

CSC 374/407: Computer Systems II

Lecture 9

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Overview

What is ncurses?

A text-package that lets you control text on the screen

ncurses

“curses” (circa 1980)

A screen package for BSD Unix from U.C. Berkeley

“ncurses” (1993)

For “new curses”

BIG IDEA:

Two screens

Virtual one written to by program

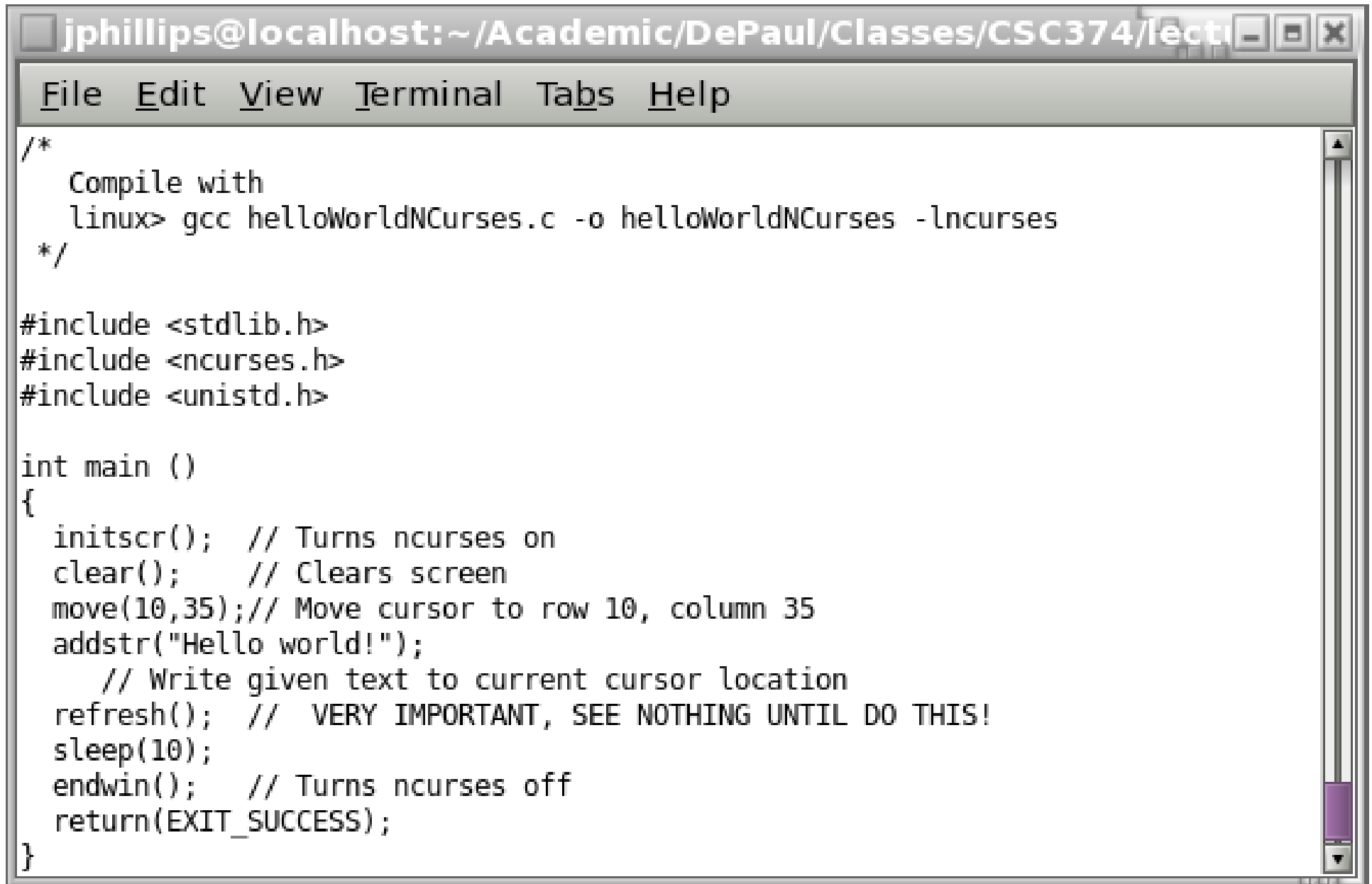
Physical one (user's terminal)

