Advanced Programming in the UNIX Environment

Week 05, Segment 2: Unix Development Tools: The Editor

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Software Development Tools

The UNIX Userland is an IDE – essential tools that follow the paradigm of "Do one thing, and do it right" can be combined.

You are here.

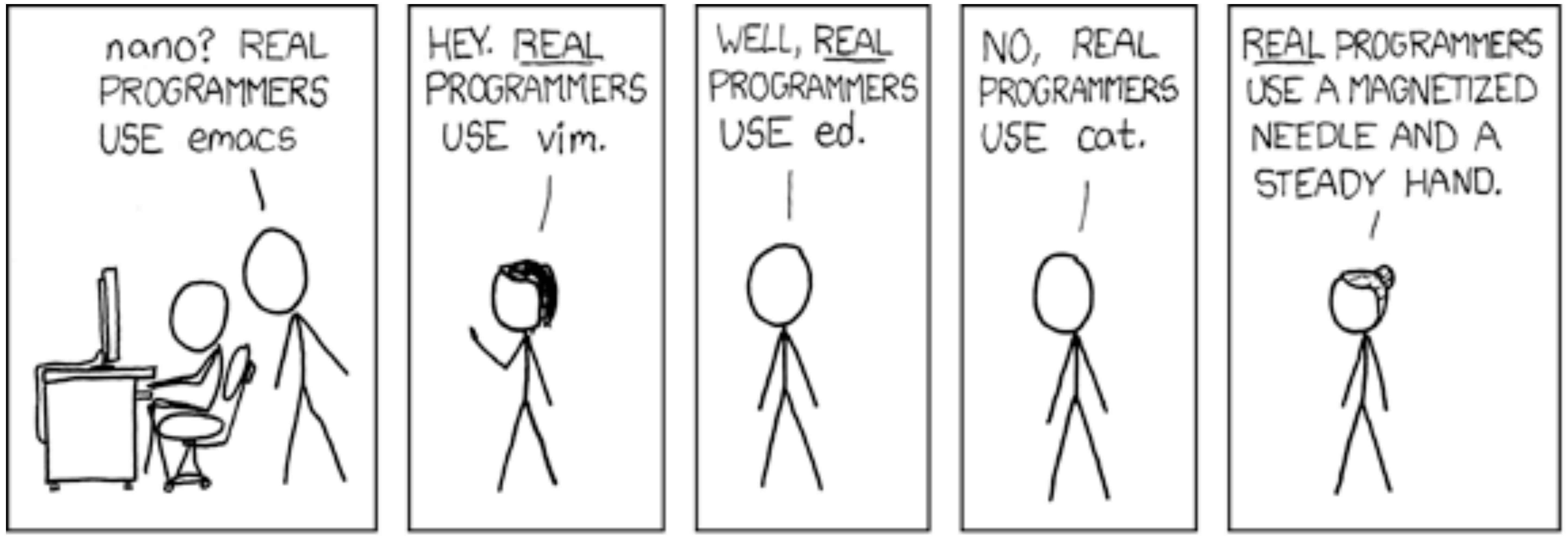
The most important tools are:

- `$EDITOR`
- the compiler toolchain
- `gdb(1)` – debugging your code
- `make(1)` – project build management, maintain program dependencies
- `diff(1)` and `patch(1)` – report and apply differences between files
- `cvs(1)`, `svn(1)`, `git(1)` etc. – revision control, distributed project management

$EDITOR

Know your $EDITOR. Core functionality:

- syntax highlighting
- efficient keyboard maneuvering
- setting markers, using buffers
- copy, yank, fold e.g. blocks
- search and replace
- window splitting
- autocompletion
- jump to definition / manual page
- applying external commands and filters


nano? REAL PROGRAMMERS USE emacs
HEY. REAL PROGRAMMERS USE vim.
WELL, REAL PROGRAMMERS USE ed.
NO, REAL PROGRAMMERS USE cat.
REAL PROGRAMMERS USE A MAGNETIZED NEEDLE AND A STEADY HAND.

