

Simple Shell Lab

Name: Yosef Ashraf Yosef

ID: 19016910

1. Overall Organization of my code:

- I implemented a simple shell program that executes some actions using some commands in UNIX.
- The code has one function and it's a file handler called (Log) that opens a (.txt) file and logs in it whenever a child process terminates.
- The main method starts with a while loop to allow the user to execute an infinite number of commands until he executes the (exit) command.
- At first, I read the command line from the user in a character array and cracks it into command with its arguments (if found) and stores them in a string array.
- I check if first word in command line equal ("echo", "export" or "cd"), then he go to function execute_shell_bultin () else go to function execute_command ().
- In function execute_shell_bultin (), I fork a child process and begins to execute the command and if it's a wrong one it'll print "Error" then check the last character of the command if equal "&" and according to I decide whether to wait for the child to terminate or to run the child in the background.
- In function execute_shell_bultin (), I implemented the required built-in functions (cd, echo, export) internally and handled all cases.

2. Major Functions

- GetStr (): take command line from user.

```

void GetStr(char **args)
{
    for(int i=0 ; 1 ; i++)
    {
        if(i)
            *args = (char*)realloc( ptr: (*args) , size: i + 1);
        else
            *args = (char*)malloc( size: i + 1);
        (*args)[i]=getchar();
        if((*args)[i] == '\n')
        {
            (*args)[i]= '\0';
            break;
        }
    }
}

```

- **get_args ():** split command line to arguments.

```

void get_args(char* str,char** args,int num){
    int i = 0;
    args[i++] = strtok( s: str, delim: " ");
    for(int j =0;j<=num;j++) {
        args[i++] = strtok( s: NULL, delim: " ");
    }
}

```

- **execute_command ():** It defines whether or not the command is built in.

```

void execute_command(char* command, char* args[], int num) {
    char **try = (char **)malloc( size: SIZE);
    if (num == 0) {
        char *ret = strstr( haystack: args[0], needle: "$");
        if (ret != NULL) {
            args[0] = strtok( s: args[0], delim: "$");
            args[0] = getenv( name: args[0]);
        }
        command = args[0];
        try[0] = command;
    }
    else{
        char* temp = NULL;
        int j=1;
        try[0] = command;
        for (int i =1; i <= num; i++) {
            char *ret = strstr( haystack: args[i], needle: "$");
            if (ret != NULL) {...}
            else
                try[j++] =args[i];
        }
    }
    bool isForeground = (strcmp(args[num], "&"));
    int id = fork();
    if (!id) {
        execvp( file: command, argv: try);
        printf( format: "Error\n");
        exit( status: 1);
    } else if(isForeground) {
        waitpid( pid: id, stat_loc: 0, options: WUNTRACED);
    }
}

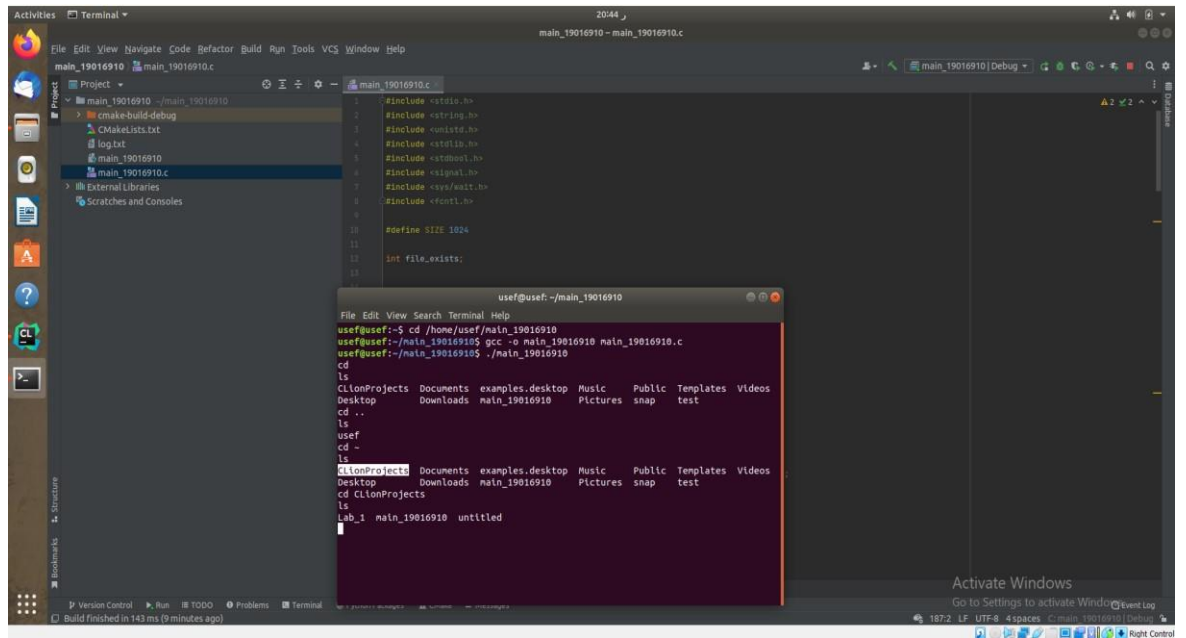
```

