COP 4600 - Homework 1

Due October 7, 2015

# Install a Unix environment on your computer

For this homework, you need a Linux environment. There are two ways in which you can proceed:

* Install Linux on your computer (potentially, in parallel with your current OS)
* Install Linux in a virtual machine in your system. VirtualBox (<https://www.virtualbox.org/wiki/Downloads>) is a good choice for this homework.

Get familiar with the operation of the bash shell (especially the equivalents of the commands that you will need to implement in your shell.

# Create a shell program

Write a C or C++ program called mysh replaces the command shell in Unix. After started, it prints a prompt “#” and reads a command line terminated by newline. This line should be parsed out into a command and all its arguments. In other words, tokenize it.

* You may assume that the only supported delimiter is the whitespace character (ASCII character number 32).
* You do not need to handle "special" characters. Do not worry about handling quotation marks, backslashes, and tab characters. This means your shell will be unable support arguments with spaces in them. For example, your shell will not support file paths with spaces in them.
* You may set a reasonable maximum on the number of command line arguments, but your shell should handle input lines of any length.

# Implement built-in commands

Your shell should be able to interpret the following commands

# cd directory

Short for change directory. It is used to change the current directory (which must be an internal variable) to the specified one. If the specified directory does not exist, it should keep the old directory and write an error message.

# pwd

Prints the current directory.

# history [-c]

Without the parameter, prints out the recently typed commands (with their arguments). If “-c” is passed, it clears the list of recently typed commands

# quit

terminates the mysh shell

# run program [parameters]

The argument “program” is the program to execute. If the argument starts with a “/” (such as /usr/bin/xterm, the shell should interpret it as a full path. Otherwise, the program will be interpreted as a relative path starting from the current directory.

The program will be executed with the optional “parameters”. It uses fork() + exec() to start the program with the corresponding parameters, and waits until the program terminates (use the waitpid() call).

For instance

run /usr/bin/xterm –bg green

would bring up a terminal with a green background. The prompt would not return until the terminal is closed.

Display an error message if the specified program cannot be found or cannot be executed.

# background program [parameters]

It is similar to the run command, but it immediately prints the PID of the program it started, and returns the prompt.

# murder PID

Immediately terminate the program with the specific PID (presumably started from this command line interpreter). Use the kill() function call to send a SIGKILL signal to the program. Display success or failure.

To help you, you might want to read some of the readings associated with this homework at the class webpage. I have also linked from the webpage a code segment which might help you in reading the commands.

## Extra credit (10 points)

Implement a repeat command as follows:

# repeat n command …

Interprets n as the number of times the command must be run, command as the full path to the program to execute, and the others as parameters. The command should start the specified number of program instances, print the PIDs of the created processes and then return to the prompt, without waiting for the processes to terminate. For instance:

repeat 4 /usr/bin/xterm

would bring up 4 terminals and print out something like:

PIDs: 31012, 31013, 31014, 31015.

## More extra credit (10 points)

Implement the following command:

# murderall

Which immediately terminates all the programs previously started by the mysh shell which had not been previously terminated by it, or by murder. It should output something like this:

Murdering 3 processes: 16000 31012 31013

## What to submit:

* The code as a single .c or .cpp file.
* If you implemented the extra credit part: a text file describing the syntax of the implementation, and example of use.