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Assignment 3 - Simple Shell with Pipes

Description:

The main goal of this assignment was to develop a simple C shell that allows users to execute commands and supports pipes.

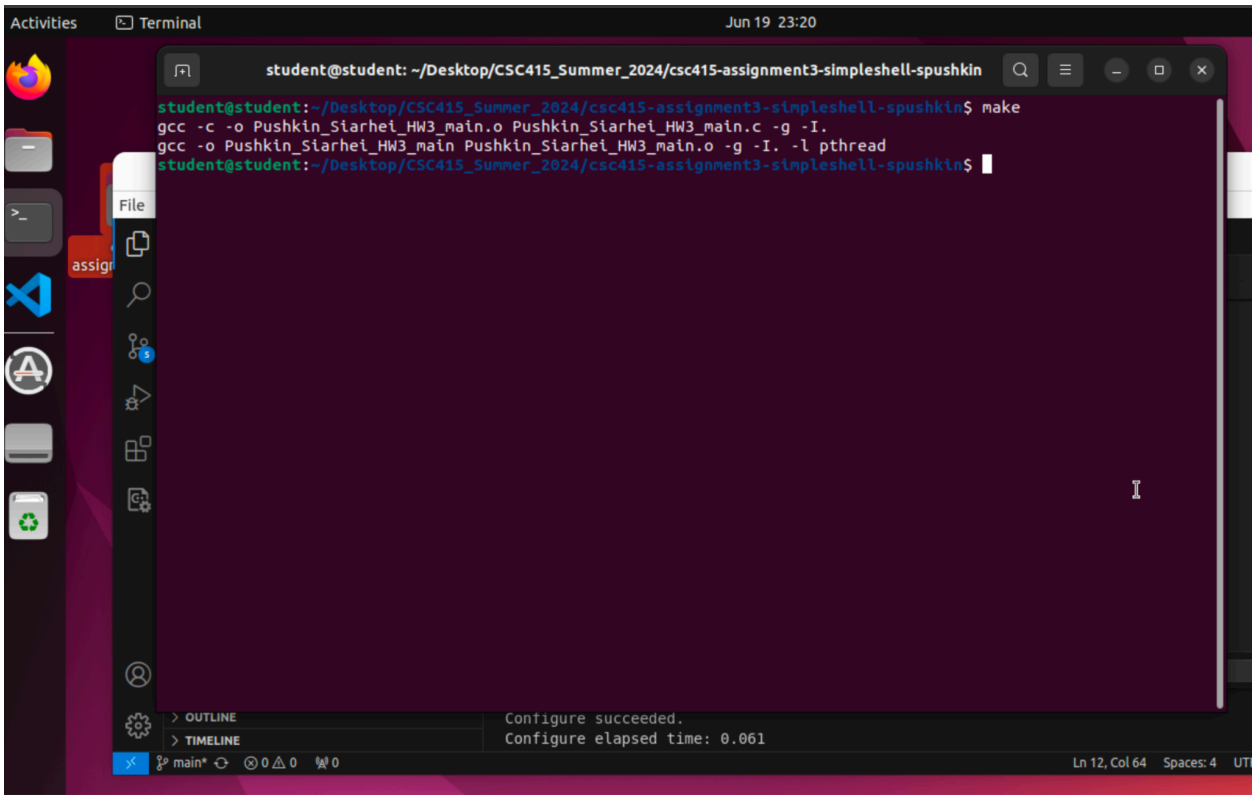
Approach:

In this assignment, I started by understanding the requirements: handling user input, creating processes, executing commands, and managing pipes. First, I built a bare shell to read and execute single commands, ensuring a solid foundation. Then, I added argument handling, including support for quoted inputs, to handle more complex commands. After that, I implemented pipe functionality so commands could pass data between each other. I focused on proper resource management, especially file descriptors, to avoid problems. The general logic involved breaking down input into commands, setting up necessary resources like pipes, and ensuring commands were executed in sequence with proper redirection of inputs and outputs. Debug statements helped me trace the execution flow and identify issues quickly. This step-by-step approach allowed me to work on this assignment efficiently, but I still encountered many problems and bugs.

