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COP 3402 – Systems Software
Programming Assignment #4
PL/0 Compiler Instructions

Prerequisites

- In order to compile the program you will need the "make" utility

Instructions

1. Open up a terminal prompt, and navigate to the project directory.

Example - If the project folder “pl0” were located on the Desktop, you would type:

- cd ~/Desktop/pl0/src and hit enter as shown below. (See Figure 1.)

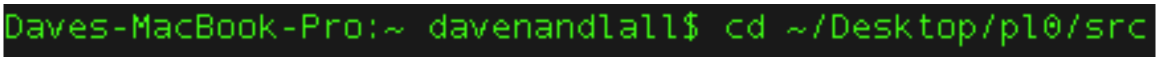
cd -> change directory

~ -> Tilde

Desktop -> the main directory where the source folder is located

/pl0/src -> the name of the project folder “pl0”, and the folder within that folder “src” which contains all of the source code files.

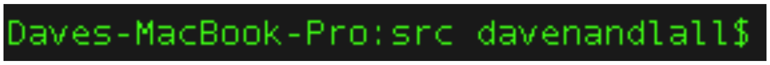
Figure 1. Navigating to the project directory via the command line



```
Daves-MacBook-Pro:~ davenandlall$ cd ~/Desktop/pl0/src
```

Tips: We recommend keeping the main project folder on the Desktop, to avoid searching through multiple file paths

Figure 2. Display of Command Line when inside of the Correct Folder



```
Daves-MacBook-Pro:src davenandlall$
```

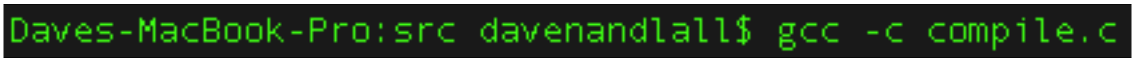
Notice after entering the command from Figure 1, we are now inside of the "src" folder as indicated by the src display on the command line. Once inside we can continue to Step 2 below.

2. Once you are inside of project folder run the command:

- gcc –c compile.c

And hit enter. This command will compile all of the pl0 source code files located in the "src" folder. In addition, this step only needs to be done once for execution. See Figure 3.

Figure 3. The Compile Command



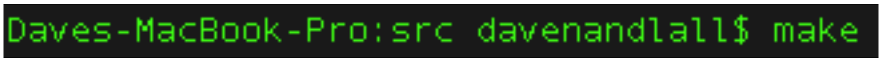
```
Daves-MacBook-Pro:src davenandlall$ gcc -c compile.c
```

3. After you compiled all the source code files, you can now enter the command:

- make

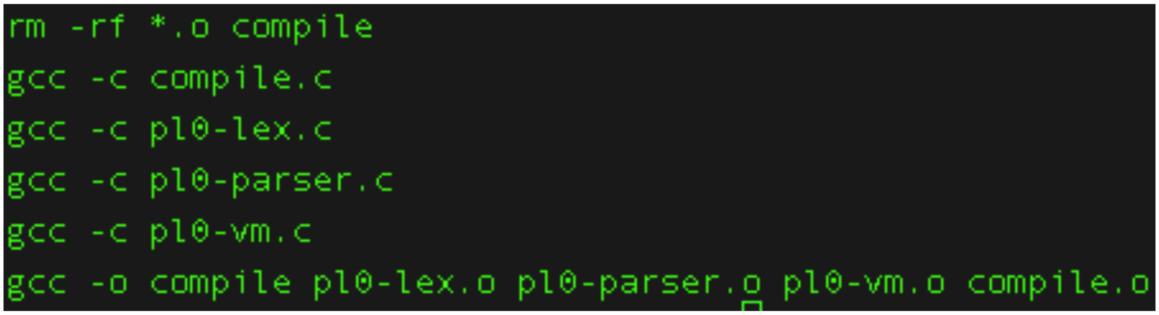
And hit enter. This make command (as shown in Figure 4) will search for a valid makefile which is located in the project directory which gives explicit details on how the program should be assembled. In addition, the makefile creates object code files (.o) (as shown in Figure 5) for all of the source files, which link all of the source files together. These files can be viewed in the project folder. An example is given below to show how to enter the make command.

