

Lab 1

Operating Systems

Name: البكري محمد السيد البكري

ID: 20010329

- **Description:**

This Code is an implementation of a Unix shell program, that allows you to run other programs.

The code is composed of 7 functions including the main function:

1. void setup_enviroment().
2. void parse_input().
3. execute_shell_bultin().
4. void execute_command()
5. void on_child_exit()
6. void shell()
7. int main().

- **Major functions:**

1. void setup_enviroment() :

It is used to prepare the shell at first start, by setting the working directory to the default one which is the Desktop.

2. void parse_input():

its used to prepare the input to be ready to be entered to `execvp()` function, by splitting the input string into multiple strings separated by “ “ where always `args[0]` contains the command the rest contains the options of the command, in this function we detect if there is ‘&’ which means that there will be a program which will

run on the background, this function also handle the situation of using '\$' to call a variable from the environment.

3. execute_shell_bultin():

In this function we execute commands which are shell built-in commands as "cd", "echo", "export", this function handles these commands in C functions.

4. void execute_command():

In this function we execute the Unix commands as "ls", "touch", "mkdir"etc, this function depends mainly on the use of fork(), to have parent and child processes, and use of execvp() for Unix commands, and the waitpid() to choose to wait for the child process or no depending if the process is in the background or not.

5. void on_child_exit():

This function is used to wait for child processes to exit and reap their resources , especially the processes that run on background, and log the termination to a log file, and its called by signal SIGCHILD.

6. void shell():

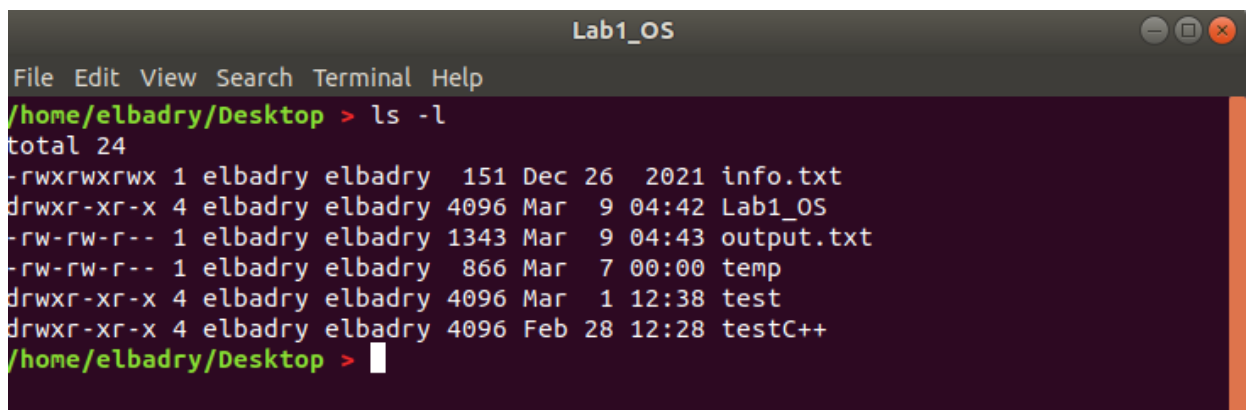
It contains most of the previous functions, to run the shell, it contains a do while loop which is stopped only by exit command, in this loop it checks whether the command is built-in or Unix command to execute the proper function.

7.int main():

The signal SIGCHLD is registered in it, also it uses the setup_enviroment() to prepare the shell, then it executes the shell itself.

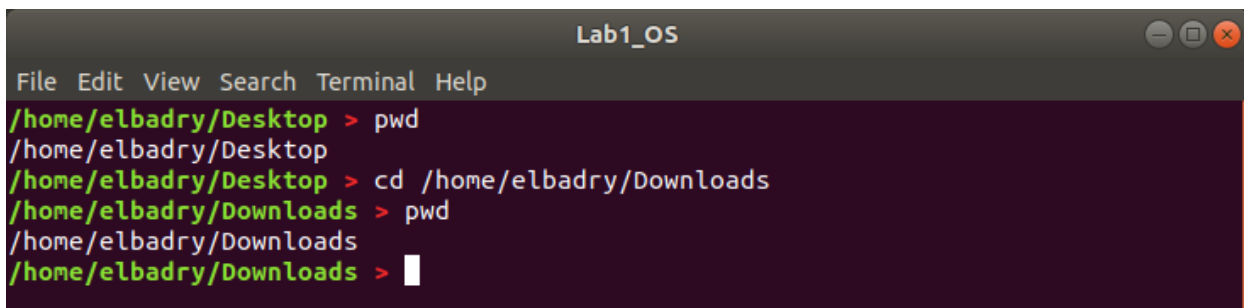
• Sample runs:

1.



