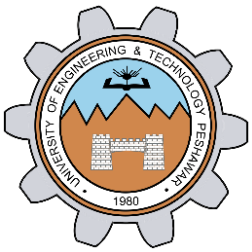
TRAVERSING
DIRECTORIES

LAB # 09



Fall 2023

CSE-302L

Systems Programming Lab

Submitted by: **AIMAL KHAN**

Registration No.: **21PWCSE1996**

Class Section: **A**

"On my honor, as student of University of Engineering and Technology, I have neither given nor received unauthorized assistance on this academic work."

Student Signature: 

Submitted to:

Engr. Abdullah Hamid

Sunday, January 28, 2024

Department of Computer Systems Engineering

University of Engineering and Technology, Peshawar

CSE 302L: SYSTEMS PROGRAMMING LAB

LAB ASSESSMENT RUBRICS

Criteria & Point Assigned	Outstanding 2	Acceptable 1.5	Considerable 1	Below Expectations 0.5	Score
Attendance and Attentiveness in Lab PLO08	Attended in proper Time and attentive in Lab	Attended in proper Time but not attentive in Lab	Attended late but attentive in Lab	Attended late not attentive in Lab	
Capability of writing Program/Algorithm/Drawing Flow Chart PLO1, PLO2, PLO3, PLO5	Right attempt/ no errors and well formatted	Right attempt/ no errors but not well formatted	Right attempt/ minor errors and not well formatted	Wrong attempt	
Result or Output/ Completion of target in Lab PLO9	100% target has been completed and well formatted.	75% target has been completed and well formatted.	50% target has been completed but not well formatted.	None of the outputs are correct.	
Overall, Knowledge PLO10,	Demonstrates excellent knowledge of lab	Demonstrates good knowledge of lab	Has partial idea about the Lab and procedure followed	Has poor idea about the Lab and procedure followed	
Attention to Lab Report PLO4,	Submission of Lab Report in Proper Time i.e., in next day of lab, with proper documentation.	Submission of Lab Report in proper time but not with proper documentation.	Late Submission with proper documentation.	Late Submission very poor documentation	

Instructor:

Name: _____ Signature: _____

TRAVERSING DIRECTORIES

Objectives:

The objectives of this lab are to gain a practical understanding of key system programming concepts, including

- Traversing Directories
- Traverse directory tree in depth-first order.
- Traverse directory tree in breadth-first order.

Tasks:

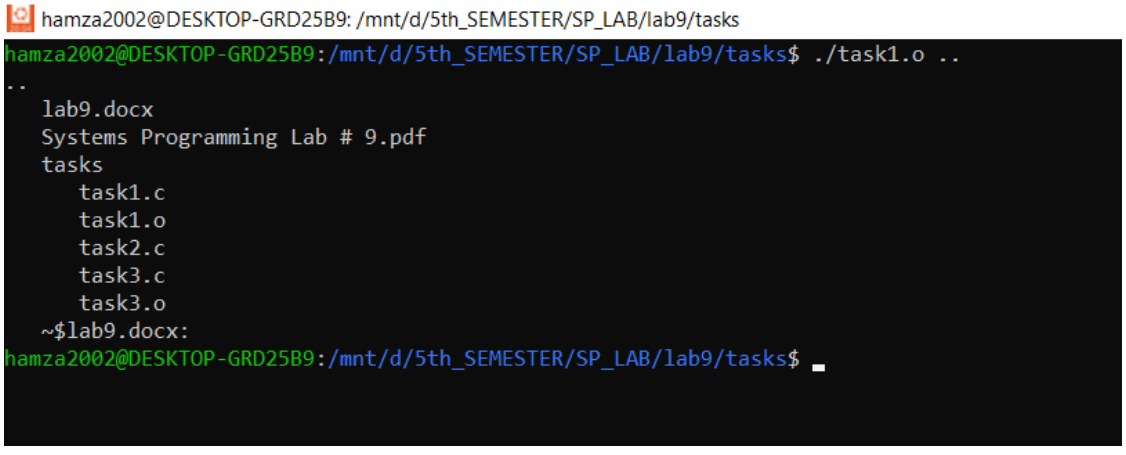
Task 1 : Traverse directory tree in depth-first order