- `execute_shell_bultin ()`: implemented the required built-in functions (`cd`, `echo`, `export`).

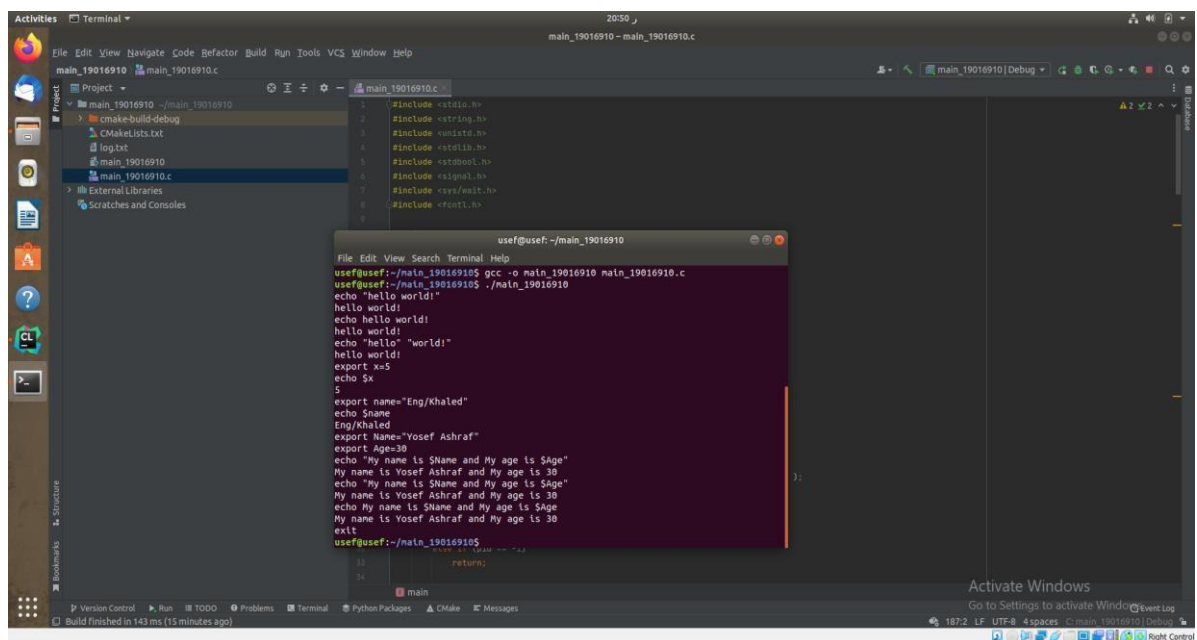
```
void execute_shell_bultin(char* args[],int num) {
    if (strcmp(args[0], "cd") == 0) {
        if (args[1] == NULL || strcmp(args[1], "~") == 0)
            chdir( path: getenv( name: "HOME"));
        else
            chdir( path: args[1]);
    } else if (strcmp(args[0], "echo") == 0) {
        for (int i = 1; i <= num; i++) {
            args[i] = strtok( s: args[i], delim: "\\");
            char *ret = strstr( haystack: args[i], needle: "$");
            if (ret != NULL) {
                args[i] = getenv( name: strtok( s: args[i], delim: "$"));
            }
            printf( format: "%s ", args[i]);
        }
        printf( format: "\\n");
    } else if (strcmp(args[0], "export") == 0) {
        char *key = NULL;
        char *data = NULL;
        key = strtok( s: args[1], delim: "=");
        data = strtok( s: strtok( s: NULL, delim: "="), delim: "\\");
        if(num>1)
            for(int i = 2;i<=num;i++)
                addSpaces(data);
        data = strtok( s: data, delim: "\\");
        setenv( name: key, value: data, replace: 1);
    }
}
```