Package minimizes bandwidth by

Relying on programmer to **refresh()** to sync screens

Only sending over minimal number of changes needed

Our first ncurses program:

A screenshot of a terminal window. The title bar shows the user 'jphillips' on 'localhost' in the directory '~/Academic/DePaul/Classes/CSC374/lect'. The menu bar includes 'File', 'Edit', 'View', 'Terminal', 'Tabs', and 'Help'. The terminal content shows a C program using ncurses. It includes headers for stdlib, ncurses, and unistd. The main function initializes the ncurses screen, clears it, moves the cursor to row 10, column 35, prints 'Hello world!', refreshes the screen, sleeps for 10 seconds, and then ends the window.

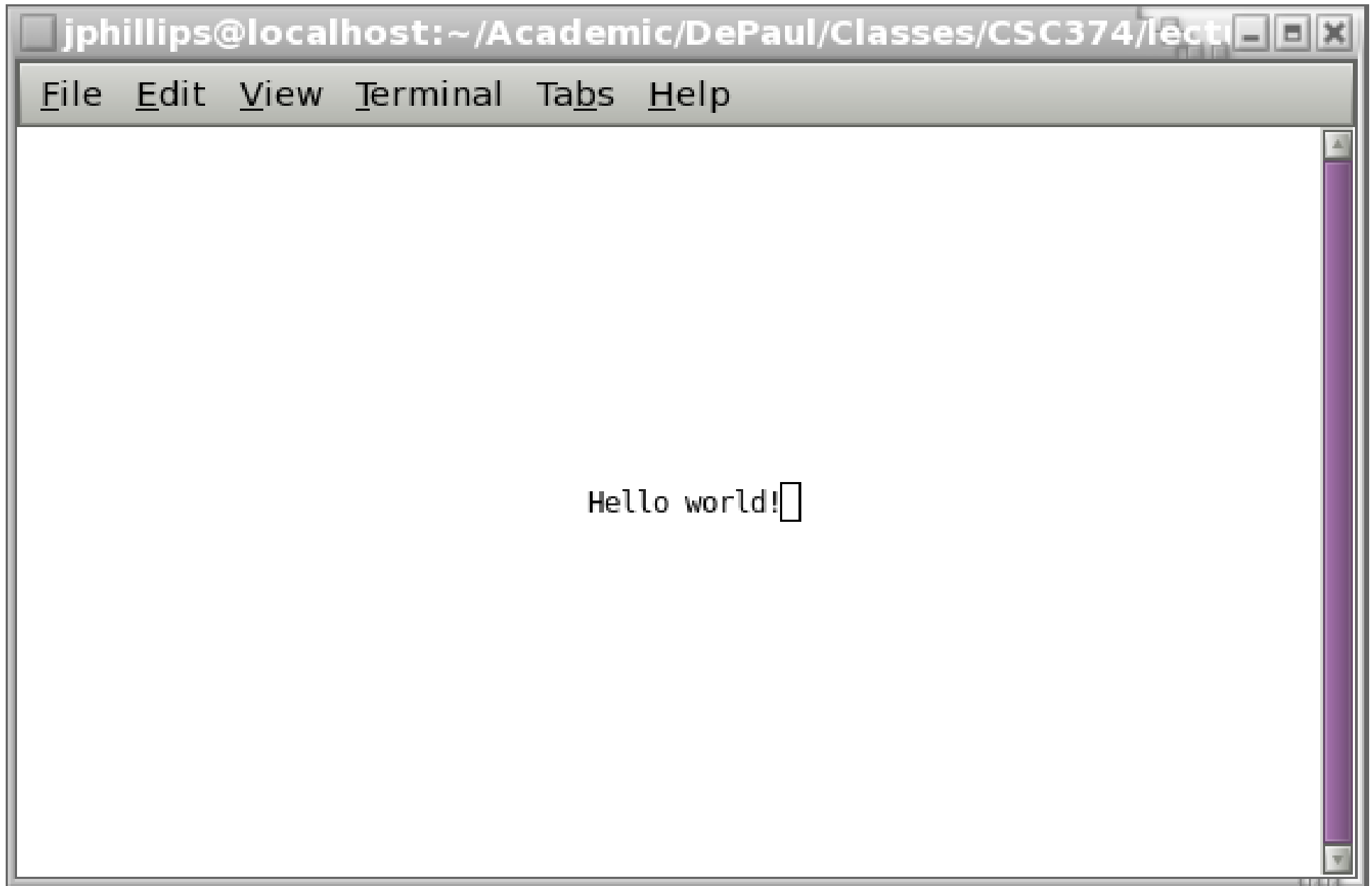
```
jphillips@localhost:~/Academic/DePaul/Classes/CSC374/lecti
File Edit View Terminal Tabs Help

/*
  Compile with
  linux> gcc helloWorldNCurses.c -o helloWorldNCurses -lncurses
*/

#include <stdlib.h>
#include <ncurses.h>
#include <unistd.h>

int main ()
{
    initscr(); // Turns ncurses on
    clear();   // Clears screen
    move(10,35); // Move cursor to row 10, column 35
    addstr("Hello world!");
    // Write given text to current cursor location
    refresh(); // VERY IMPORTANT, SEE NOTHING UNTIL DO THIS!
    sleep(10);
    endwin();  // Turns ncurses off
    return(EXIT_SUCCESS);
}
```