Figure 4. The MAKE Command



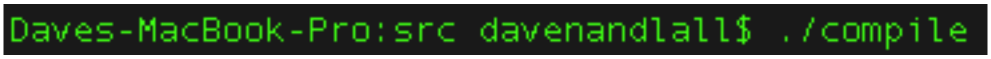
```
Daves-MacBook-Pro:src davenandlall$ make
```

Figure 5. The MAKEFILE Assembling Process

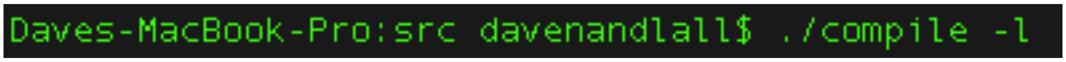


```
rm -rf *.o compile
gcc -c compile.c
gcc -c pl0-lex.c
gcc -c pl0-parser.c
gcc -c pl0-vm.c
gcc -o compile pl0-lex.o pl0-parser.o pl0-vm.o compile.o
```

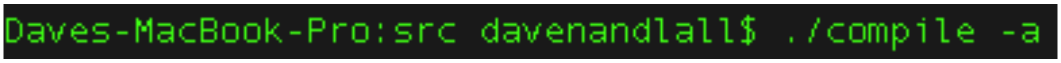
4. After you run the make command, you can now compile different programs written in the PL/0 Programming Language, with these particular compiler directives.



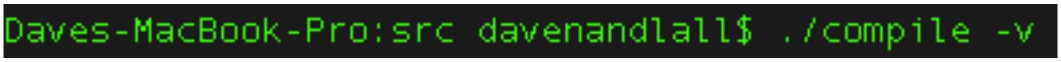
```
Daves-MacBook-Pro:src davenandlall$ ./compile
```



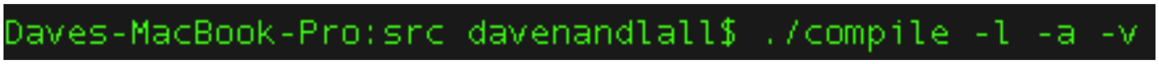
```
Daves-MacBook-Pro:src davenandlall$ ./compile -l
```



```
Daves-MacBook-Pro:src davenandlall$ ./compile -a
```



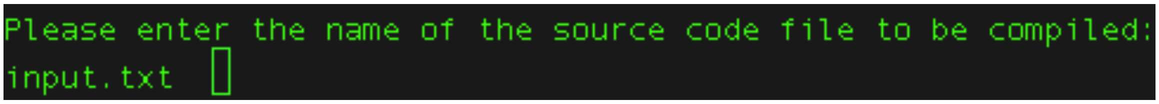
```
Daves-MacBook-Pro:src davenandlall$ ./compile -v
```



```
Daves-MacBook-Pro:src davenandlall$ ./compile -l -a -v
```

After entering any combination of these compiler directives, the user will be prompted to enter a name of a valid PL/0 Program input file that should be compiled as shown in Figure 6.

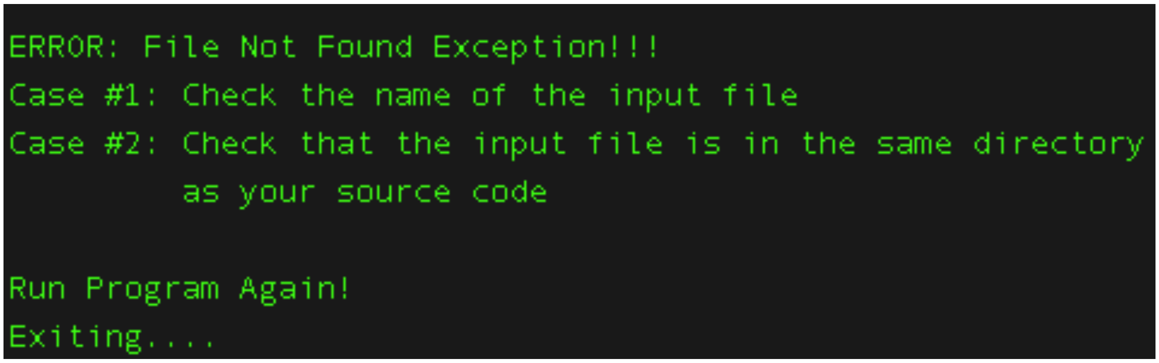
Figure 6. Entering a valid PL/0 Program Input File



```
Please enter the name of the source code file to be compiled:
input.txt
```