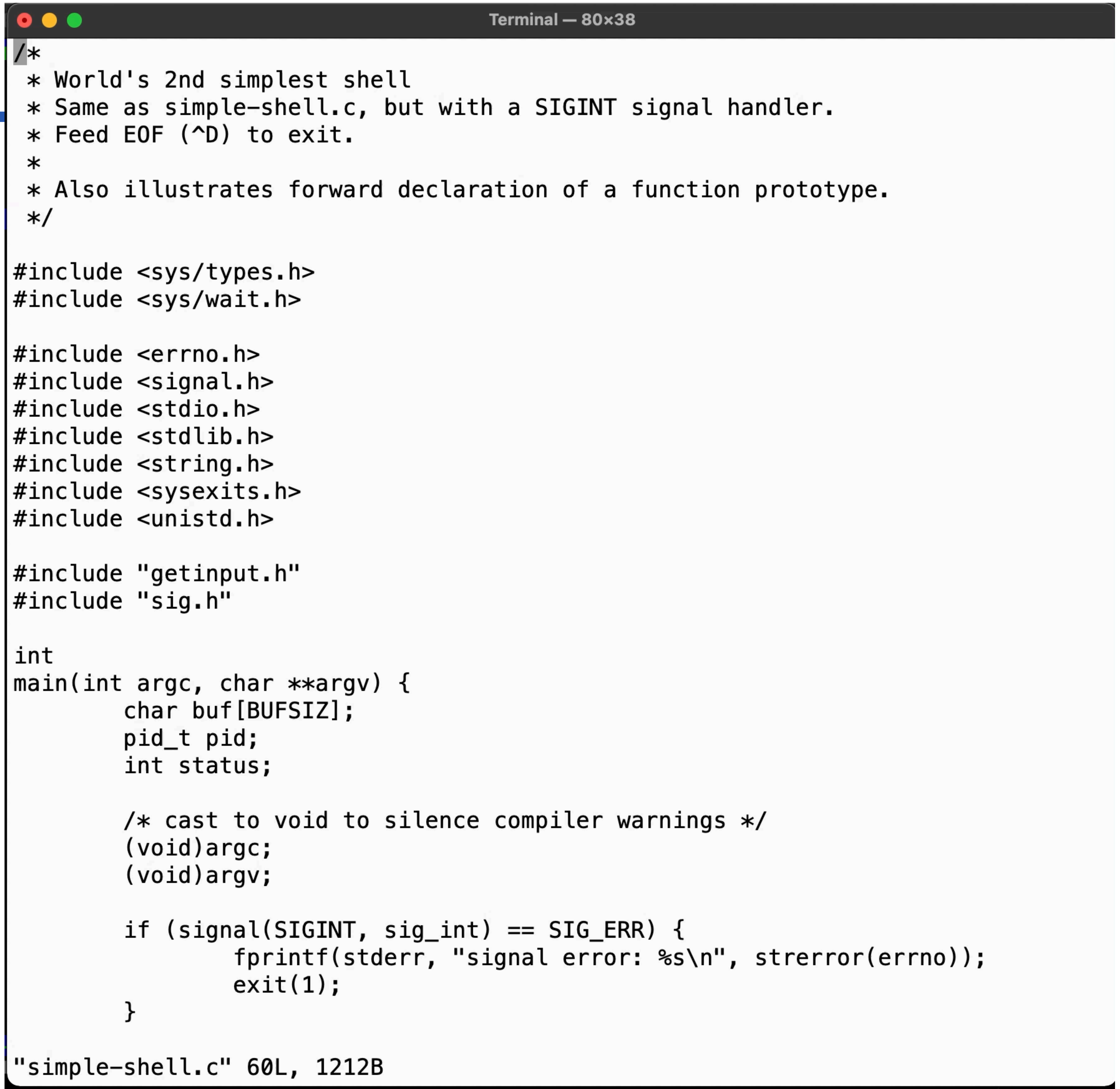
Partial https://xkcd.com/378/

https://dave.cheney.net/2017/08/21/the-here-is-key

$EDITOR Examples: vim

Efficient keyboard maneuvering:

- up, down, left, right (h, j, k, l)
- move by word, go to end (w, b, e)
- search forward, backward, move to beginning or end of line (/, ?,^, $)
- page up or down (^D,^B)
- center page, top or bottom (zz, zt, zb)
- move to matching brace, move to beginning/end of code block (%,]}, [{)
- move through multiple files (:n, :prev, :rew)