Our first ncurses program, cont'd



ncurses functions (1)

initscr()

Starts ncurses package

clear()

Clears screen

move(int row, int col)

Moves cursor to given *row* and *col* (upper left is 0,0)

addstr(const char* str)

Write string pointed to by *str* to current location

addch(char c)

Writes character *c* to current location

refresh()

Sends changes need to write virtual screen to physical

endwin()

Ends ncurses package

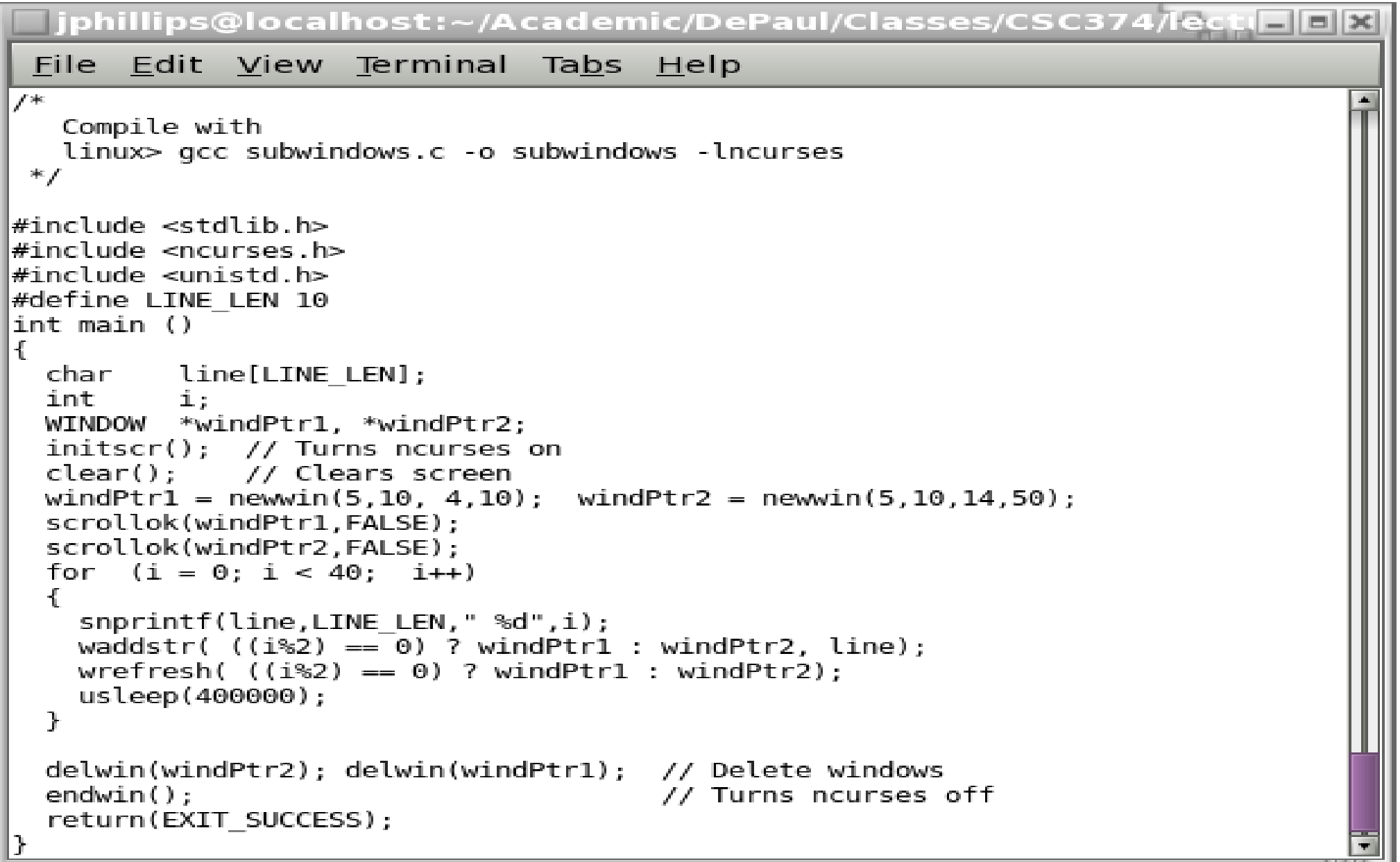
Subwindows

Type **WINDOW*** refers to a window

stdscr refers to the whole window

Can define subwindows of whole screen

subwindows.c



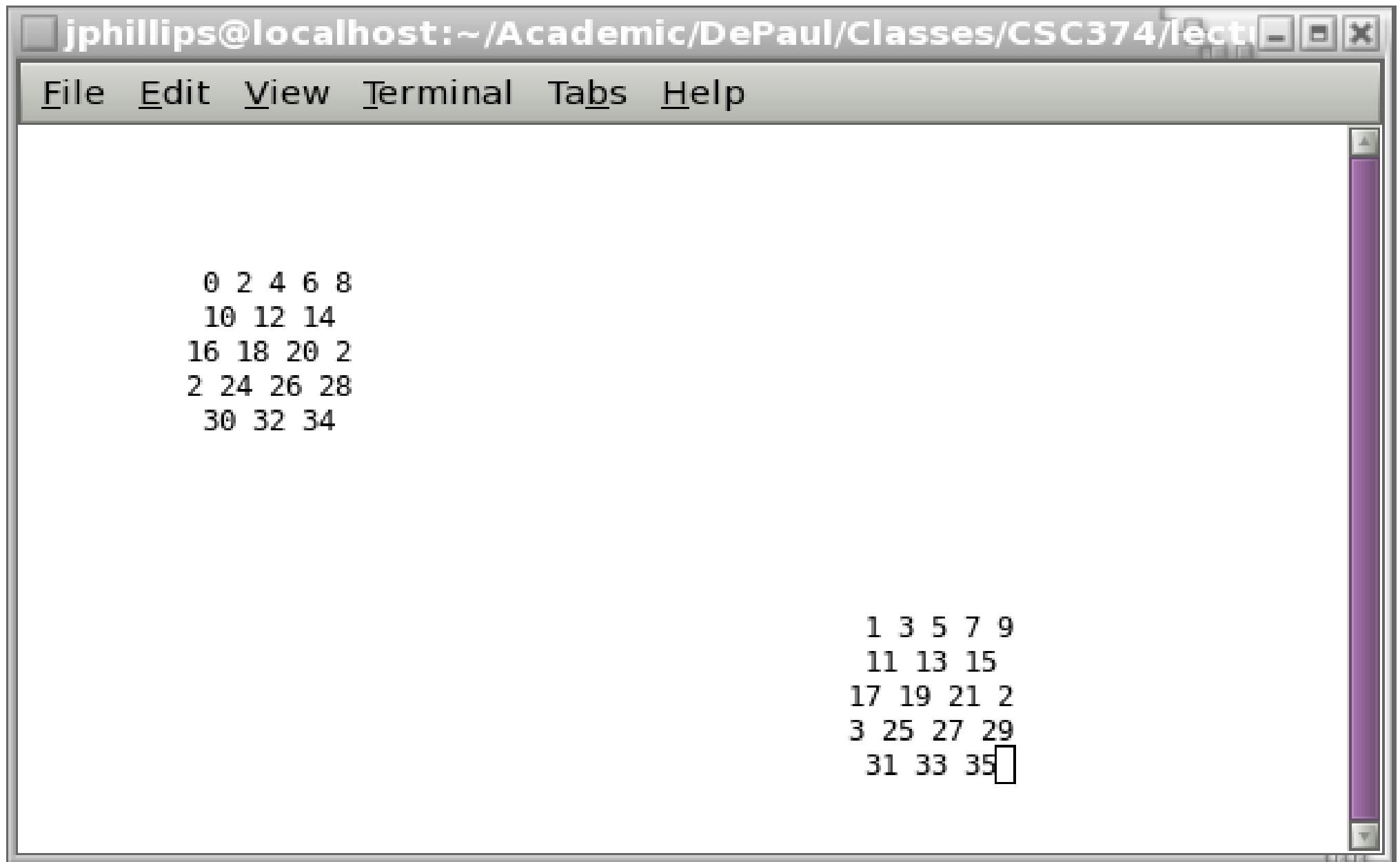
```
jphillips@localhost:~/Academic/DePaul/Classes/CSC374/lecti
File Edit View Terminal Tabs Help

/*
 * Compile with
 * linux> gcc subwindows.c -o subwindows -lncurses
