

LAB 1

(Multiprocessing: Simple Shell)

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Structure & Flow of Program

when the program is run,

- the program starts loading the environment variables that might be used
- the program then set up environment and change directory into the home directory
- it then executes one of the major functions that is ***shell()***

inside ***shell()*** function: there is a loop that continues till the user enters ***exit*** , inside the loop

- the user input is got and parsed to be classified
- then according to this classification, it will return a number determining if the process is built in or executed somewhere in the PATH

the main functions implementing these functionalities are :

- ***cd(path)*** : it uses ***chdir(path)*** to get to the desired path and update the current working directory
- ***echo()*** : that prints out a variable either it is environment variable or user-defined one
- ***export()*** : it stores a variable whose value might be string, numeric, or even in terms in other variable's value

executable commands have also their own classifier to classify them into some functions that are:

- ***lsNoArgument()***
- ***lsWithArgument()***
- ***copyOrMove()***
- ***removeF()***
- ***mkdir()***
- ***open()***

In all the above method, the parent process of each has to wait(it is blocked) till termination of the job to continue its job. This is except in case of ***open()*** as in case of background processes, the shell will not be blocked

Pseudo Codes for some major functions

cd(secondPartOfCommand)

```
if( secondPartOfCommand == "..") chdir(..)
else if( secondPartOfCommand == "/" or "~")
    chdir(Home Directory)
else if( secondPartOfCommand begins with "/")
    chdir(secondPartOfCommand)
else if (secondPartOfCommand begins with $)
    remove $ and chdir to secondPartOfCommand value
else chdir (secondPartOfCommand)
```

export(secondPartOfCommand)

```
if(secondPartOfCommand starts with ")
    make sure it ends with "
    get what is written in quotes ////it will not mapped
else
    search for the value in RHS, if you find it assign it to
    the variable
```

- else assign the RHS as it is to the variables
- search in env. variables or userDefined ones
- if the variable name is found
 - update the variable's value
 - else store a new variable with new value

echo(secondPartOfCommand)

- print secondPartOfCommand unless it begins with '\$',
hence , we got that it is a variable and we print its value

any non-built-in-command function

- split secondPartOfCommand
- fork

in child :

- pass tokens to ***execvp()*** and it will do all the required

in parent :

- wait till child process exits except in case of
background processes, where the parent has to
continue regardless the child status

Assumptions

- . no mathematical operations
- . we can not append or concatenate a sign to a variable, but you can depend on its value and do many things
- . inside "" of export, no variables are mapped

Sample Runs

1) ls-with-Arguments command

```
$ ls -l
total 122272
drwxrwxr-x 2 louay louay 4096 Mar 23 10:54 '&'
drwxrwxr-x 3 louay louay 4096 Mar 18 18:57 CLionProjects
-rw-rw-r-- 1 louay louay 141 Mar 18 15:13 cv_debug.log
drwxr-xr-x 2 louay louay 4096 Mar 11 06:28 Desktop
drwxr-xr-x 2 louay louay 4096 Mar 11 06:28 Documents
drwxr-xr-x 2 louay louay 4096 Mar 18 15:06 Downloads
-rw-rw-r-- 1 louay louay 15617 Mar 23 23:39 'Lab10S report.odt'
-rwxrwxrwx 1 louay louay 55297 Sep 17 2019 l.jpg
drwxr-xr-x 2 louay louay 4096 Mar 11 06:28 Music
drwxr-xr-x 2 louay louay 4096 Mar 11 06:28 Pictures
drwxr-xr-x 2 louay louay 4096 Mar 11 06:28 Public
drwx----- 3 louay louay 4096 Mar 11 07:34 snap
-rw-rw-r-- 1 louay louay 68143908 Mar 20 2020 teams_1.3.00.5153_amd64.deb
drwxr-xr-x 2 louay louay 4096 Mar 11 06:28 Templates
drwxrwxr-x 4 louay louay 4096 Mar 23 14:37 testShell
-rw-rw-r-- 1 louay louay 15460 Mar 23 21:32 'Untitled 1.odt'
drwxr-xr-x 2 louay louay 4096 Mar 11 06:28 Videos
-rw-rw-r-- 1 louay louay 56914528 Feb 28 11:32 zoom_amd64.deb
Task Completed Successfully
Current Directory : /home/louay
$
```