If the input file exists in the src folder, the source code will be compiled successfully, if not the user will be prompted with this error message shown in Figure 7.

Figure 7. Entering an INVALID input file

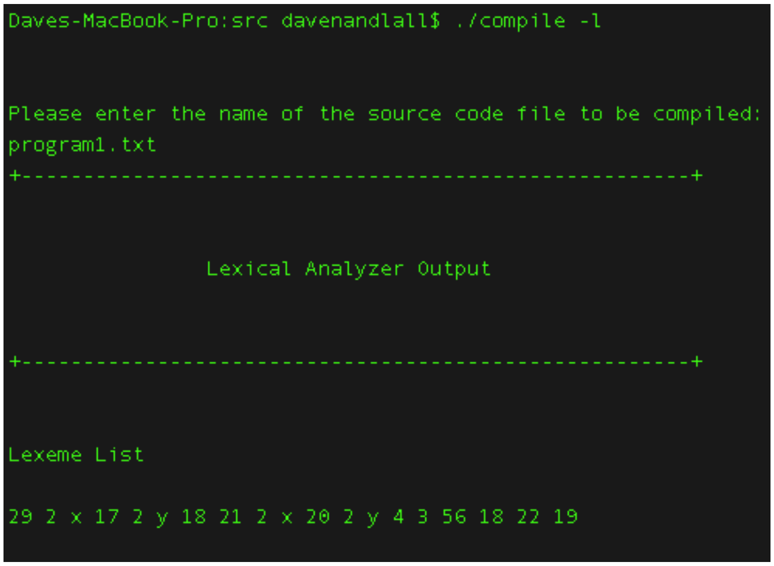


```
ERROR: File Not Found Exception!!!
Case #1: Check the name of the input file
Case #2: Check that the input file is in the same directory
         as your source code

Run Program Again!
Exiting....
```

In this case of a FILE NOT FOUND EXCEPTION, the user will need to first check if the input file is in the general folder "/pl0/src/input.txt" and NOT in any other subfolders, located in the main project folder "pl0". For example the input file needs to be located in /pl0/src/input.txt and NOT /pl0/src/folder1/folder2/program1.txt Next check for the user would be to check if the name of the input.txt file was misspelled on the console. These should be two quick fixes to a file not found exception. Otherwise, the user will have to create a new .txt file and store it in the pl0 source folder (pl0/src/input.txt).

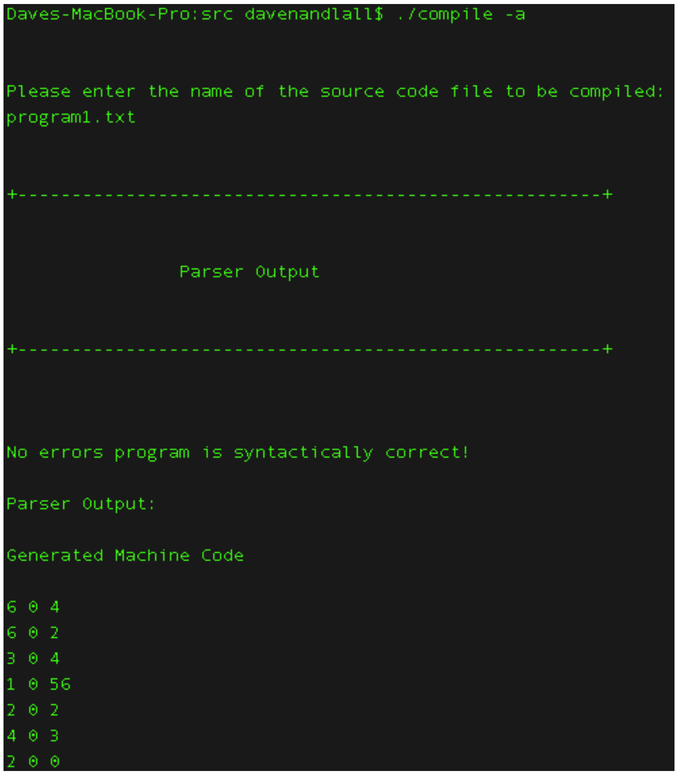
If a valid input file was found, then the normal outputs should print to the console, provided the correct compiler directives were entered on the command line. Some examples can be shown in Figures 8, 9 and 10.