 */

#include <stdlib.h>
#include <ncurses.h>
#include <unistd.h>
#define LINE_LEN 10
int main ()
{
    char    line[LINE_LEN];
    int     i;
    WINDOW  *windPtr1, *windPtr2;
    initscr(); // Turns ncurses on
    clear();   // Clears screen
    windPtr1 = newwin(5,10, 4,10);  windPtr2 = newwin(5,10,14,50);
    scrollok(windPtr1,FALSE);
    scrollok(windPtr2,FALSE);
    for (i = 0; i < 40; i++)
    {
        snprintf(line,LINE_LEN," %d",i);
        waddstr( ((i%2) == 0) ? windPtr1 : windPtr2, line);
        wrefresh( ((i%2) == 0) ? windPtr1 : windPtr2);
        usleep(400000);
    }

    delwin(windPtr2); delwin(windPtr1); // Delete windows
    endwin();                          // Turns ncurses off
    return(EXIT_SUCCESS);
}
```


subwindow.c, cont'd



A terminal window titled "jphillips@localhost:~/Academic/DePaul/Classes/CSC374/lecti" with a menu bar containing "File", "Edit", "View", "Terminal", "Tabs", and "Help". The terminal displays two columns of numbers. The left column contains the numbers 0, 2, 4, 6, 8 on the first line, 10, 12, 14 on the second line, 16, 18, 20, 2 on the third line, 2, 24, 26, 28 on the fourth line, and 30, 32, 34 on the fifth line. The right column contains the numbers 1, 3, 5, 7, 9 on the first line, 11, 13, 15 on the second line, 17, 19, 21, 2 on the third line, 3, 25, 27, 29 on the fourth line, and 31, 33, 35 on the fifth line, followed by a cursor.

```
jphillips@localhost:~/Academic/DePaul/Classes/CSC374/lecti
File Edit View Terminal Tabs Help

0 2 4 6 8
10 12 14
16 18 20 2
2 24 26 28
30 32 34

1 3 5 7 9
11 13 15
17 19 21 2
3 25 27 29
31 33 35
```