2) cd and ls-No-Argument commands

```
Current Directory : /home/louay
$ cd testShell
Current Directory : /home/louay/testShell
$ ls
logsFile.txt  lol  test
Task Completed Successfully
Current Directory : /home/louay/testShell
$
```

3) echo, export, mkdir

```
$ ls
logsFile.txt  lol  test
Task Completed Successfully
Current Directory : /home/louay/testShell
$ export x="new Test Directory"
Current Directory : /home/louay/testShell
$ echo "$x"
new Test Directory
Current Directory : /home/louay/testShell
$ mkdir $x
Task Completed Successfully
Current Directory : /home/louay/testShell
$ ls
logsFile.txt  lol  'new Test Directory'  test
Task Completed Successfully
Current Directory : /home/louay/testShell
$ |
```

4) mv , cp , rm

```
|/home/lovay/CLionProjects/Lab10S/cmake-build-debug/Lab10S
Current Directory : /home/lovay
$ ls
'&'      'Lab10S report.odt'  teams_1.3.00.5153_amd64.deb
CLionProjects  l.jpg              Templates
cv_debug.log   Music              testShell
Desktop        Pictures           'Untitled 1.odt'
Documents      Public             Videos
Downloads      snap              zoom_amd64.deb
Task Completed Successfully
Current Directory : /home/lovay
$ export x="l.jpg"
Current Directory : /home/lovay
$ echo "$x"
l.jpg
Current Directory : /home/lovay
$ mv $x Lovay.jpg
Reaped process 12449----0
$Task Completed Successfully
```

```
|/home/lovay/CLionProjects/Lab10S/cmake-build-debug/Lab10S
Current Directory : /home/lovay
$ ls
'&'      'Lab10S report.odt'  teams_1.3.00.5153_amd64.deb
CLionProjects  l.jpg              Templates
cv_debug.log   Music              testShell
Desktop        Pictures           'Untitled 1.odt'
Documents      Public             Videos
Downloads      snap              zoom_amd64.deb
Task Completed Successfully
Current Directory : /home/lovay
$ export x="l.jpg"
Current Directory : /home/lovay
$ echo "$x"
l.jpg
Current Directory : /home/lovay
$ mv $x Lovay.jpg
Reaped process 12449----0
$Task Completed Successfully
```

```

Current Directory : /home/lovay
$ ls
'&'      'Lab10S report.odt'      Templates
CLionProjects  Louay.jpg      testShell
cv_debug.log   Music          'Untitled 1.odt'
Desktop        Pictures       Videos
dist           Public         zoom_amd64.deb
Documents      snap
Downloads      teams_1.3.00.5153_amd64.deb
Task Completed Successfully
Current Directory : /home/lovay
$ cp Louay.jpg testShell/Louay.jpg
Task Completed Successfully
Current Directory : /home/lovay
$ cd testShell
Current Directory : /home/lovay/testShell
$ ls
logsFile.txt  lol  louay.jpg  'new Test Directory'  test
Task Completed Successfully

```

```

$ ls
logsFile.txt  lol  louay.jpg  'new Test Directory'  test
Task Completed Successfully
Current Directory : /home/lovay/testShell
$ rm louay.jpg
Task Completed Successfully
Current Directory : /home/lovay/testShell
$ ls
logsFile.txt  lol  'new Test Directory'  test
Task Completed Successfully
Current Directory : /home/lovay/testShell
$ |

