

Assignment 3 - Simple Shell

Description:

For this assignment we implemented our own shell that runs on top of the regular command-line interpreter for Linux. Our shell reads lines of user input, then parses and executes the commands by forking/creating new processes. For each command, our shell calls `fork()` followed by `execvp()`. Following each command, the shell should wait for its child process to complete, and then print the child PID and the return result from the child process.

Approach / What I Did:

Firstly, I read all the steps and instructions carefully to fully understand the assignment. I started the assignment by firstly editing the "Makefile". I added my first name and last name. After that I started working on a program written in C. I started with parsing and making sure that we parse the input using a buffer which should not exceed more than 180 bytes and then separate the input buffer into substrings using `strtok()`. After that I implemented the `fork()` -> `exec()` -> `wait()` process, which took the most time to complete. A `fork()` call is made, and the child process runs an `execvp()` call which overwrites the current process with the new process. Then the parent process issues a `wait()` call, which lets the child run first and checks if the child process died successfully, and then prints the child PID and exit code to the console. Along with that, several error checking was done when an error occurs while reading a line of input, If the shell encounters EOF and If the user entered an empty line.

Issues and Resolutions:

The first problem I had was during the parsing of the input string. I initially couldn't figure out a way to separate the input string into a collection of substrings representing the executable file and any command-line arguments. Then during one of the lectures, the professor told us to look at the ilearn for a hint. And that hint was the thing I needed to get the parsing working. The hint wanted us to use `strtok()`, which took two parameters, The string which is to be split and the character on the basis of which the split will be done.

```
arg[0] = strtok(input, " \t\n");
```

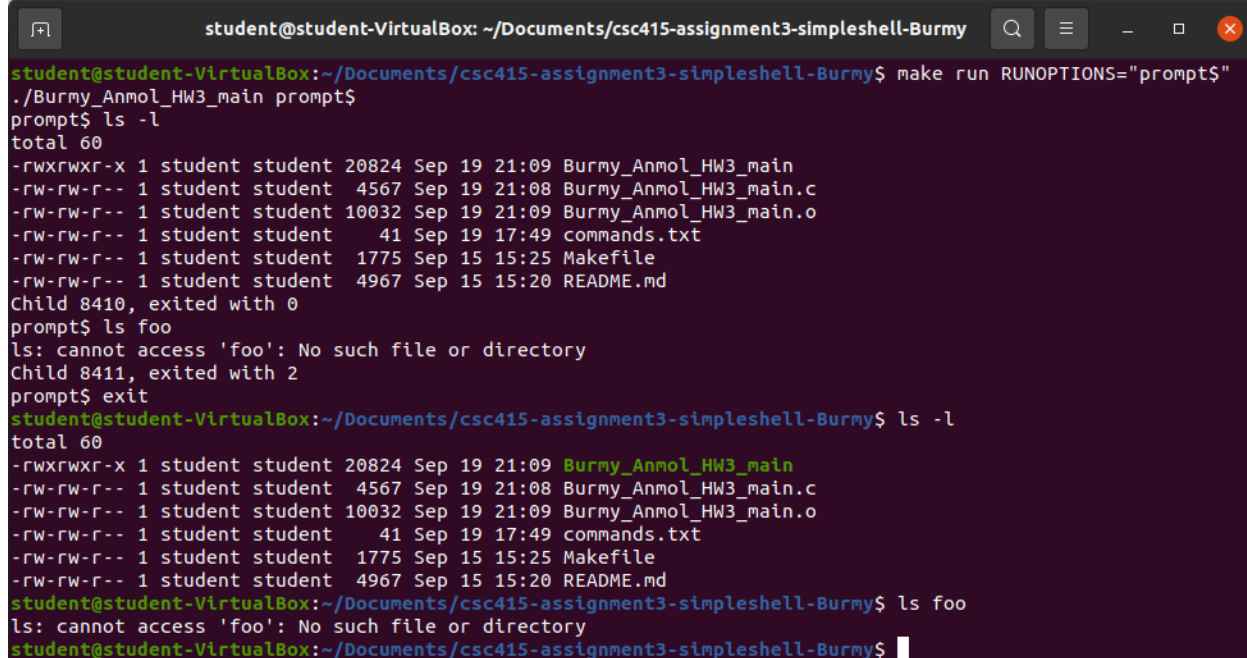
So in our case this will be perfect as the "input" is the string entered by the user which is to be split. And the second parameter are the character on the basis of which the split will be done, which in this case is a space (" "), tab (`\t`) and newline (`\n`).

Additionally, I was also having a lot of difficulty understanding how to implement the `fork()` -> `exec()` -> `wait()` process for this assignment. But after rewatching the lecture recording and reading through the provided slides, I was able to use the provided example code in the slides to get an idea how to use the process. That was honestly my mistake because I didn't really look at the slides when starting the assignment.

Screenshot of compilation:

```
student@student-VirtualBox:~/Documents/csc415-assignment3-simpleshell-Burmy$ make
gcc -c -o Burmy_Anmol_HW3_main.o Burmy_Anmol_HW3_main.c -g -I.
gcc -o Burmy_Anmol_HW3_main Burmy_Anmol_HW3_main.o -g -I. -l pthread
student@student-VirtualBox:~/Documents/csc415-assignment3-simpleshell-Burmy$
```

Screen shot(s) of the execution of the program:



```
student@student-VirtualBox: ~/Documents/csc415-assignment3-simpleshell-Burmy
student@student-VirtualBox:~/Documents/csc415-assignment3-simpleshell-Burmy$ make run RUNOPTIONS="prompt$"
./Burmy_Anmol_HW3_main prompt$
prompt$ ls -l
total 60
-rwxrwxr-x 1 student student 20824 Sep 19 21:09 Burmy_Anmol_HW3_main
-rw-rw-r-- 1 student student 4567 Sep 19 21:08 Burmy_Anmol_HW3_main.c
-rw-rw-r-- 1 student student 10032 Sep 19 21:09 Burmy_Anmol_HW3_main.o
-rw-rw-r-- 1 student student 41 Sep 19 17:49 commands.txt
-rw-rw-r-- 1 student student 1775 Sep 15 15:25 Makefile
-rw-rw-r-- 1 student student 4967 Sep 15 15:20 README.md
Child 8410, exited with 0
prompt$ ls foo
ls: cannot access 'foo': No such file or directory
Child 8411, exited with 2
prompt$ exit
student@student-VirtualBox:~/Documents/csc415-assignment3-simpleshell-Burmy$ ls -l
total 60
-rwxrwxr-x 1 student student 20824 Sep 19 21:09 Burmy_Anmol_HW3_main
-rw-rw-r-- 1 student student 4567 Sep 19 21:08 Burmy_Anmol_HW3_main.c
-rw-rw-r-- 1 student student 10032 Sep 19 21:09 Burmy_Anmol_HW3_main.o
-rw-rw-r-- 1 student student 41 Sep 19 17:49 commands.txt
-rw-rw-r-- 1 student student 1775 Sep 15 15:25 Makefile
-rw-rw-r-- 1 student student 4967 Sep 15 15:20 README.md
student@student-VirtualBox:~/Documents/csc415-assignment3-simpleshell-Burmy$ ls foo
ls: cannot access 'foo': No such file or directory
student@student-VirtualBox:~/Documents/csc415-assignment3-simpleshell-Burmy$
```