Using subwindows

```
WINDOW* newwin (int numRows, int  
    numCols, int beginRow, int  
    beginCol)
```

Makes and returns new window.

```
wrefresh(WINDOW* wPtr)
```

Refreshes just **wPtr*.

```
delwin(WINDOW* wPtr)
```

Deletes **wPtr*.

Using subwindows, cont'd

waddstr(WINDOW* wPtr, const char* str)

Writes *str* to **wPtr*.

waddch(WINDOW* wPtr, char ch)

Writes *ch* to *stdscr/*wPtr*.

wmove(WINDOW* wPtr, int row, int col)

Moves cursor to *row,col* within window **wPtr*.

scrollok(windowPtr, TRUE)

scrollok(windowPtr, FALSE)

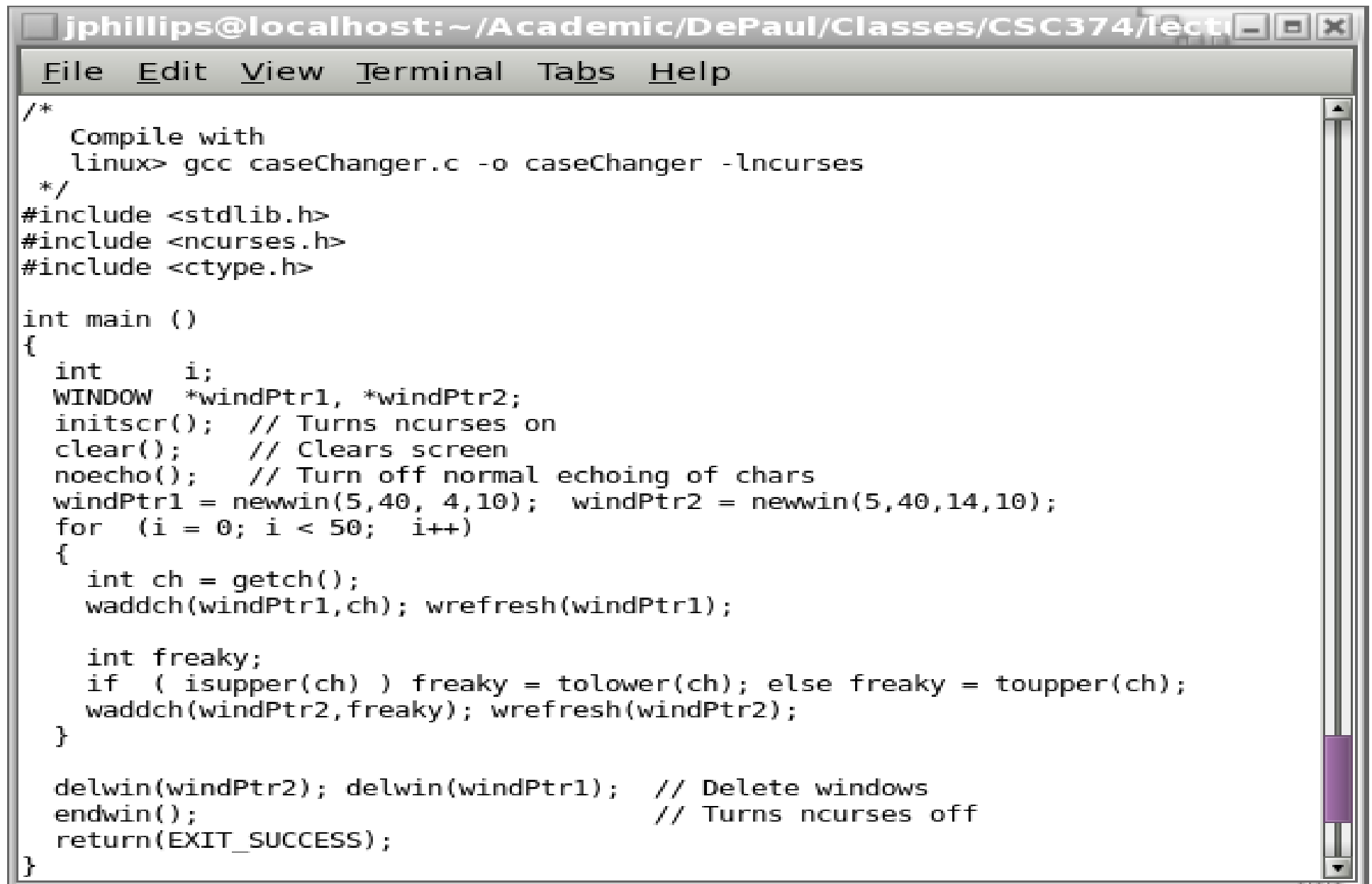
Allows/disallows scrolling of window.