Terminal — 80×38

```
/*
 * World's 2nd simplest shell
 * Same as simple-shell.c, but with a SIGINT signal handler.
 * Feed EOF (^D) to exit.
 *
 * Also illustrates forward declaration of a function prototype.
 */

#include <sys/types.h>
#include <sys/wait.h>

#include <errno.h>
#include <signal.h>
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <sysexits.h>
#include <unistd.h>

#include "getinput.h"
#include "sig.h"

int
main(int argc, char **argv) {
        char buf[BUFSIZ];
        pid_t pid;
        int status;

        /* cast to void to silence compiler warnings */
        (void)argc;
        (void)argv;

        if (signal(SIGINT, sig_int) == SIG_ERR) {
                fprintf(stderr, "signal error: %s\n", strerror(errno));
                exit(1);
        }

"simple-shell.c" 60L, 1212B
```

$EDITOR Examples: vim

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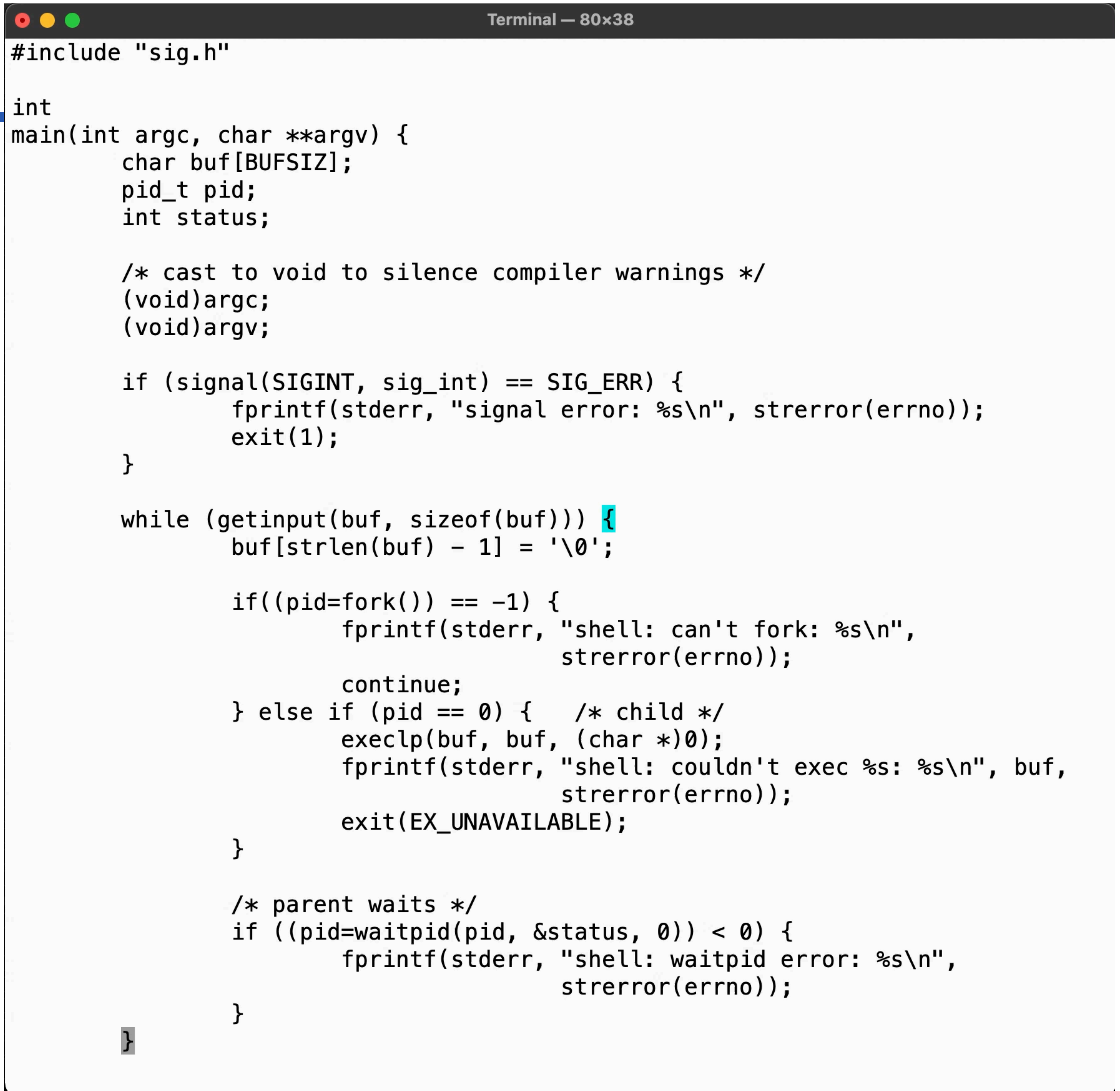


