

Programming Assignment #1

1. Introduction

This project consists of designing a Java program to serve as a shell interface that accepts user commands and then executes each command in a separate process.

- Project

- Implementation a shell using a Java program
- The shell interface gives the user a prompt, after which the next command is entered

- What you did
 - Implement pwd, ls, ps, cat, cd, history commands using ProcessBuilder

- Design
 - Using the OSProcess code, basic commands such as ls, pwd, and ps were implemented.

- What did/didn't work?

- Did
 - There are many types of instructions in CD, so commands according to various cases were implemented.
 - ArrayList was used to output the history command, and if it is the same as the previous command, it is not added.
 - In Linux history, if the same command is executed immediately, it is not added to history.
 - !! The reason why not implement <history !!> is that on Linux, you must enter two exclamation points without history to execute the previous command.
 - Similarly, in the case of !(number), it is possible without history.
 - The reason why the index starts from 1 not 0 in history is that Linux history also shows 500 recent commands from 1.
- Didn't
 - Not all commands were fully implemented in the cd command.
 - In addition, there have been cases where it is not executed perfectly on an absolute path.
 - There seems to be a problem in which the path is not accurately recognized in the part where the absolute path is input.
 - In addition, the size of the history was not limited to 500, and it was not implemented

to show only the latest 500.

- It is a way to show all the history even if there are more than 500.

- Results

- Compile and runs the program

```
jlh1218@jlh1218-900X5T:~$ cd Project1/
jlh1218@jlh1218-900X5T:~/Project1$ javac SimpleShell.java
jlh1218@jlh1218-900X5T:~/Project1$ java SimpleShell
jsh>
```

- ProcessBuilder object

- ProcessBuilder

```
jlh1218@jlh1218-900X5T:~/Project1$ cat SimpleShell.java | grep pb
ProcessBuilder pb = new ProcessBuilder();
pb.directory(startDir);
    pb.directory(home);
    File parentDir = new File(pb.directory().getParent());
    pb.directory(parentDir);
    File newDir = new File(pb.directory() + File.separator + dir);
    pb.directory(newDir);
    pb.command(commandArr);
    Process process = pb.start();
jlh1218@jlh1218-900X5T:~/Project1$
```

- ps, ls, cat

```
jlh1218@jlh1218-900X5T:~/Project1$ java SimpleShell
jsh>ps
  PID TTY          TIME CMD
 3282 pts/0    00:00:00 bash
 4030 pts/0    00:00:00 java
 4047 pts/0    00:00:00 ps
jsh>ls
SimpleShell.class
SimpleShell.java
test.txt
jsh>cat test.txt
Hello World
jsh>cat SimpleShell.java
import java.io.*;
import java.util.*;

public class SimpleShell {

    public static void main(String[] args) throws IOException {
        String commandLine;
        BufferedReader console = new BufferedReader(new InputStreamReader(System.in));
        ProcessBuilder pb = new ProcessBuilder();
        File startDir = new File(System.getProperty("user.dir"));
        pb.directory(startDir);
        String beforeCmd;

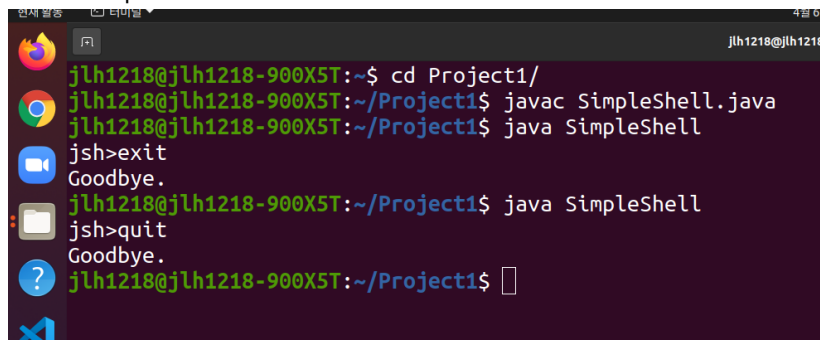
        ArrayList<List<String>> history = new ArrayList<>();

        // we break out with <control><C>
        while (true) {
            // read what the user entered
            System.out.print("jsh>");
            commandLine = console.readLine();

            // making ArrayList
            List<String> commandArr = Arrays.asList(commandLine.split(" "));

            if(!commandLine.contains("!")){
                if(history.size() == 0){
```