Keyboard input

Gives you more control over keyboard input

- Can get keys as they are typed, without user pressing “**Enter**”
- Can get arrow keys
- Can turn off “echoing” of typed chars
(When would this be good?)

caseChanger.c



```
jphillips@localhost:~/Academic/DePaul/Classes/CSC374/lect
File Edit View Terminal Tabs Help

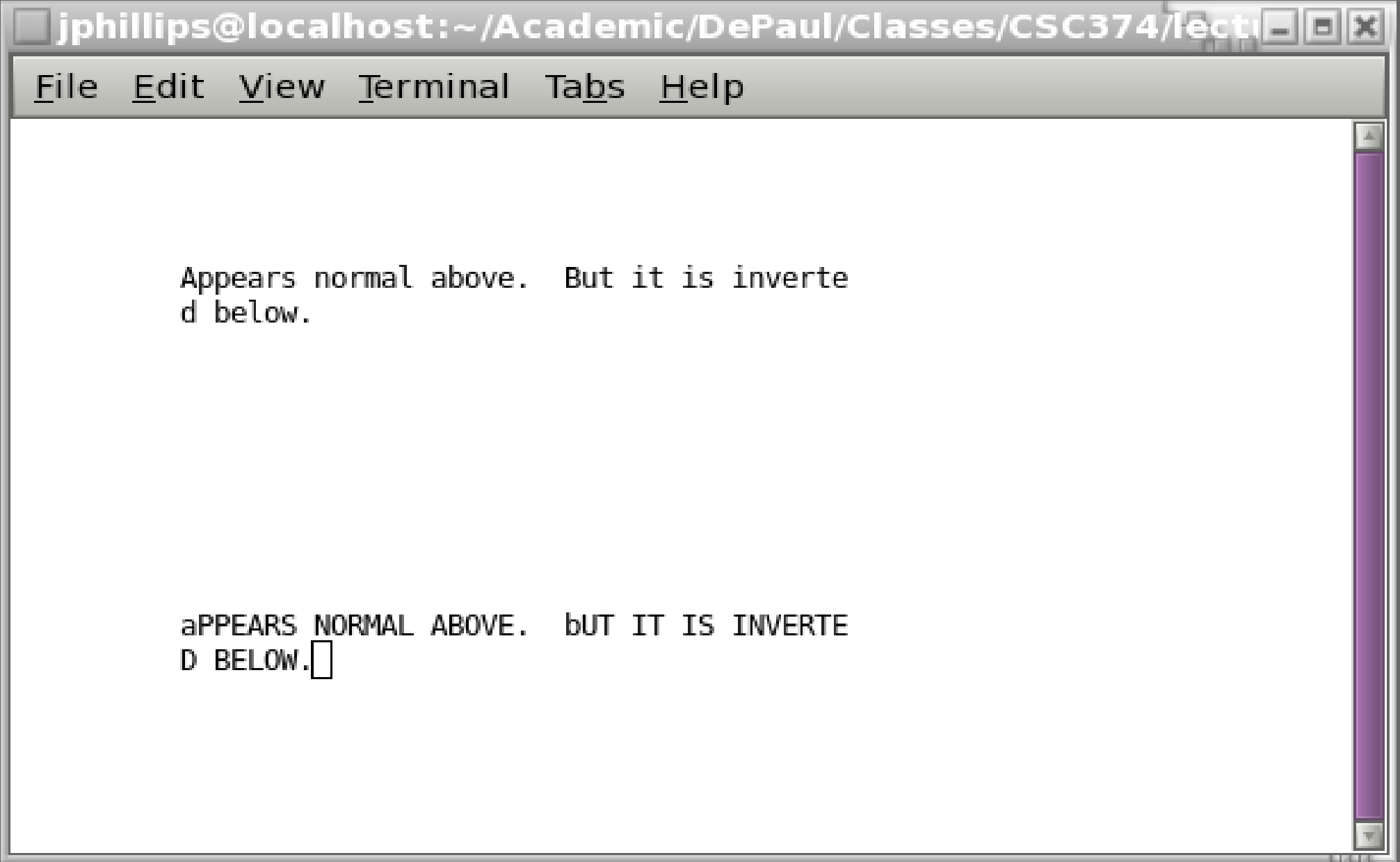
/*
    Compile with
    linux> gcc caseChanger.c -o caseChanger -lncurses
*/
#include <stdlib.h>
#include <ncurses.h>
#include <ctype.h>

int main ()
{
    int    i;
    WINDOW *windPtr1, *windPtr2;
    initscr(); // Turns ncurses on
    clear();   // Clears screen
    noecho();  // Turn off normal echoing of chars
    windPtr1 = newwin(5,40, 4,10); windPtr2 = newwin(5,40,14,10);
    for (i = 0; i < 50; i++)
    {
        int ch = getch();
        waddch(windPtr1,ch); wrefresh(windPtr1);

        int freaky;
        if ( isupper(ch) ) freaky = tolower(ch); else freaky = toupper(ch);
        waddch(windPtr2,freaky); wrefresh(windPtr2);
    }

    delwin(windPtr2); delwin(windPtr1); // Delete windows
    endwin();                          // Turns ncurses off
    return(EXIT_SUCCESS);
}
```