```
#include "sig.h"

int
main(int argc, char **argv) {
	char buf[BUFSIZ];
	pid_t pid;
	int status;

	/* cast to void to silence compiler warnings */
	(void)argc;
	(void)argv;

	if (signal(SIGINT, sig_int) == SIG_ERR) {
		fprintf(stderr, "signal error: %s\n", strerror(errno));
		exit(1);
	}

	while (getinput(buf, sizeof(buf))) {
		buf[strlen(buf) - 1] = '\0';

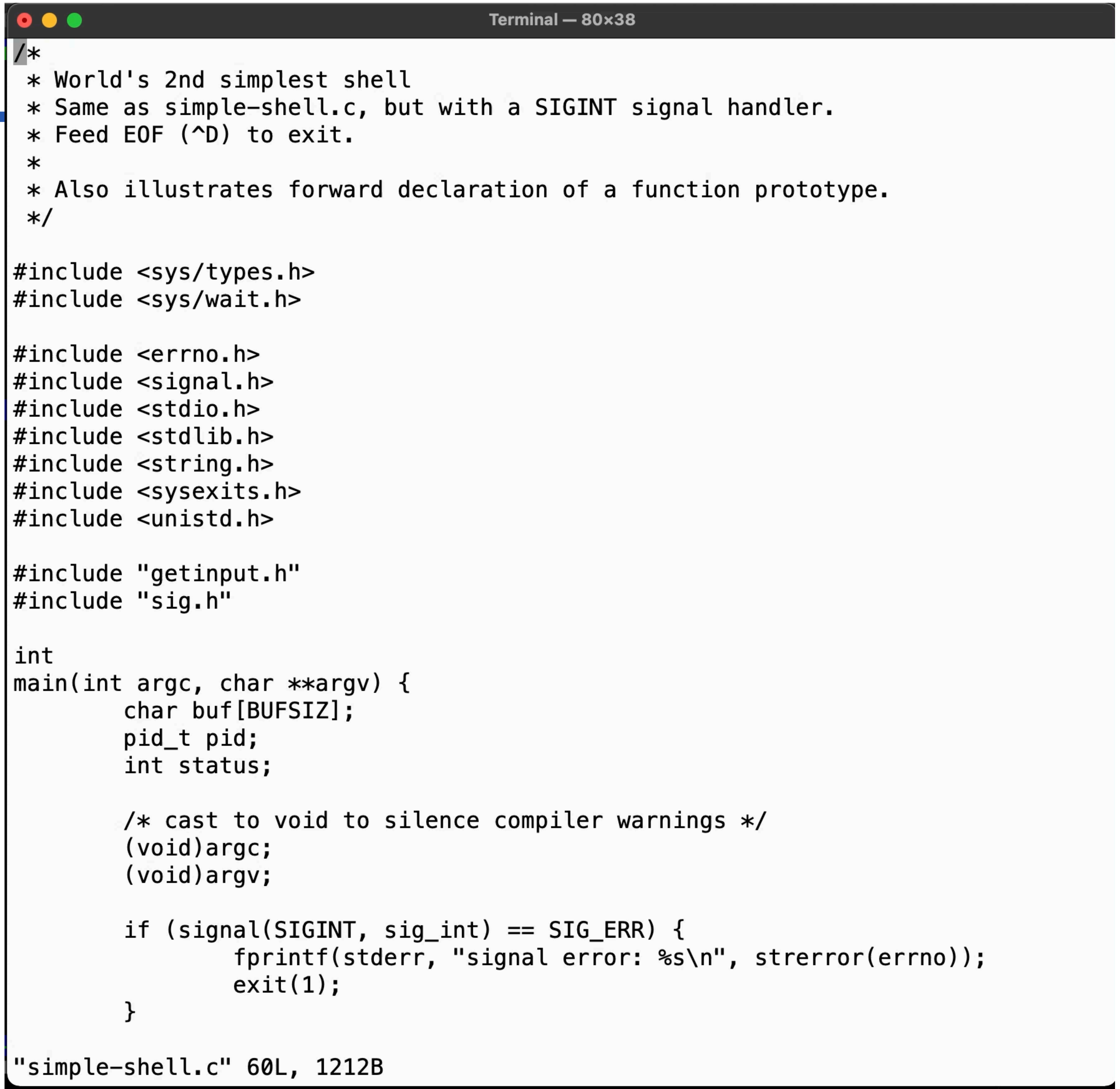
		if((pid=fork()) == -1) {
			fprintf(stderr, "shell: can't fork: %s\n",
					strerror(errno));
			continue;
		} else if (pid == 0) {   /* child */
			execlp(buf, buf, (char *)0);
			fprintf(stderr, "shell: couldn't exec %s: %s\n", buf,
					strerror(errno));
			exit(EX_UNAVAILABLE);
		}

		/* parent waits */
		if ((pid=waitpid(pid, &status, 0)) < 0) {
			fprintf(stderr, "shell: waitpid error: %s\n",
					strerror(errno));
		}
	}
```