- Exit and quit



```
jlh1218@jlh1218-900X5T:~$ cd Project1/
jlh1218@jlh1218-900X5T:~/Project1$ javac SimpleShell.java
jlh1218@jlh1218-900X5T:~/Project1$ java SimpleShell
jsh>exit
Goodbye.
jlh1218@jlh1218-900X5T:~/Project1$ java SimpleShell
jsh>quit
Goodbye.
jlh1218@jlh1218-900X5T:~/Project1$
```

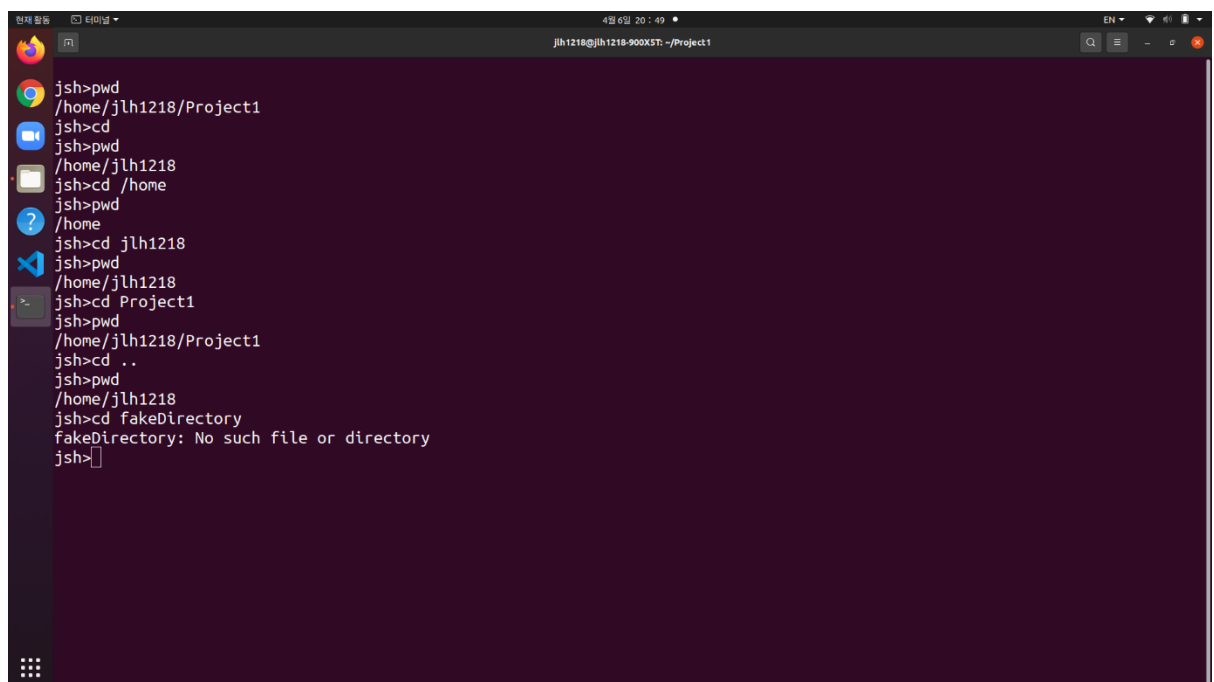
- Change directory to /home/user

- Handle absolute path

- Relative path

- cd user
- cd Project1

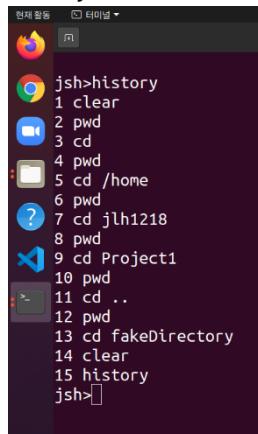
- Error handling



```
jsh>pwd
/home/jlh1218/Project1
jsh>cd
jsh>pwd
/home/jlh1218
jsh>cd /home
jsh>pwd
/home
jsh>cd jlh1218
jsh>pwd
/home/jlh1218
jsh>cd Project1
jsh>pwd
/home/jlh1218/Project1
jsh>cd ..
jsh>pwd
/home/jlh1218
jsh>cd fakeDirectory
fakeDirectory: No such file or directory
jsh>
```