caseChanger.c cont'd

A terminal window with a title bar showing the user 'jphillips' at 'localhost' in the directory '~/Academic/DePaul/Classes/CSC374/lecti'. The menu bar includes 'File', 'Edit', 'View', 'Terminal', 'Tabs', and 'Help'. The terminal content shows two lines of text: 'Appears normal above. But it is inverted below.' and 'aPPEARS NORMAL ABOVE. bUT IT IS INVERTED BELOW.' with a cursor at the end of the second line.

```
jphillips@localhost:~/Academic/DePaul/Classes/CSC374/lecti
File Edit View Terminal Tabs Help

Appears normal above. But it is inverted below.

aPPEARS NORMAL ABOVE. bUT IT IS INVERTED BELOW.█
```

Misc. ncurses

int getch()

Gets key (without having to press Enter!)

If it ==**ERR** then no key was pressed.

noecho()

Turns off echoing of chars

cbreak()

Turns off the “*Don’t send any char until the user press ‘Enter’*” buffering.

nodelay(stdscr, TRUE)

Allows non-blocking input from keyboard
(Doesn't even wait for typed key)

keypad(stdscr, TRUE)

Allows keypad chars (like arrow keys)

YOUR TURN!

Write a program that writes a string diagonally, bouncing off the top/bottom/left/right if the string is too long.

Your turn, again!

Write a program that writes the text you type diagonally, bouncing off the top/bottom/left/right borders as you type it.

Combing sockets with ncurses

Our turn!

How would you design a Unix “talk” (or Internet “chat”) program?