$EDITOR Examples: vim

Copy, yank, fold, markers, buffers etc.:

- set and display markers (m[a-zA-Z], :marks)
- select visual blocks (v, V)
- format / indent selected block (=)
- delete, yank, use of buffers (d, y, "xy, "xp)
- fold sections (zf, zA)
- autocomplete (^N)



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main(int argc, char **argv) {
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        if (signal(SIGINT, sig_int) == SIG_ERR) {
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                exit(1);
        }

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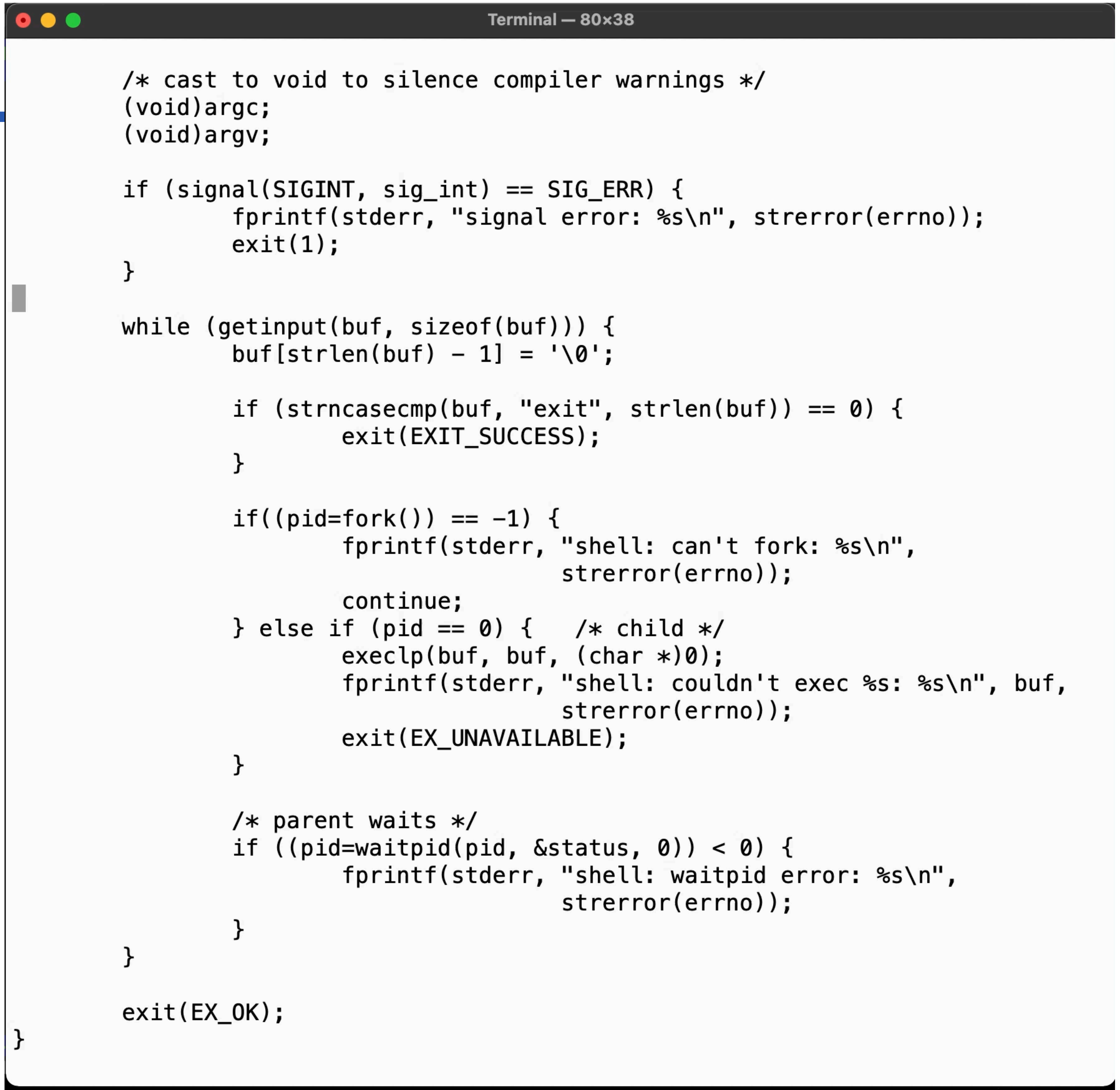
```

$EDITOR Examples: vim

Integration with compiler, debugger, make(1) etc.:

- build your project (:make)
- show / go to error (:cc [N])
- jump to next / previous error (:cn, :cp)
- list errors (:cl, :copen)


Terminal — 80×38