Sample Runs:

- `execute_shell_bultin`
 1. `"cd"`



2. “echo” and “export”



- `execute_command`

```

ls
cmake-build-debug CMakeLists.txt log.txt main_19016910 main_19016910.c
mkdir test
ls
cmake-build-debug log.txt main_19016910.c
ls -la -lh
total 52K
drwxrwxr-x 5 user user 4.0K 23 20:57 .
drwxr-xr-x 21 user user 4.0K 23 20:57 ..
drwxrwxr-x 6 user user 4.0K 23 20:56 cmake-build-debug
-rw-rw-r-- 1 user user 135 23 20:33 CMakeLists.txt
drwxrwxr-x 2 user user 4.0K 23 20:56 .idea
-rw-r--r-- 1 user user 98 23 20:57 log.txt
-rwxrwxr-x 1 user user 14K 23 20:56 main_19016910
-rw-rw-r-- 1 user user 4.5K 23 20:56 main_19016910.c
drwxrwxr-x 2 user user 4.0K 23 20:57 test
export x="a"
ls $x
total 52K
drwxrwxr-x 5 user user 4.0K 23 20:57 .
drwxr-xr-x 21 user user 4.0K 23 20:57 ..
drwxrwxr-x 6 user user 4.0K 23 20:56 cmake-build-debug
-rw-rw-r-- 1 user user 135 23 20:33 CMakeLists.txt
drwxrwxr-x 2 user user 4.0K 23 20:56 .idea
-rw-r--r-- 1 user user 128 23 20:57 log.txt
-rwxrwxr-x 1 user user 14K 23 20:56 main_19016910
-rw-rw-r-- 1 user user 4.5K 23 20:56 main_19016910.c
drwxrwxr-x 2 user user 4.0K 23 20:57 test
export x="a"
export y="l"
export z="h"
ls $x $y $z
total 52K
drwxrwxr-x 5 user user 4.0K 23 20:57 .
drwxr-xr-x 21 user user 4.0K 23 20:57 ..
drwxrwxr-x 6 user user 4.0K 23 20:56 cmake-build-debug
-rw-rw-r-- 1 user user 135 23 20:33 CMakeLists.txt
drwxrwxr-x 2 user user 4.0K 23 20:56 .idea
-rw-r--r-- 1 user user 159 23 20:58 log.txt
-rwxrwxr-x 1 user user 14K 23 20:56 main_19016910
-rw-rw-r-- 1 user user 4.5K 23 20:56 main_19016910.c
drwxrwxr-x 2 user user 4.0K 23 20:57 test
export x="ls"
$X
cmake-build-debug log.txt main_19016910.c
CMakeLists.txt main_19016910 test
exit

```

- Exit and error in command line

```

//main_19016910.c
1 //str us ' '
2 numDFSspace++;
3 str++;
4 }
5 return numDFSspace;
6 }
7 void execute_command(char* command, char* args[], int num) {
8
9 char *entry = (char **)malloc(sizeof(SIZE));
10 if (num == 0) {
11 char *ret = strtok(command, args[0], &needle);
12 if (ret != NULL) {
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```

