

Assignment 3 – Simple Shell

Description:

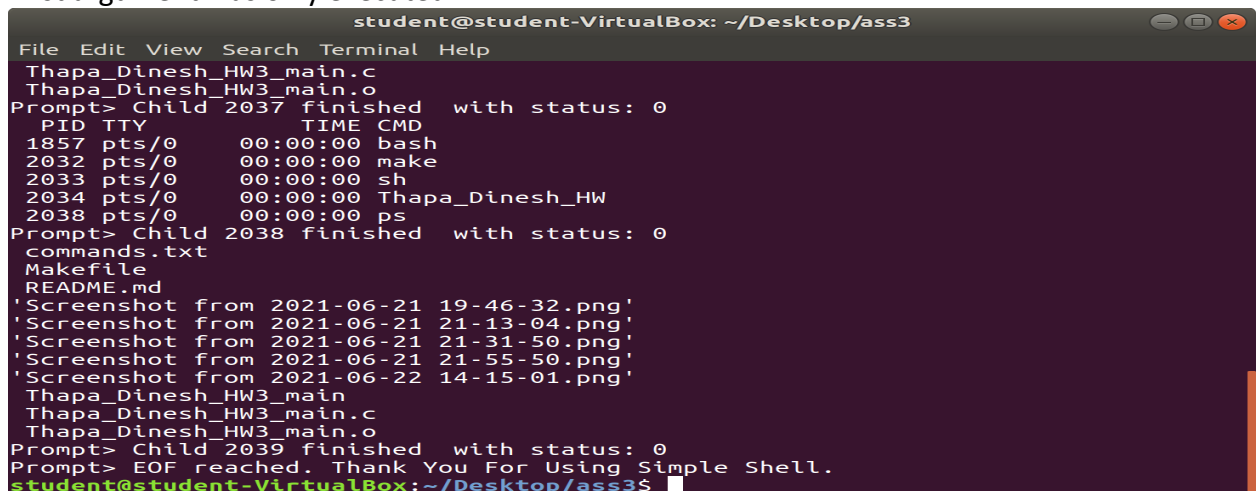
This assignment is to write a simple own shell program using fork and execvp which can interact with operating system just like a regular terminal that runs on top of the regular command-line interpreter for Linux.

Approach / What I Did:

For this assignment, I allocate 512 bytes buffer which are fetched with the command line inputs. And token needed to be half the size of buffer as discussed in lecture, after the space it could hold only half the size of buffer. These inputs should be broken down into tokens and store in the buffer array. I used fgets function which will read the input from the command line and strtok is used to break them into tokens, good thing about strtok is that it will add null terminator at end of strings which is very useful later in my code. Once tokens are filled, we call fork() function which will create a new child process. Then all we need to do is handle the process appropriately. Fork() returns integer for the success and fail processes which I used to check for errors and if it's successful, execvp function is used by child process to overwrite the current process with the new process. If execvp is successful, we can't return to predecessor process so, if there's error print message will be called and don't really need to check with anything else. Then parent wait for child process to terminate, and its normal termination is checked by WIFEXITED. Then, final step is to free the buffer, or deallocating memory allocated by malloc.

Issues and Resolutions:

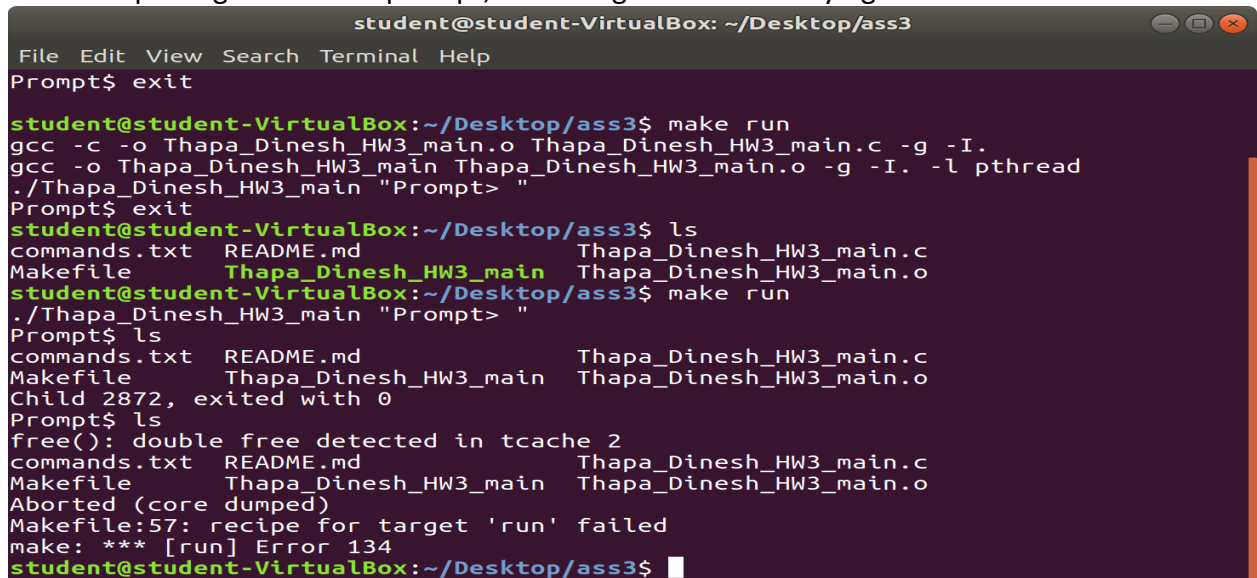
- a. First argument was only executed.



```
student@student-VirtualBox: ~/Desktop/ass3
File Edit View Search Terminal Help
Thapa_Dinesh_HW3_main.c
Thapa_Dinesh_HW3_main.o
Prompt> Child 2037 finished with status: 0
PID TTY TIME CMD
1857 pts/0 00:00:00 bash
2032 pts/0 00:00:00 make
2033 pts/0 00:00:00 sh
2034 pts/0 00:00:00 Thapa_Dinesh_HW
2038 pts/0 00:00:00 ps
Prompt> Child 2038 finished with status: 0
commands.txt
Makefile
README.md
'Screenshot from 2021-06-21 19-46-32.png'
'Screenshot from 2021-06-21 21-13-04.png'
'Screenshot from 2021-06-21 21-31-50.png'
'Screenshot from 2021-06-21 21-55-50.png'
'Screenshot from 2021-06-22 14-15-01.png'
Thapa_Dinesh_HW3_main
Thapa_Dinesh_HW3_main.c
Thapa_Dinesh_HW3_main.o
Prompt> Child 2039 finished with status: 0
Prompt> EOF reached. Thank You For Using Simple Shell.
student@student-VirtualBox:~/Desktop/ass3$
```

Resolution: It was a minor error in parameter for strtok for same line input. After referring to man page and reading the whole thing, once initialization is done, strtok needs to read from NULL instead of buffer.

- b. If same input is given in next prompt, it would give me error saying buffer is freed.

A screenshot of a terminal window titled 'student@student-VirtualBox: ~/Desktop/ass3'. The terminal shows the following commands and output:

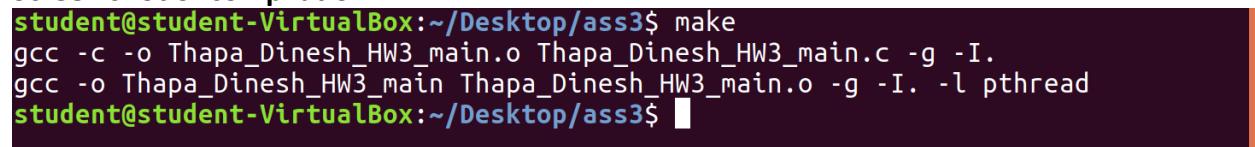
```
student@student-VirtualBox: ~/Desktop/ass3$ make run
gcc -c -o Thapa_Dinesh_HW3_main.o Thapa_Dinesh_HW3_main.c -g -I.
gcc -o Thapa_Dinesh_HW3_main Thapa_Dinesh_HW3_main.o -g -I. -l pthread
./Thapa_Dinesh_HW3_main "Prompt> "
Prompt$ exit
student@student-VirtualBox:~/Desktop/ass3$ ls
commands.txt  README.md          Thapa_Dinesh_HW3_main.c
Makefile      Thapa_Dinesh_HW3_main  Thapa_Dinesh_HW3_main.o
student@student-VirtualBox:~/Desktop/ass3$ make run
./Thapa_Dinesh_HW3_main "Prompt> "
Prompt$ ls
commands.txt  README.md          Thapa_Dinesh_HW3_main.c
Makefile      Thapa_Dinesh_HW3_main  Thapa_Dinesh_HW3_main.o
Child 2872, exited with 0
Prompt$ ls
free(): double free detected in tcache 2
commands.txt  README.md          Thapa_Dinesh_HW3_main.c
Makefile      Thapa_Dinesh_HW3_main  Thapa_Dinesh_HW3_main.o
Aborted (core dumped)
Makefile:57: recipe for target 'run' failed
make: *** [run] Error 134
student@student-VirtualBox:~/Desktop/ass3$
```

Resolution: Free buffer was inside while loop. Took it outside the while loop which will after execution of processes are finished.

- c. **Issue:** Thought EOF was a thing to handle ctrl+d key, after watching lecture video realized the it was end of file or no more lines to read.

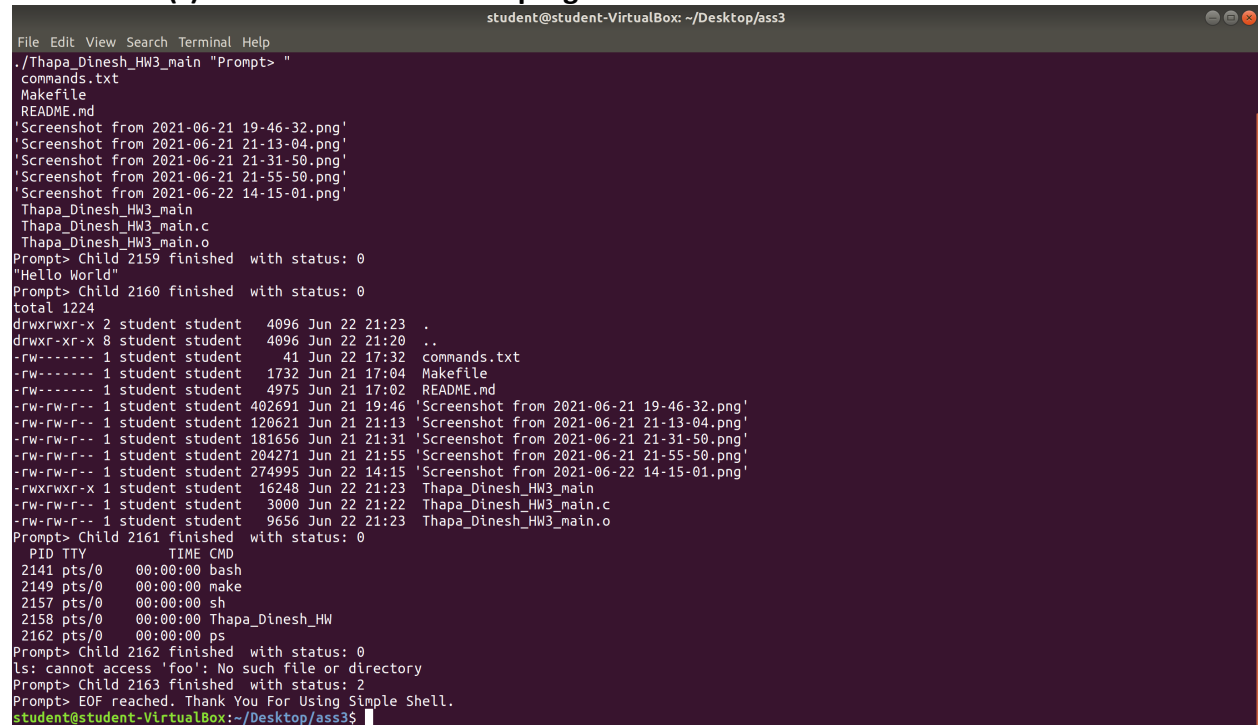
Resolution: Checked the fgets itself to find EOF.