```
        /* cast to void to silence compiler warnings */
        (void)argc;
        (void)argv;

        if (signal(SIGINT, sig_int) == SIG_ERR) {
                fprintf(stderr, "signal error: %s\n", strerror(errno));
                exit(1);
        }

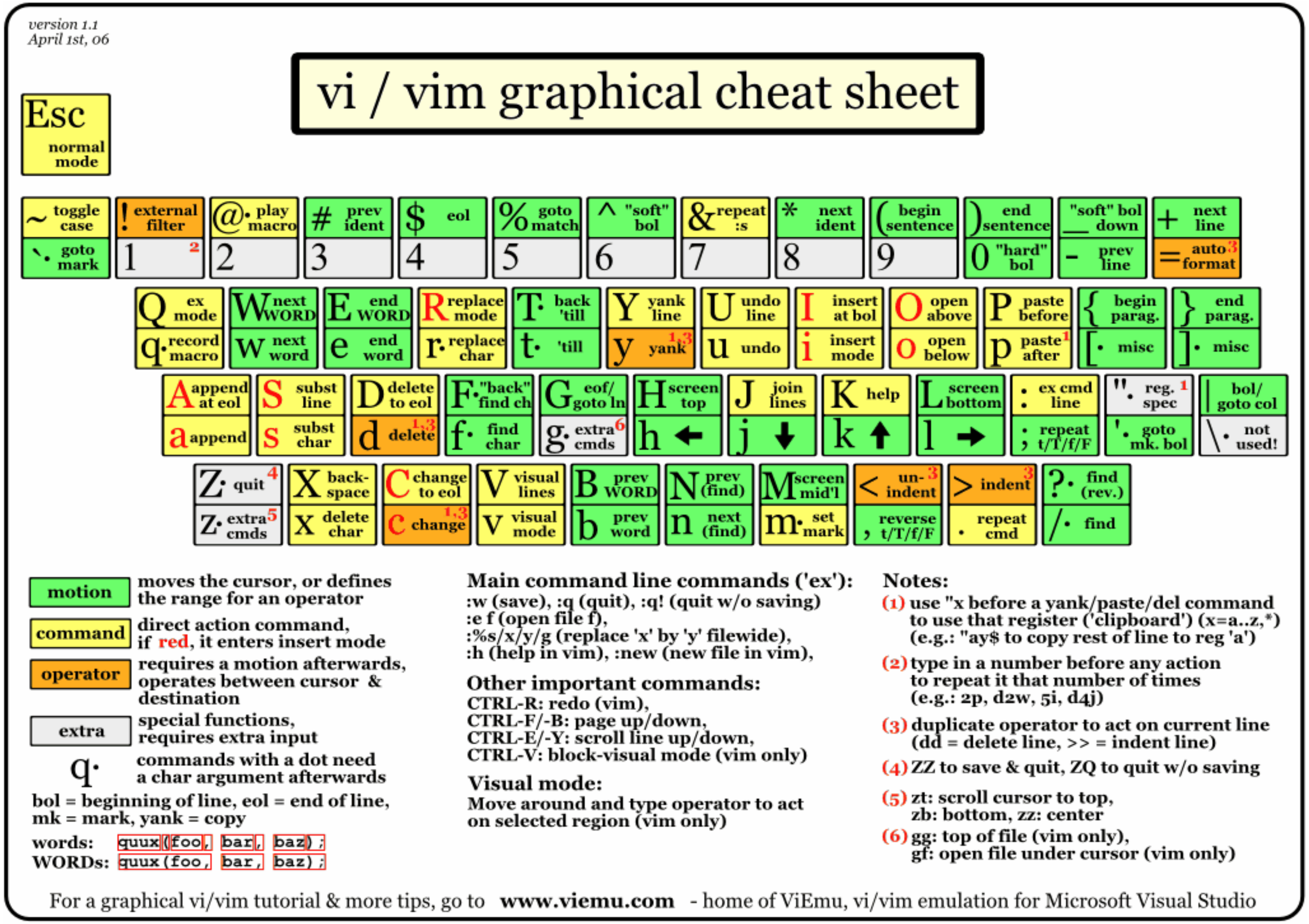
        while (getinput(buf, sizeof(buf))) {
                buf[strlen(buf) - 1] = '\0';

