly if necessary)
- Undo!
 - C-/ or C-_
- "What did I just do?"
 - M-x view-lossage

Common problems

- Backspace key not deleting?
 - `M-x normal-erase-is-backspace-mode`
- Keys with `M-` not working? Use `ESC` instead
 - `ESC x` instead of `M-x`
 - `ESC C-t` instead of `C-M-t`

Migrating to Emacs

- From Windows applications
 - `M-x cua-mode`: recovers `C-z`, `C-x`, `C-c`, `C-v` for their usual purposes
- From vi/vim
 - `M-x viper-mode`

Resources

- Emacs manuals
 - Read with `M-x info`
- Emacs reference card
 - <http://web.mit.edu/olh/Emacs/Refcard.pdf>

■ **Bonus: Emacs distractions**

- `M-x tetris`
- `M-x hanoi`
- `M-x doctor`