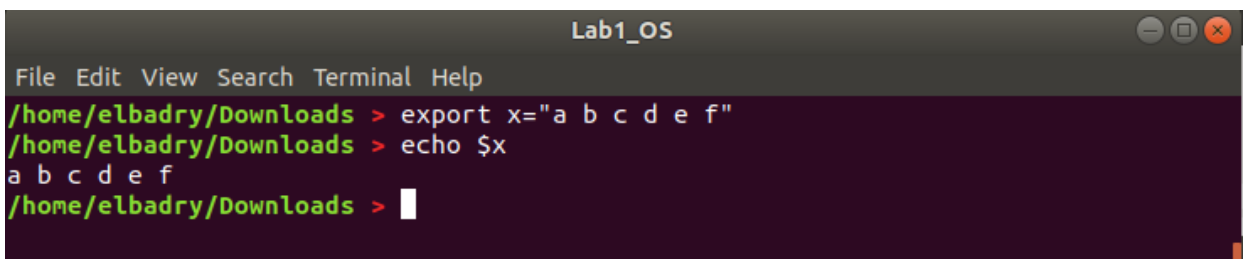
```
Lab1_OS
File Edit View Search Terminal Help
/home/elbadry/Desktop > ls -l
total 24
-rwxrwxrwx 1 elbadry elbadry 151 Dec 26 2021 info.txt
drwxr-xr-x 4 elbadry elbadry 4096 Mar 9 04:42 Lab1_OS
-rw-rw-r-- 1 elbadry elbadry 1343 Mar 9 04:43 output.txt
-rw-rw-r-- 1 elbadry elbadry 866 Mar 7 00:00 temp
drwxr-xr-x 4 elbadry elbadry 4096 Mar 1 12:38 test
drwxr-xr-x 4 elbadry elbadry 4096 Feb 28 12:28 testC++
/home/elbadry/Desktop > 
```

2.



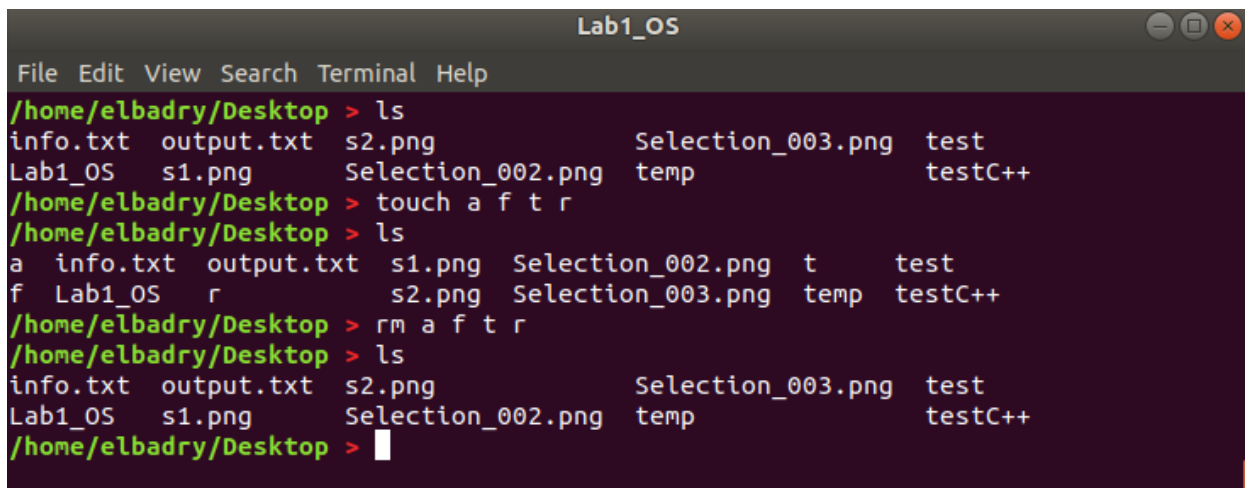
```
Lab1_OS
File Edit View Search Terminal Help
/home/elbadry/Desktop > pwd
/home/elbadry/Desktop
/home/elbadry/Desktop > cd /home/elbadry/Downloads
/home/elbadry/Downloads > pwd
/home/elbadry/Downloads
/home/elbadry/Downloads > 
```

3.



```
Lab1_OS
File Edit View Search Terminal Help
/home/elbadry/Downloads > export x="a b c d e f"
/home/elbadry/Downloads > echo $x
a b c d e f
/home/elbadry/Downloads > 
```