                if (strncasecmp(buf, "exit", strlen(buf)) == 0) {
                        exit(EXIT_SUCCESS);
                }

                if((pid=fork()) == -1) {
                        fprintf(stderr, "shell: can't fork: %s\n",
                                        strerror(errno));
                        continue;
                } else if (pid == 0) {   /* child */
                        execlp(buf, buf, (char *)0);
                        fprintf(stderr, "shell: couldn't exec %s: %s\n", buf,
                                        strerror(errno));
                        exit(EX_UNAVAILABLE);
                }

                /* parent waits */
                if ((pid=waitpid(pid, &status, 0)) < 0) {
                        fprintf(stderr, "shell: waitpid error: %s\n",
                                        strerror(errno));
                }
        }

        exit(EX_OK);
}
```



vi / vim graphical cheat sheet

motion	moves the cursor, or defines the range for an operator
command	direct action command, if red, it enters insert mode
operator	requires a motion afterwards, operates between cursor & destination
extra	special functions, requires extra input
q·	commands with a dot need a char argument afterwards

bol = beginning of line, eol = end of line,
mk = mark, yank = copy

words: `quux(foo, bar, baz);`
WORDs: `quux(foo, bar, baz);`

Main command line commands ('ex'):
:w (save), :q (quit), :q! (quit w/o saving)
:e f (open file f),
:%s/x/y/g (replace 'x' by 'y' filewide),
:h (help in vim), :new (new file in vim),

Other important commands:
CTRL-R: redo (vim),
CTRL-F/-B: page up/down,
CTRL-E/-Y: scroll line up/down,
CTRL-V: block-visual mode (vim only)

Visual mode:
Move around and type operator to act on selected region (vim only)

Notes:
(1) use "x before a yank/paste/del command to use that register ('clipboard') (x=a..z,*) (e.g.: "ay$ to copy rest of line to reg 'a')
(2) type in a number before any action to repeat it that number of times (e.g.: 2p, d2w, 5i, d4j)
(3) duplicate operator to act on current line (dd = delete line, >> = indent line)
(4) ZZ to save & quit, ZQ to quit w/o saving
(5) zt: scroll cursor to top, zb: bottom, zz: center
(6) gg: top of file (vim only), gf: open file under cursor (vim only)

For a graphical vi/vim tutorial & more tips, go to **www.viemu.com** - home of ViEmu, vi/vim emulation for Microsoft Visual Studio

https://duckduckgo.com/?q=vim+tutorial

$EDITOR

Other powerful Unix IDE integrations:

- code index and definitions via *e.g.*, `ctags(1)`
- a terminal multiplexer (*e.g.* `screen(1)` or `tmux(1)`)
- copious use of `Ctrl+Z` (*i.e.*, the shell's job control mechanisms)

See our tool tips for more details:

- https://youtu.be/TWog5NklSws
- https://youtu.be/vxTXXaCr4s8