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Lab Assignment 1: Shell and System Calls

Code Organization:

The code is divided between 6 main c files and their equivalent headers:

command_parser.c : responsible for parsing the commands over different split as space/tab for normal Linux commands and over ":" for paths . It handles the splitting for the echo command too and call functions from other files to replace the environment variables by their equivalent values.

commands.c : handles different commands and their special cases such as "cd" , ls and also it validates any command y searching in the binary file if not found , it sends invalidation message to caller function.

environment.c : responsible for the environment variables and their handling setting the variables,getting them,replacing with environment values,formatting the variable by removing"\$" and also sets up the environment for the beginning of shell.

variables.c: contains the main global variables used in the program ,their declaration as well as the environment paths stored.

file_processing.c: responsible for reading and writing in the log and history files as well as opening the batch file and sending the signal for the child process termination to be written in the log file.

main.c: the main program calls set-up environment function first and identifies the number of arguments to determine the mode type: batch or

interactive and then execute the shell loop which calls different function from different files and is responsible for forking the process.

Main Functions:

Function name	Responsible for
char**parse_command(const char* command,char split)	Parsing the commands over space and " : " for paths
char** Splitter(const char*command,char split)	Split the command in char* where environment variables will be replaces later
void cd(char** parsed)	Responsible for cd command with parameters "~" or "/"
char* getCommand(char**src,char*cmd)	Compare the command with that in the binary files to validate it
char* getEnvironmentVars(char* envName)	Get environment variables
int setEnviroVars(char**parsed,int arg)	Set their values
void ReplaceVarsWithVals(char**parsed)	Replace variables with values
void setup_environment(void)	Set the PATH ,HOME ,PWD before starting the shell
void read_from_history_file()	Read from history file
FILE * write_in_history_file(char input[])	Write in history file
void signalHandler()	Send the signal of process child termination
int setBatchEnv(char* path)	Set up the path of the batch file from the main argument
pid_t execute(pid_t pid,char**parsed,char *command)	Responsible for forking processes
void shell_loop()	The main shell loop where commands are scanned and executed

Compiling and running Manual:

1. open terminal and cd the path of the program
2. type "make" to get the "out" file here named **shell**
3. **./shell** for interactive mode.
4. **./shell batchfile_path** for batch mode.

Sample runs:

history file:

```

xt (~/.Desktop/os/Lab 1/Shell and System calls) - gedit
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```

```

pwd
history
ls
ls
/bin/ls
#this is
x=5
echo $x
echo 7
echo "hell owored"
history
exit

ls
ls -al
ls -a -l

/bin/ls -l -a

/bin/ls -l

firefox &

ps
/bin/ps


pwd
mkdir newDir
touch newDir/newFile.txt
cd newDir
pwd

```

log file :

[illegible]

batch file :

```
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ls  
/bin/ls  
x=5  
echo $x  
echo 7  
echo "hell owored"  
exit
```

```
aaa@aaa-Lenovo-ideapad-310-15ISK: ~/Desktop/os/Lab 1/lab1-28  
aaa@aaa-Lenovo-ideapad-310-15ISK:~/Desktop/os/Lab 1/lab1-28$ ./shell batch.txt  
ls  
batch.txt      file      shell  
bin            file_processing.c  Shell and System calls.cbp  
command_parser.c  file_processing.h  Shell and System calls.depend  
command_parser.h  history.txt        Shell and System calls.layout  
commands.c        Lab1 Report.pdf    shell.c  
commands.h        log.txt            variables.c  
environment.c      makefile           variables.h  
environment.h      obj  
/bin/ls  
batch.txt      file      shell  
bin            file_processing.c  Shell and System calls.cbp  
command_parser.c  file_processing.h  Shell and System calls.depend  
command_parser.h  history.txt        Shell and System calls.layout  
commands.c        Lab1 Report.pdf    shell.c  
commands.h        log.txt            variables.c  
environment.c      makefile           variables.h  
environment.h      obj  
x=5  
echo $x  
5  
echo 7  
7  
echo "hell owored"  
"hell owored"  
exit  
aaa@aaa-Lenovo-ideapad-310-15ISK:~/Desktop/os/Lab 1/lab1-28$
```

Interactive:

```
exit  
aaa@aaa-Lenovo-ideapad-310-15ISK:~/Desktop/os/Lab 1/lab1-28$ ./shell  
SHELL> ls  
batch.txt      commands.c  file      Lab1 Report.pdf  shell      shell.c  
bin            commands.h  file_processing.c  log.txt        Shell and System calls.cbp  variables.c  
command_parser.c  environment.c  file_processing.h  makefile      Shell and System calls.depend  variables.h  
command_parser.h  environment.h  history.txt      obj           Shell and System calls.layout  
SHELL> echo 5  
5  
SHELL> pwd  
/home/aaa/Desktop/os/Lab 1/lab1-28  
SHELL> cd ~  
SHELL> pwd  
/home/aaa  
SHELL>
```

d System calls

```

x
SHELL> echo 5
5
SHELL> echo "hello world"
hello world
SHELL> cd /
SHELL> pwd
/
SHELL> cd ~
SHELL> pwd
/home/aaa
SHELL> ls
couchbase-spark-samples  Documents      history.txt  Pictures      try-cb
dead.letter              Downloads     log.txt      Public        Videos
Desktop                  examples.desktop  Music        Templates
SHELL> v="-a -l"
SHELL> ls $v
total 632
drwxr-xr-x 22 aaa aaa 4096 11 21:46 .
drwxr-xr-x 5 root root 4096 13 19:12 ..
drwx----- 3 aaa aaa 4096 13 10:51 .adobe
-rw----- 1 aaa aaa 12263 12 07:32 .bash_history
-rw-r--r-- 1 aaa aaa 220 18 23:18 .bash_logout
-rw-r--r-- 1 aaa aaa 3771 18 23:18 .bashrc
drwx----- 25 aaa aaa 4096 8 01:30 .cache
drwx----- 3 aaa aaa 4096 19 01:31 .compiz
drwx----- 23 aaa aaa 4096 8 01:30 .config
drwxr-xr-x 5 aaa aaa 4096 24 12:29 couchbase-spark-samples
-rw----- 1 aaa aaa 142 13 19:21 dead.letter
drwxr-xr-x 3 aaa aaa 4096 12 07:25 Desktop
-rw-r--r-- 1 aaa aaa 25 1 11:51 .dmrc
drwxr-xr-x 4 aaa aaa 4096 6 16:39 Documents
drwxr-xr-x 2 aaa aaa 4096 8 01:42 Downloads
-rw-r--r-- 1 aaa aaa 8980 18 23:18 examples.desktop
-rw-r--r-- 1 aaa aaa 457336 6 11:26 history.txt
-rw----- 1 aaa aaa 23954 11 21:46 .ICEauthority
drwxr-xr-x 3 aaa aaa 4096 24 12:32 .ivy2
drwx----- 3 aaa aaa 4096 19 01:30 .local
-rw-r--r-- 1 aaa aaa 116 6 11:26 log.txt
drwx----- 3 aaa aaa 4096 13 10:51 .macromedia
drwx----- 4 aaa aaa 4096 26 12:46 .mozilla
drwxr-xr-x 2 aaa aaa 4096 19 01:30 Music
-rw----- 1 aaa aaa 0 1 11:34 .news_time
drwxr-xr-x 242 aaa aaa 12288 22 13:00 .npm
drwxr-xr-x 2 aaa aaa 4096 8 01:42 Pictures
-rw-r--r-- 1 aaa aaa 675 18 23:18 .profile
drwxr-xr-x 2 aaa aaa 4096 19 01:30 Public
drwxr-xr-x 3 aaa aaa 4096 24 12:30 .sbt
-rw-r--r-- 1 aaa aaa 0 25 12:14 .sudo_as_admin_successful
drwxr-xr-x 2 aaa aaa 4096 19 01:30 Templates
drwxr-xr-x 8 aaa aaa 4096 24 11:45 try-cb
drwxr-xr-x 2 aaa aaa 4096 19 01:30 Videos
-rw----- 1 aaa aaa 219 11 21:46 .Xauthority
-rw----- 1 aaa aaa 3817 11 21:46 .xsession-errors
-rw----- 1 aaa aaa 3817 11 15:00 .xsession-errors.old
SHELL>

```