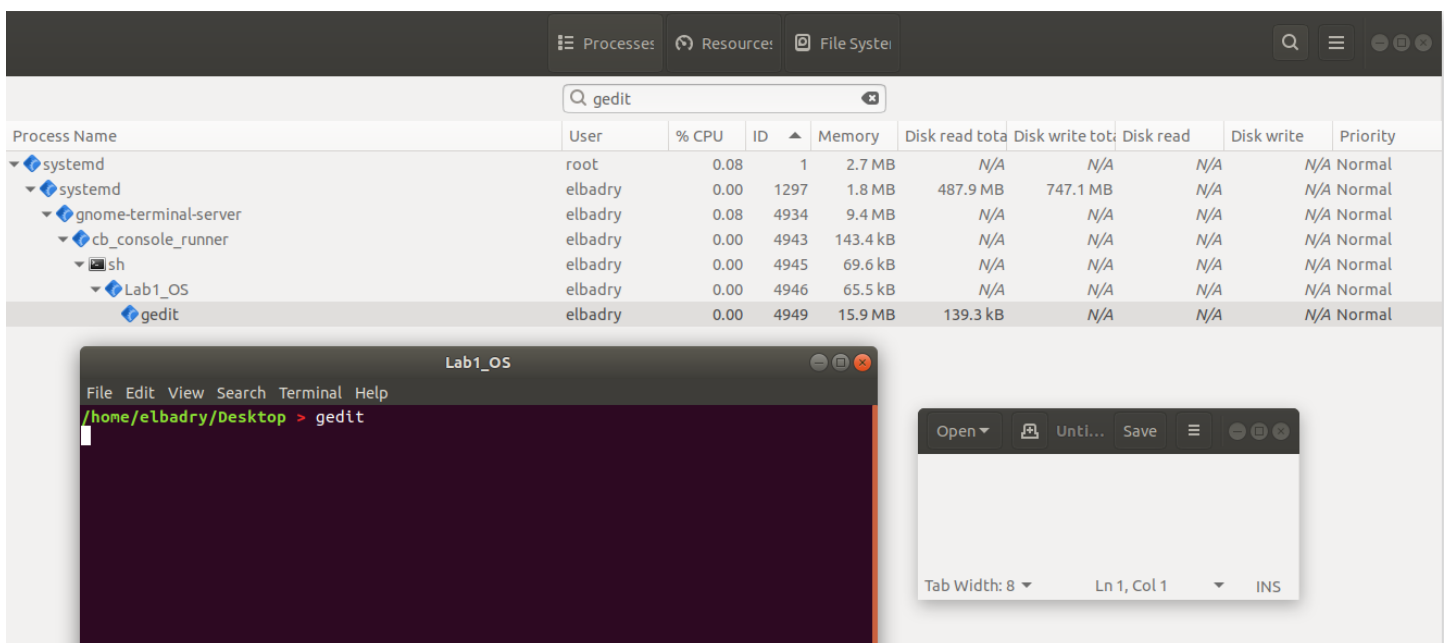
4.



```
Lab1_OS
File Edit View Search Terminal Help
/home/elbadry/Desktop > ls
info.txt  output.txt  s2.png      Selection_003.png  test
Lab1_OS   s1.png      Selection_002.png  temp               testC++
/home/elbadry/Desktop > touch a f t r
/home/elbadry/Desktop > ls
a info.txt  output.txt  s1.png  Selection_002.png  t      test
f Lab1_OS   r          s2.png  Selection_003.png  temp   testC++
/home/elbadry/Desktop > rm a f t r
/home/elbadry/Desktop > ls
info.txt  output.txt  s2.png      Selection_003.png  test
Lab1_OS   s1.png      Selection_002.png  temp               testC++
/home/elbadry/Desktop > 
```

- Screenshots for process hierarchy:

1.



The screenshot shows the GNOME System Monitor window with the 'Processes' tab selected. It displays a hierarchy of processes starting from 'systemd' down to 'gedit'. Below the process list, there is a terminal window titled 'Lab1_OS' and a 'gedit' window.

Process Name	User	% CPU	ID	Memory	Disk read tota	Disk write tota	Disk read	Disk write	Priority
systemd	root	0.08	1	2.7 MB	N/A	N/A	N/A	N/A	Normal
systemd	elbadry	0.00	1297	1.8 MB	487.9 MB	747.1 MB	N/A	N/A	Normal
gnome-terminal-server	elbadry	0.08	4934	9.4 MB	N/A	N/A	N/A	N/A	Normal
cb_console_runner	elbadry	0.00	4943	143.4 kB	N/A	N/A	N/A	N/A	Normal
sh	elbadry	0.00	4945	69.6 kB	N/A	N/A	N/A	N/A	Normal
Lab1_OS	elbadry	0.00	4946	65.5 kB	N/A	N/A	N/A	N/A	Normal
gedit	elbadry	0.00	4949	15.9 MB	139.3 kB	N/A	N/A	N/A	Normal

2.

Q gedit

Process Name	User	% CPU	ID	Memory	Disk read tota	Disk write tota	Disk read	Disk write	Priority
systemd	root	0.08	1	2.7 MB	N/A	N/A	N/A	N/A	Normal
systemd	elbadry	0.00	1297	1.8 MB	487.9 MB	747.1 MB	N/A	N/A	Normal
gnome-terminal-server	elbadry	0.00	4934	9.4 MB	N/A	N/A	N/A	N/A	Normal
cb_console_runner	elbadry	0.00	4943	143.4 kB	N/A	N/A	N/A	N/A	Normal
sh	elbadry	0.00	4945	69.6 kB	N/A	N/A	N/A	N/A	Normal
Lab1_OS	elbadry	0.00	4946	65.5 kB	139.3 kB	36.9 kB	N/A	N/A	Normal
gedit	elbadry	0.04	6265	15.8 MB	N/A	N/A	N/A	N/A	Normal

Lab1_OS

File Edit View Search Terminal Help

/home/elbadry/Desktop > gedit &

/home/elbadry/Desktop >

Open Unti... Save

Tab Width: 8 Ln 1, Col 1 INS