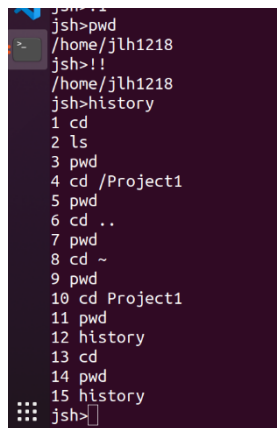
- history

- history



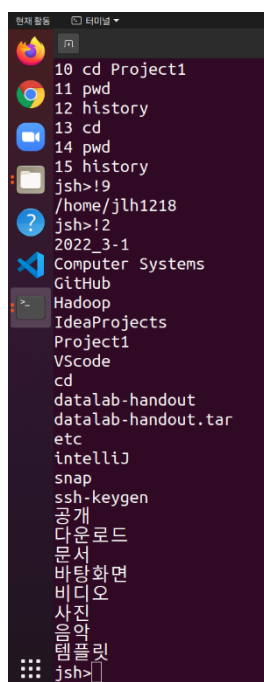
```
jsh>history
1 clear
2 pwd
3 cd
4 pwd
5 cd /home
6 pwd
7 cd jlh1218
8 pwd
9 cd Project1
10 pwd
11 cd ..
12 pwd
13 cd fakeDirectory
14 clear
15 history
jsh>
```

- !!



```
jsh>!!
/home/jlh1218
jsh>!!
/home/jlh1218
jsh>history
1 cd
2 ls
3 pwd
4 cd /Project1
5 pwd
6 cd ..
7 pwd
8 cd ~
9 pwd
10 cd Project1
11 pwd
12 history
13 cd
14 pwd
15 history
jsh>
```

- !<number>



```
10 cd Project1
11 pwd
12 history
13 cd
14 pwd
15 history
jsh>!9
/home/jlh1218
jsh>!2
2022_3-1
Computer Systems
GitHub
Hadoop
IdeaProjects
Project1
VScode
cd
datalab-handout
datalab-handout.tar
etc
intelliJ
snap
ssh-keygen
공개
다운로드
문서
바탕화면
비디오
사진
음악
템플릿
jsh>
```

What did you learn?

1. How far did you get in this project? What grade are you expecting? Did you find the milestones in the description helpful? Do you think you could have gotten the project working as well as you did without the milestones?

I expect my grade 70.

The explanation of the assignment was very helpful. If there was no explanation, I would have been at a loss how to implement it.

2. Do you feel like a better programmer now that you've completed this project? How does this compare to programming project that you've had in prior class?

I think my skills have improved a little.

While implementing shell, I was able to learn more by directly searching for each function. In addition, I think it helped my programming skills because I could search for various Java functions and use them myself to implement them.

3. Describe 3 problems (relating to this assignment) that arose while you were working on this project and explain how you solved them.

1. Path input slash

Windows and Linux had different path input methods, so it was difficult to do. However, as much as we basically implemented the shell of Linux, we tried to implement it more specifically for the Linux environment.

2. cd .

In Windows Terminal, you can type cd. in the current location, but in Linux, you can go to the home directory. Even in this case, I thought about what criteria to implement.

3. history

At first, I thought I could simply put history in an array and print it out. However, while studying the history command, I learned that if it is the same as the previous command, it will not be recorded. Accordingly, to solve this problem, a method of comparing it with all commands was used using a string called beforeCmd.

Perhaps the overall difficulty was the standard of implementation. I was wondering if I should implement it based on Linux, whether it was based on Windows, or whether it should be implemented in the example shown in the document. In this dilemma, I decided to follow Linux, and although there are some differences from the explanation of the task, I tried to write it down directly in the terminal as much as possible and implemented it to make the output similar.

4. How long did you spend on this assignment? Give me specifics.

Date	Time	Activities	Outcomes
2022.04.04.	1hr	Identify and understand Project.	Drawing the ultimate goal of the task: making a simple cell using java like Linux
2022.04.05.	8hr	Implement code for each step	Most functional tools except for a few errors
2022.04.06.	5hr	Minor error correction. Writing a report and README.md file.	testing and captured results. Writing a report and README file.

5. Total hours spent. Try to be honest and do not exaggerate here.

About 14-15hr.

2. Conclusions

It was confirmed that all functions in the Testing Table showed good results.

I want to implement the commands more than the commands written in the assignment.

What's unfortunate is that it wasn't fully implemented. In particular, it is regrettable that the cd command for entering the path. In addition, it does not seem to have been implemented almost the same as Linux in areas such as the output of the history command.

Based on this regret, I would like to implement more functions and re-implement shell similar to Linux as much as possible.