Code in C:

```
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <sys/stat.h>
#include <dirent.h>
#include <string.h>

void depthFirstTraverse(const char *path, int depth)
{
    struct stat entryStatistics;
    struct dirent *directoryEntry;
    DIR *dp;

    if ((dp = opendir(path)) == NULL)
    {
        perror("Error while opening directory.\n");
        return;
    }

    while ((directoryEntry = readdir(dp)) != NULL)
    {
        char newPath[1024];

        if ((!strcmp(directoryEntry->d_name, ".")) ||
(!strcmp(directoryEntry->d_name, "..")))
            continue;

        for (int i = 0; i < depth; i++)
        {
            printf("   ");
        }

        S_ISDIR(entryStatistics.st_mode) ? printf("%s:\n",
directoryEntry->d_name) : printf("%s\n", directoryEntry->d_name);
```

```
        snprintf(newPath, sizeof(newPath), "%s/%s", path,
directoryEntry->d_name);

        if (stat(newPath, &entryStatistics) == -1)
        {
            perror("Error while traversing statistics.\n");
            return;
        }

        if (S_ISDIR(entryStatistics.st_mode))
        {
            depthFirstTraverse(newPath, depth + 1);
        }
    }

    closedir(dp);
}

int main(int argc, char *argv[])
{
    if (argc != 2)
    {
        fprintf(stderr, "Need at exactly one arg. Usage:\n%s
[DIR_PATH]\n", argv[0]);
        return 1;
    }

    printf("%s\n", argv[1]);
    depthFirstTraverse(argv[1], 1);

    return 0;
}
```

Output:



Task 2: Traverse directory tree in breadth-first order.

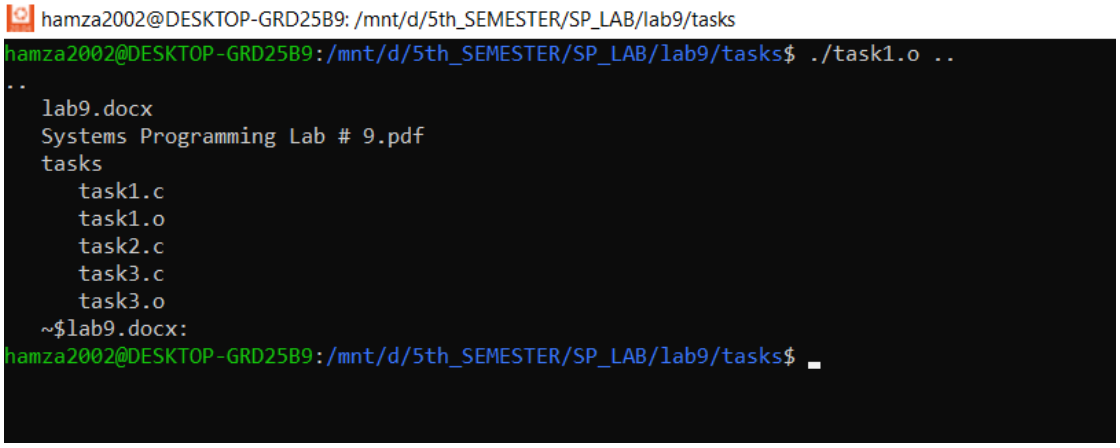
Code in C:

```
#include <stdio.h>
```

```
#include <stdlib.h>
#include <unistd.h>
#include <sys/stat.h>
#include <dirent.h>
#include <string.h>

// TODO Complete this function
void breadthFirstTraverse(char *path)
{
    struct stat entryStatistics;
    struct dirent *directoryEntry;
    DIR *dp;

    chdir(path);

    if ((dp = opendir(path)) == NULL)
    {
        perror("Error while opening directory.\n");
        return;
    }

    while ((directoryEntry = readdir(dp)) != NULL)
    {
        if ((!strcmp(directoryEntry->d_name, ".")) ||
(!strcmp(directoryEntry->d_name, "..")))
            continue;

        char newPath[1024];
        snprintf(newPath, sizeof(newPath), "%s/%s", path,
directoryEntry->d_name);

        if (stat(newPath, &entryStatistics) == -1)
        {
            perror("Error while traversing statistics.\n");
            return;
        }

        if (S_ISDIR(entryStatistics.st_mode))
        {
            breadthFirstTraverse(newPath);
        }

    }

    closedir(dp);
}

int main(int argc, char *argv[])
{
       if (argc != 2)
    {
        fprintf(stderr, "Usage: %s <directory_path>\n", argv[0]);
        return EXIT_FAILURE;
    }
```

```
    char *startPath = argv[1];
    breadthFirstTraverse(startPath);
    return 0;
}
```

