

## Assignment 3 - Simple Shell

### Description:

This assignment involved creating a program that acts as a simple shell which accepts commands, uses `execvp` on child processes, and then returns their status to the command line once they finish executing or fail. A custom command line prompt is also accepted for the shell.

### Approach / What I Did:

To start off with this assignment I had to first understand what was actually happening when a process is forked and how it “returns” to the parent process. Rewatching the lecture where this was explained was pretty helpful and let me start with a leg up on the whole project. But I didn’t actually implement that part of the program first. I decided to get the input reading and string parsing out of the way first and then do the forking and exec stuff after. This worked out pretty handily and I didn’t run into too many bugs along the way, which was nice.

### Issues and Resolutions:

I realized at some point during my coding that the main function of this program was getting a little large and unwieldy. To solve this I decided to use helper functions to break down the parts of each thing that I needed to do. This actually helped a lot with the logic of the program as well since I could easily see which part was working and what wasn’t

When I started passing the manually allocated arg string I was getting a couple of compiler warnings. To fix this I had to change the function variable to a `char**` (a pointer to a char pointer).

Even though the spec didn’t require it, I wanted the commands from the `commands.txt` file to be printed to the terminal. I had to figure out how to use `isatty()` to check for stdin input from a file or from the keyboard (I’m not sure about the exact terminology for the latter). But once I figured out that function, it was a simple matter of passing a bool into the input reading function to print the commands!

## Compilation

```
student@student-VirtualBox:~/Desktop/Spring23Assignments/csc415-assignment3-simpleshell-nlrennacker$ make
gcc -c -o Rennacker_Nathan_HW3_main.o Rennacker_Nathan_HW3_main.c -g -I.
gcc -o Rennacker_Nathan_HW3_main Rennacker_Nathan_HW3_main.o -g -I. -l pthread
student@student-VirtualBox:~/Desktop/Spring23Assignments/csc415-assignment3-simpleshell-nlrennacker$
```

## Execution

```
student@student-VirtualBox:~/Desktop/Spring23Assignments/csc415-assignment3-simpleshell-nlrennacker$ make run
./Rennacker_Nathan_HW3_main "Prompt> "
Prompt> ls
commands.txt  README.md                Rennacker_Nathan_HW3_main.c
Makefile      Rennacker_Nathan_HW3_main Rennacker_Nathan_HW3_main.o
Child 5643, exited with 0
Prompt> ps
  PID TTY          TIME CMD
 5631 pts/0    00:00:00 bash
 5640 pts/0    00:00:00 make
 5641 pts/0    00:00:00 sh
 5642 pts/0    00:00:00 Rennacker_Natha
 5644 pts/0    00:00:00 ps
Child 5644, exited with 0
Prompt> ls -a
.  commands.txt  Makefile  Rennacker_Nathan_HW3_main  Rennacker_Nathan_HW3_main.o
.. .git          README.md Rennacker_Nathan_HW3_main.c
Child 5645, exited with 0
Prompt> exit
Exiting... Thank you for using Simple Shell™
student@student-VirtualBox:~/Desktop/Spring23Assignments/csc415-assignment3-simpleshell-nlrennacker$
```

```
student@student-VirtualBox:~/Desktop/Spring23Assignments/csc415-assignment3-simpleshell-nlrennacker$ ls
commands.txt  README.md                Rennacker_Nathan_HW3_main.c
Makefile      Rennacker_Nathan_HW3_main Rennacker_Nathan_HW3_main.o
student@student-VirtualBox:~/Desktop/Spring23Assignments/csc415-assignment3-simpleshell-nlrennacker$ ps
  PID TTY          TIME CMD
 5631 pts/0    00:00:00 bash
 5649 pts/0    00:00:00 ps
student@student-VirtualBox:~/Desktop/Spring23Assignments/csc415-assignment3-simpleshell-nlrennacker$ ls -a
.  commands.txt  Makefile  Rennacker_Nathan_HW3_main  Rennacker_Nathan_HW3_main.o
.. .git          README.md Rennacker_Nathan_HW3_main.c
student@student-VirtualBox:~/Desktop/Spring23Assignments/csc415-assignment3-simpleshell-nlrennacker$
```

## Commands with file

```
student@student-VirtualBox:~/Desktop/Spring23Assignments/csc415-assignment3-simpleshell-nlrennacker$ make run <commands.txt
./Rennacker_Nathan_HW3_main "Prompt> "
Prompt> ls
commands.txt Makefile README.md Rennacker_Nathan_HW3_main Rennacker_Nathan_HW3_main.c Rennacker_Nathan_HW3_main.o
Child 5686, exited with 0
Prompt> echo "Hello World"
"Hello World"
Child 5687, exited with 0
Prompt> ls -l -a
total 64
drwxrwxr-x 3 student student 4096 Mar  2 10:24 .
drwxrwxr-x 5 student student 4096 Feb 27 22:57 ..
-rw-rw-r-- 1 student student  42 Feb 17 03:16 commands.txt
drwxrwxr-x 8 student student 4096 Feb 17 03:16 .git
-rw-rw-r-- 1 student student 1869 Feb 17 03:18 Makefile
-rw-rw-r-- 1 student student 5097 Feb 17 03:16 README.md
-rwxrwxr-x 1 student student 16680 Mar  2 10:24 Rennacker_Nathan_HW3_main
-rw-rw-r-- 1 student student 3955 Mar  2 10:23 Rennacker_Nathan_HW3_main.c
-rw-rw-r-- 1 student student 10336 Mar  2 10:24 Rennacker_Nathan_HW3_main.o
Child 5688, exited with 0
Prompt> ps
  PID TTY          TIME CMD
  5631 pts/0        00:00:00 bash
  5683 pts/0        00:00:00 make
  5684 pts/0        00:00:00 sh
  5685 pts/0        00:00:00 Rennacker_Natha
  5689 pts/0        00:00:00 ps
Child 5689, exited with 0
Prompt> ls foo
ls: cannot access 'foo': No such file or directory
Child 5690, exited with 2
Prompt>
Prompt>
End of File reached... Thank you for using Simple Shell™
student@student-VirtualBox:~/Desktop/Spring23Assignments/csc415-assignment3-simpleshell-nlrennacker$
```