

Assignment 1 Report CSCI 3310

I started by counting the number of commands in the pipeline. To execute the pipeline of commands I created and initialized $n-1$ pipes. If there was only one command to execute I simply forked a child process and executed it with the appropriate arguments. To execute the command with `execvp` you need the arguments in array format. So I constructed an array of arguments with a while loop. Handling the input/output redirection was done by getting the return value (file descriptor) when opening the file and using `dup2` to assign the current process's standard input/output to the correct file descriptor. If there was a pipeline to execute, I looped over each command forking a new child process for each and routing the pipes to the correct locations. I used `dup2` with two if statements, if the current command is not the first command, set the standard input to $(\text{counter}-1)*2$ location in array of file descriptors for the pipes. If the current command is not the last command set the standard output to $\text{counter}*2+1$ in the array of fds. Once those are set close all pipes and execute command. Increment the current command and continue until reaching a NULL in the list of commands. Once the while loop has terminated the parent closes all pipes and waits for remaining children. There are also two if statements for handling the "exit" and "prompt" command.

Challenges I encountered during the assignment were very difficult since debugging was very unforgiving. Remembering how to loop over a linked list was my first issue. I had problems using the fork correctly in a while loop because it would create infinite processes. Understanding how and when to use pipes was difficult because there was no easy way to debug why my program was not working, same issue with fork. The hardest part about implementing correct piping was figuring out an algorithm for constructing complex piping systems. I also had issues with waiting for processes to end at the wrong times and closing pipes at the wrong times.