Output:



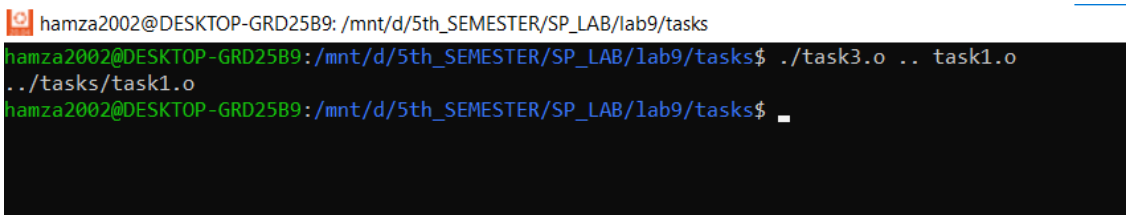
Task 3: Implement the pfind utility

Code in C:

```
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <sys/stat.h>
#include <dirent.h>
#include <string.h>

void searchFile(const char *path, const char *target)
{
    struct stat entryStatistics;
    struct dirent *directoryEntry;
    DIR *dp;

    // open path(directory)
    if ((dp = opendir(path)) == NULL)
    {
        perror("Error while opening directory.\n");
        return;
    }

    // read the directory entries one by one
    while ((directoryEntry = readdir(dp)) != NULL)
    {
        char newPath[1024];

        // skip . and ..
        if ((!strcmp(directoryEntry->d_name, ".")) ||
(!strcmp(directoryEntry->d_name, "..")))
            continue;
```

```
        // S_ISDIR(entryStatistics.st_mode) ? printf("%s:\n",
directoryEntry->d_name) : printf("%s\n", directoryEntry->d_name);
        // update the path by appending the file name with it.
        snprintf(newPath, sizeof(newPath), "%s/%s", path,
directoryEntry->d_name);

        if (stat(newPath, &entryStatistics) == -1)
        {
            perror("Error while traversing statistics.\n");
            return;
        }

        if (S_ISDIR(entryStatistics.st_mode)) // if directory search
for file in subdirectories.
            searchFile(newPath, target);
        else if (S_ISREG(entryStatistics.st_mode)) // if regular
file compare the name of entry and target.
            if (!strcmp(target, directoryEntry->d_name))
                printf("%s/%s\n", path, directoryEntry->d_name);
    }

    if (closedir(dp) == -1)
    {
        perror("Error while opening directory.\n");
        return;
    }
}

int main(int argc, char *argv[])
{
    if (argc != 3)
    {
        fprintf(stderr, "Need at exactly two arg. Usage:\n%s
[DIR_PATH] [TARGET_FILE]\n", argv[0]);
        return 1;
    }

    searchFile(argv[1], argv[2]);

    return 0;
}
```

Output:



Reference:

To view my codes, please refer to my GitHub account: https://github.com/aimalexe/DCSE/tree/main/semester_5_(fall-23)/systems_programming_lab/lab_reports .

Conclusion:

In summary, this laboratory experience has provided a comprehensive exploration of various fundamental system programming concepts, including traversing directories ,traverse directory tree in depth-first order and traverse directory tree in breadth-first order.

The End.