Screen shot of compilation:

A screenshot of a terminal window showing the compilation of a program. The commands and output are:

```
student@student-VirtualBox:~/Desktop/ass3$ make
gcc -c -o Thapa_Dinesh_HW3_main.o Thapa_Dinesh_HW3_main.c -g -I.
gcc -o Thapa_Dinesh_HW3_main Thapa_Dinesh_HW3_main.o -g -I. -l pthread
student@student-VirtualBox:~/Desktop/ass3$
```

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



```
student@student-VirtualBox: ~/Desktop/ass3
File Edit View Search Terminal Help
./Thapa_Dinesh_HW3_main "Prompt> "
commands.txt
Makefile
README.md
'Screenshot from 2021-06-21 19-46-32.png'
'Screenshot from 2021-06-21 21-13-04.png'
'Screenshot from 2021-06-21 21-31-50.png'
'Screenshot from 2021-06-21 21-55-50.png'
'Screenshot from 2021-06-22 14-15-01.png'
Thapa_Dinesh_HW3_main
Thapa_Dinesh_HW3_main.c
Thapa_Dinesh_HW3_main.o
Prompt> Child 2159 finished with status: 0
"Hello World"
Prompt> Child 2160 finished with status: 0
total 1224
drwxrwxr-x 2 student student 4096 Jun 22 21:23 .
drwxr-xr-x 8 student student 4096 Jun 22 21:20 ..
-rw-r--r-- 1 student student 41 Jun 22 17:32 commands.txt
-rw-r--r-- 1 student student 1732 Jun 21 17:04 Makefile
-rw-r--r-- 1 student student 4975 Jun 21 17:02 README.md
-rw-rw-r-- 1 student student 402691 Jun 21 19:46 'Screenshot from 2021-06-21 19-46-32.png'
-rw-rw-r-- 1 student student 120621 Jun 21 21:13 'Screenshot from 2021-06-21 21-13-04.png'
-rw-rw-r-- 1 student student 181656 Jun 21 21:31 'Screenshot from 2021-06-21 21-31-50.png'
-rw-rw-r-- 1 student student 204271 Jun 21 21:55 'Screenshot from 2021-06-21 21-55-50.png'
-rw-rw-r-- 1 student student 274995 Jun 22 14:15 'Screenshot from 2021-06-22 14-15-01.png'
-rwxrwxr-x 1 student student 16248 Jun 22 21:23 Thapa_Dinesh_HW3_main
-rw-rw-r-- 1 student student 3000 Jun 22 21:22 Thapa_Dinesh_HW3_main.c
-rw-rw-r-- 1 student student 9656 Jun 22 21:23 Thapa_Dinesh_HW3_main.o
Prompt> Child 2161 finished with status: 0
PID TTY TIME CMD
2141 pts/0 00:00:00 bash
2149 pts/0 00:00:00 make
2157 pts/0 00:00:00 sh
2158 pts/0 00:00:00 Thapa_Dinesh_HW
2162 pts/0 00:00:00 ps
Prompt> Child 2162 finished with status: 0
ls: cannot access 'foo': No such file or directory
Prompt> Child 2163 finished with status: 2
Prompt> EOF reached. Thank You For Using Simple Shell.
student@student-VirtualBox:~/Desktop/ass3$
```