```

user@user:~/main_19016910
user@user:~$ cd /home/user/main_19016910
user@user:~/main_19016910$ gcc -o main_19016910 main_19016910.c
user@user:~/main_19016910$ ./main_19016910
ls a
ls: cannot access 'a': No such file or directory
ZZZZZZ
Error
exit
user@user:~/main_19016910$

```

3. The processes hierarchy in Keyguard:

Activities System Monitor 21:12

Processer Resource File System

Process Name	User	% CPU	ID	Memory	Disk read tota	Disk write tota	Disk read	Disk write	Priority
gnome-keyring-daemon	user	0.00	1409	856.0 kB	N/A	N/A	N/A	N/A	Normal
gsd-printer	usef	0.00	1825	544.8 kB	N/A	N/A	N/A	N/A	Normal
ibus-x11	usef	0.00	1678	1.7 MB	21.8 MB	N/A	N/A	N/A	Normal
pulseaudio	usef	0.00	1655	1.8 MB	29.2 MB	8.2 kB	N/A	N/A	Very High
systemd	usef	0.00	1395	1.5 MB	5.0 GB	338.3 MB	N/A	N/A	Normal
atspi2-registrd	usef	0.00	1598	417.8 kB	12.1 MB	N/A	N/A	N/A	Normal
atspi-bus-launcher	usef	0.00	1591	380.9 kB	569.3 kB	N/A	N/A	N/A	Normal
dbus-daemon	usef	0.00	1596	430.1 kB	3.8 MB	N/A	N/A	N/A	Normal
clion.sh	usef	0.00	14418	102.4 kB	22.1 MB	N/A	N/A	N/A	Normal
java	usef	0.00	14456	2.2 GB	66.1 MB	27.0 MB	N/A	1.3 KiB/s	Normal
fsnotifier	usef	0.00	14516	258.0 kB	N/A	N/A	N/A	N/A	Normal
ion clangd.main	usef	0.00	14830	10.1 MB	1.2 MB	3.6 MB	N/A	N/A	Normal
main_19016910	usef	0.00	15372	25.1 MB	N/A	N/A	N/A	N/A	Normal
libreoffice	usef	0.00	15579	129.4 MB	199.0 MB	27.4 MB	N/A	N/A	Normal
Privileged Cont.	usef	0.00	15678	26.3 MB	N/A	N/A	N/A	N/A	Normal
Socket Process	usef	0.00	15637	7.6 MB	N/A	N/A	N/A	N/A	Normal
Web Content	usef	0.00	15781	10.5 MB	N/A	N/A	N/A	N/A	Normal
Web Content	usef	0.00	15802	10.5 MB	N/A	N/A	N/A	N/A	Normal
Web Content	usef	0.00	15804	10.5 MB	N/A	N/A	N/A	N/A	Normal
WebExtensions	usef	0.00	15722	18.9 MB	N/A	N/A	N/A	N/A	Normal
dbus-daemon	usef	0.00	1427	3.7 MB	9.3 MB	N/A	N/A	N/A	Normal
dconf-service	usef	0.00	1950	663.6 kB	3.0 MB	1.7 MB	N/A	N/A	Normal
evolution-addressbook-factory	usef	0.00	1954	307.2 kB	1.6 MB	N/A	N/A	N/A	Normal
evolution-addressbook-factory-subprocess	usef	0.00	1965	761.9 kB	5.8 MB	53.2 kB	N/A	N/A	Normal
evolution-calendar-factory	usef	0.00	1863	897.0 kB	11.6 MB	N/A	N/A	N/A	Normal
evolution-calendar-factory-subprocess	usef	0.00	1934	2.3 MB	10.5 MB	N/A	N/A	N/A	Normal
evolution-source-registry	usef	0.00	1702	1.4 MB	6.6 MB	N/A	N/A	N/A	Normal
gnome-shell-calendar-server	usef	0.00	1696	2.3 MB	11.0 MB	N/A	N/A	N/A	Normal
gnome-terminal-server	usef	0.00	15169	10.0 MB	270.3 kB	254.0 kB	N/A	N/A	Normal
bash	usef	0.00	15514	1.5 MB	49.2 kB	86.0 kB	N/A	N/A	Normal
main_19016910	usef	0.00	15561	65.5 kB	N/A	4.1 kB	N/A	N/A	Normal
gpa-daemon	usef	0.00	1709	647.2 kB	23.4 MB	N/A	N/A	N/A	Normal
gpa-identity-service	usef	0.00	1729	290.8 kB	1.9 MB	N/A	N/A	N/A	Normal
gvfs-afc-volume-monitor	usef	0.00	1746	561.2 kB	1.2 MB	N/A	N/A	N/A	Normal
gvfsd	usef	0.00	1569	561.2 kB	2.8 MB	N/A	N/A	N/A	Normal

End Process

Activate Windows
Go to Settings to activate Windows.

Right Control