Figure 8. Outputs to console using the COMPILE –L command



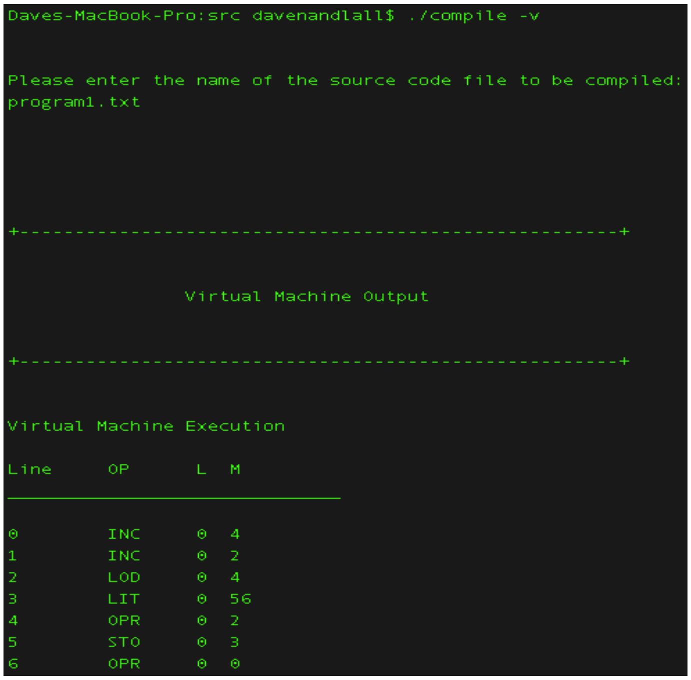
```
Daves-MacBook-Pro:src davenandlall$ ./compile -l


Please enter the name of the source code file to be compiled:
program1.txt
+-------------------------------------------------------+



                Lexical Analyzer Output



+-------------------------------------------------------+



Lexeme List

29 2 x 17 2 y 18 21 2 x 20 2 y 4 3 56 18 22 19
```

Figure 9. Outputs to console using the COMPILE –A command



```
Daves-MacBook-Pro:src davenandlall$ ./compile -a


Please enter the name of the source code file to be compiled:
program1.txt


+-------------------------------------------------------+


                Parser Output


+-------------------------------------------------------+



No errors program is syntactically correct!

Parser Output:

Generated Machine Code

6 0 4
6 0 2
3 0 4
1 0 56
2 0 2
4 0 3
2 0 0
```