```


5) background and foreground processes

```
/home/lovey/CLionProjects/Lab10
Current Directory : /home/lovey
$ firefox &
Current Directory : /home/lovey
$ |
```

```
Program Not Found !! or invalid command !!. No such file
$$Reaped process 13050----0
$Current Directory : /home/lovey
$ firefox
ATTENTION: default value of option mesa_glthread overridden
```

Processes Resources File Systems									
Process Name	User	% CPU	ID	Memory	Disk read tot	Disk write tot	Disk read	Disk write	Priority
evolution-addressboo	louay	0	1619	380.0 KiB	3.3 MiB	36.0 KiB	N/A	N/A	Normal
tracker-miner-fs	louay	0	1310	2.0 MiB	10.0 MiB	28.0 KiB	N/A	N/A	Very Low
pulseaudio	louay	0	1308	2.7 MiB	29.6 MiB	8.0 KiB	N/A	N/A	Very High
gnome-terminal-serve	louay	0	2789	6.6 MiB	31.0 MiB	8.0 KiB	N/A	N/A	Normal
bash	louay	0	2797	N/A	460.0 KiB	N/A	N/A	N/A	Normal
clion.sh	louay	0	2829	N/A	204.0 KiB	N/A	N/A	N/A	Normal
java	louay	0	2844	2.0 GiB	2.0 GiB	222.2 MiB	N/A	N/A	Normal
ion.clangd.r	louay	0	2916	12.0 MiB	243.0 MiB	2.2 MiB	N/A	N/A	Normal
fsnotifier	louay	0	2897	160.0 KiB	1.3 MiB	N/A	N/A	N/A	Normal
gnome-session-binary	louay	0	1517	1.6 MiB	11.4 MiB	4.0 KiB	N/A	N/A	Normal
update-notifier	louay	0	2106	1020.0 KiB	6.8 MiB	7.0 MiB	N/A	N/A	Normal
gsd-disk-utility-noti	louay	0	1660	752.0 KiB	468.0 KiB	N/A	N/A	N/A	Normal
evolution-alarm-not	louay	0	1661	856.0 KiB	4.9 MiB	N/A	N/A	N/A	Normal
snap-store	louay	0	1793	3.8 MiB	63.6 MiB	4.0 KiB	N/A	N/A	Normal
msedge_crashpad_har	louay	0	2238	72.0 KiB	3.5 MiB	4.0 KiB	N/A	N/A	Normal
(sd-pam)	louay	0	1302	596.0 KiB	N/A	N/A	N/A	N/A	Normal
dbus-daemon	louay	0	1313	1.4 MiB	2.7 MiB	N/A	N/A	N/A	Normal
gvfsd	louay	0	1317	628.0 KiB	12.7 MiB	N/A	N/A	N/A	Normal
gvfsd-trash	louay	0	1713	1.0 MiB	2.0 MiB	N/A	N/A	N/A	Normal
gvfsd-network	louay	0	3703	856.0 KiB	1.7 MiB	N/A	N/A	N/A	Normal
gvfsd-dnsssd	louay	0	3719	N/A	108.0 KiB	N/A	N/A	N/A	Normal
gvfsd-fuse	louay	0	1322	N/A	48.0 KiB	N/A	N/A	N/A	Normal
gvfs-udisks2-volume-r	louay	0	1342	1.2 MiB	1.3 MiB	N/A	N/A	N/A	Normal
gvfs-goa-volume-moni	louay	0	1351	388.0 KiB	944.0 KiB	N/A	N/A	N/A	Normal
goa-daemon	louay	0	1355	460.0 KiB	1.6 MiB	N/A	N/A	N/A	Normal
goa-identity-service	louay	0	1364	36.0 KiB	4.0 KiB	N/A	N/A	N/A	Normal
gvfs-mtp-volume-moni	louay	0	1370	424.0 KiB	1004.0 KiB	N/A	N/A	N/A	Normal
gvfs-gphoto2-volume-r	louay	0	1376	388.0 KiB	880.0 KiB	N/A	N/A	N/A	Normal

End Process