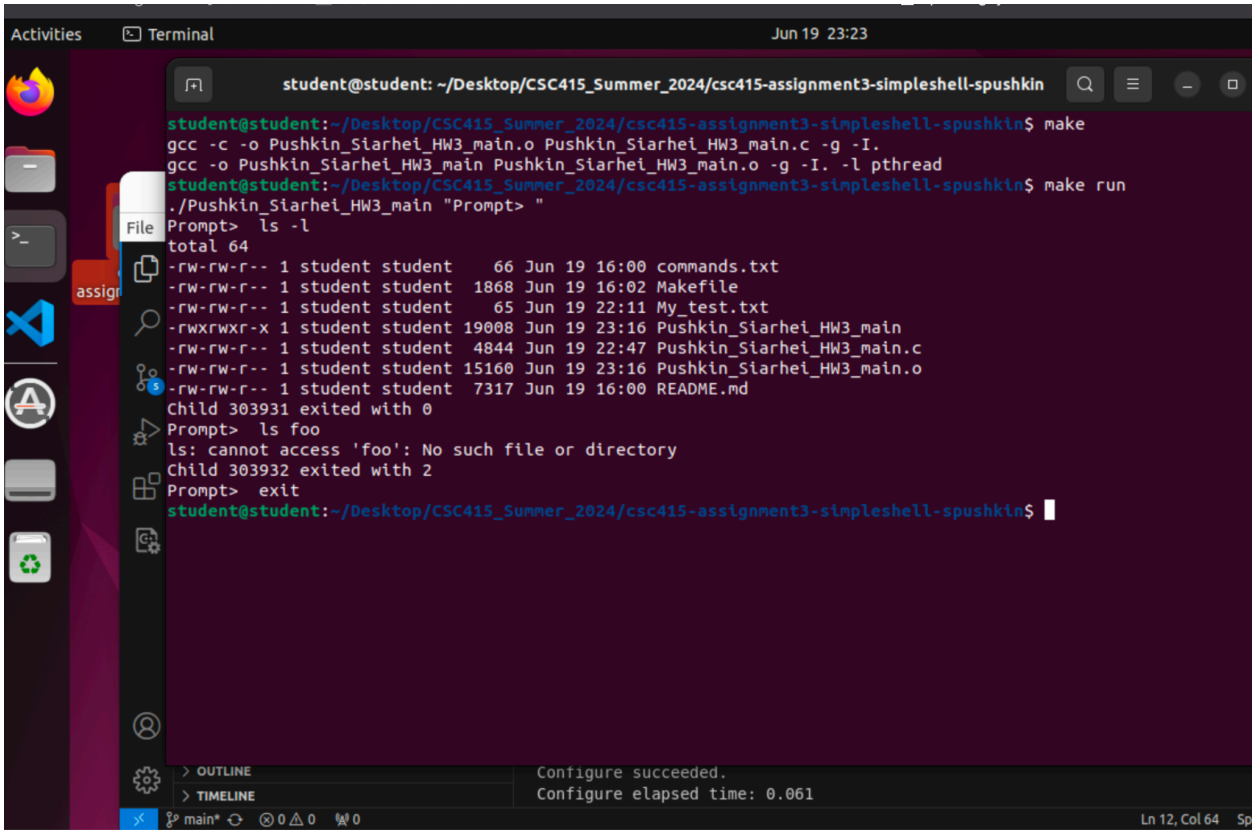
Issues and Resolutions:

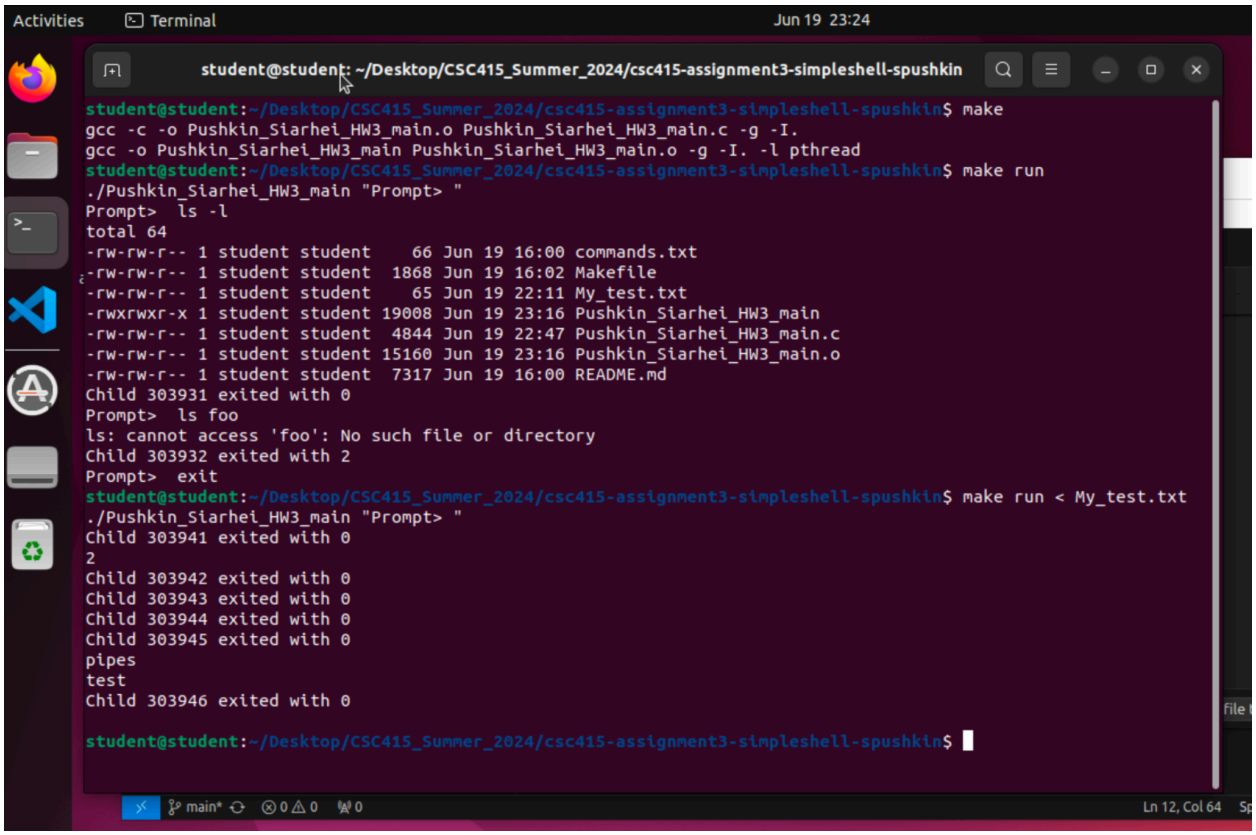
Throughout the assignment, I encountered several issues and bugs. One major problem was managing file descriptors correctly, which caused conflicts and incorrect data flow between commands. I resolved this by ensuring proper duplication and closure of file descriptors using dup2 and careful management of pipes. Another problem was handling quoted inputs correctly, which I fixed by modifying the input parsing logic to account for quotes. Debug statements were crucial in tracing these problems and identifying where the logic failed. Unfortunately, I also faced a persistent segmentation fault when reading input from a file, which I resolved by ensuring that all pointers and buffers were correctly allocated and managed. Eventually, I enhanced the shell's reliability and functionality by thoroughly addressing each issue and conducting constant testing.

Screen shot of compilation:



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




Activities
Terminal
Jun 19 23:24
student@student: ~/Desktop/CSC415_Summer_2024/csc415-assignment3-simpleshell-spushkin
student@student:~/Desktop/CSC415_Summer_2024/csc415-assignment3-simpleshell-spushkin$ make
gcc -c -o Pushkin_Siarhei_HW3_main.o Pushkin_Siarhei_HW3_main.c -g -I.
gcc -o Pushkin_Siarhei_HW3_main Pushkin_Siarhei_HW3_main.o -g -I. -l pthread
student@student:~/Desktop/CSC415_Summer_2024/csc415-assignment3-simpleshell-spushkin$ make run
./Pushkin_Siarhei_HW3_main "Prompt> "
Prompt> ls -l
total 64
-rw-rw-r-- 1 student student 66 Jun 19 16:00 commands.txt
-rw-rw-r-- 1 student student 1868 Jun 19 16:02 Makefile
-rw-rw-r-- 1 student student 65 Jun 19 22:11 My_test.txt
-rwxrwxr-x 1 student student 19008 Jun 19 23:16 Pushkin_Siarhei_HW3_main
-rw-rw-r-- 1 student student 4844 Jun 19 22:47 Pushkin_Siarhei_HW3_main.c
-rw-rw-r-- 1 student student 15160 Jun 19 23:16 Pushkin_Siarhei_HW3_main.o
-rw-rw-r-- 1 student student 7317 Jun 19 16:00 README.md
Child 303931 exited with 0
Prompt> ls foo
ls: cannot access 'foo': No such file or directory
Child 303932 exited with 2
Prompt> exit
student@student:~/Desktop/CSC415_Summer_2024/csc415-assignment3-simpleshell-spushkin$ make run < My_test.txt
./Pushkin_Siarhei_HW3_main "Prompt> "
Child 303941 exited with 0
2
Child 303942 exited with 0
Child 303943 exited with 0
Child 303944 exited with 0
Child 303945 exited with 0
pipes
test
Child 303946 exited with 0
student@student:~/Desktop/CSC415_Summer_2024/csc415-assignment3-simpleshell-spushkin$
main*
Ln 12, Col 64