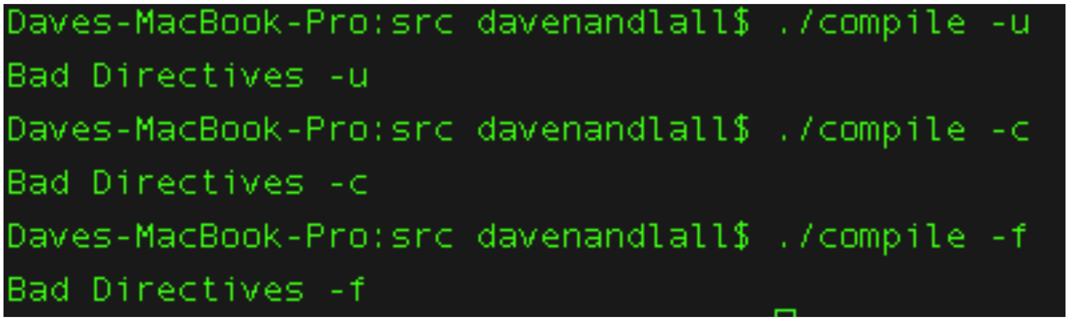
Figure 10. Outputs to console using COMPILE –V command



```
Daves-MacBook-Pro:src davenandlall$ ./compile -v


Please enter the name of the source code file to be compiled:
program1.txt




+-------------------------------------------------------+


                Virtual Machine Output


+-------------------------------------------------------+


Virtual Machine Execution

Line      OP       L   M
______________________________

0         INC      0   4
1         INC      0   2
2         LOD      0   4
3         LIT      0   56
4         OPR      0   2
5         STO      0   3
6         OPR      0   0
```

In the case of an unidentified compiler directive, an error message will appear on the console to the user (as seen in Figure 11) to signify that the compiler received a command that it does not recognize. In this case, the user should re-enter one of the valid compiler directives such as "-l" "-a" or "-v" or "no directive".

Figure 11. Entering a Bad Compiler Directive



```
Daves-MacBook-Pro:src davenandlall$ ./compile -u
Bad Directives -u
Daves-MacBook-Pro:src davenandlall$ ./compile -c
Bad Directives -c
Daves-MacBook-Pro:src davenandlall$ ./compile -f
Bad Directives -f
```

<u>Running on the Eustis Server</u>

- Provided that you do not own a UNIX machine, you can run the PL/0 compiler on the Eustis Server.

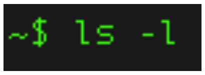
All Eustis Server setup instructions could be found at the link below.
Link: http://www.cs.ucf.edu/courses/cop3402/fall2013/assignments.html

1) First you need to connect to the Eustis Server via PuTTY or SSH.

2) Next you need a FTP or File Transfer Protocol program to transfer the "pl0" folder to the Eustis Server. Once the program folder is transferred continue to step 3.

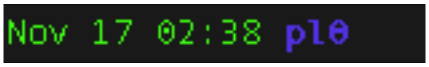
3) Now type the command “ls –l” (see Figure 12). This command displays all valid files on the Eustis Server. If the “pl0” folder is on the Eustis server you should see something like Figure 13.

Figure 12. Displaying all files and folders using LS –L Command via the Eustis Server



```
~$ ls -l
```

Figure 13. Display of the PL0 Folder on Eustis Server

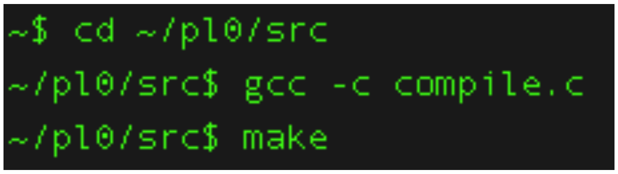


```
Nov 17 02:38 pl0
```

4) If the folder appears, you now have to change directories to access the contents of the folder, which contains all of the source files. After you access the folder, you need to compile the source code. After all the source code is compiled you can now enter the make command. Here are all the commands to be performed:

- cd ~/pl0/src -> and hit enter
- gcc –c compile.c -> and hit enter
- make -> and hit enter

Figure 14. Commands to Navigate To Project Folder, Compile Source Code and Makefile Utility on the Eustis Server



```
~$ cd ~/pl0/src
~/pl0/src$ gcc -c compile.c
~/pl0/src$ make
```

After these command you should be prompted to enter the name of the input file for the program as well as your compiler directives. Outputs should print to the console as well as output files. For more directions on how to read files and other Eustis commands visit the weblink and click on Eustis Tutorial.
Link: http://www.cs.ucf.edu/courses/cop3402/fall2013/assignments.html