

Nithilam Subbaian  
Computer Operating Systems  
ECE-357-1  
Prof. Hakner  
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## **PSET 2: Problem 3 -- Recursive filesystem lister**

### **Source Code:**

```
#include <stdio.h>
#include <stdlib.h>
#include <fcntl.h>
#include <dirent.h>
#include <sys/types.h>
#include <sys/stat.h>
#include <errno.h>
#include <pwd.h>
#include <grp.h>
#include <time.h>
#include <unistd.h>
#include <string.h>

int directorySearch(char* dir, int flag){
    struct dirent *readopendirectory;
    DIR *opendirectory;

    if (!(opendirectory = opendir (dir))) {
        fprintf(stderr, "ERROR: Could not open directory %s: %s\n", dir, strerror(errno));
        return -1;
    }
    errno = 0;
    while ((readopendirectory = readdir(opendirectory)) != NULL) {
        const char *directoryname;
        char path[PATH_MAX];

        if (!flag) {
            if (((snprintf(path, sizeof(path), "%s/%s", dir, readopendirectory->d_name))<0)) {
                fprintf(stderr, "ERROR: PATH_MAX was exceeded for %s: %s\n", dir,
strerror(errno));
                return -1;
            }
            directoryname = readopendirectory->d_name;
        }else{
            sprintf(path, "%s", dir);
            directoryname = dir;
        }

        if (strcmp(directoryname, ".") != 0 && strcmp(directoryname, "..") != 0) {
```

```

struct stat st1;
if (lstat(path, &st1) < 0) {
    fprintf(stderr, "ERROR: Could not stat file %s: %s\n", path, strerror(errno));
    return -1;
}

ino_t ino = st1.st_ino;
printf("%*lu", 9, ino);

blkcnt_t blocks = st1.st_blocks;
printf("%*lu ", 7, blocks/2);

mode_t mode = st1.st_mode;
int isdir = S_ISDIR(mode);
int issymlink = S_ISLNK(mode);
int isregfile = S_ISREG(mode);

if (isdir) {
    printf("%s", "d" );
} else if (issymlink) {
    printf("%s", "l" );
} else if (isregfile) {
    printf("%s", "-");
}

printf( (mode & S_IRUSR) ? "r" : "-"); /* R for owner */
printf( (mode & S_IWUSR) ? "w" : "-"); /* W for owner */
printf( (mode & S_IXUSR) ? "x" : "-"); /* X for owner */
printf( (mode & S_IRGRP) ? "r" : "-"); /* R for group */
printf( (mode & S_IWGRP) ? "w" : "-"); /* W for group */
printf( (mode & S_IXGRP) ? "x" : "-"); /* X for group */
printf( (mode & S_IROTH) ? "r" : "-"); /* R for other */
printf( (mode & S_IWOTH) ? "w" : "-"); /* W for other */
printf( (mode & S_IXOTH) ? "x" : "-"); /* X for other */

nlink_t nlink = st1.st_nlink;
printf("%*lu", 4, nlink);

uid_t userid = st1.st_uid;
struct passwd *pwd;
pwd = getpwuid(userid);
if(pwd == NULL) {
    fprintf(stderr, "ERROR: Unable to obtain user id for %s", dir);
} else {
    printf("%*s", 6, pwd->pw_name);
}

```

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gid_t groupid = st1.st_gid;
struct group *grp;
grp = getgrgid(groupid);
if(grp == NULL) {
    fprintf(stderr, "ERROR: Unable to obtain group id for %s", dir);
} else {
    printf("%*s", 9, grp->gr_name); //must alter the number for user and group id with
different length
}

off_t size = st1.st_size;
printf("%*lu", 12, size);

time_t rawtime;
struct tm * timeinfo;
time ( &rawtime );
timeinfo = localtime( &rawtime );
int curYear = timeinfo->tm_year;
int curday = timeinfo->tm_yday;

struct tm *modificationtime;
modificationtime = localtime(&st1.st_mtime);

if(!modificationtime) {
    fprintf(stderr, "ERROR: Could not get mtime for path %s\n", path);
}

if(!timeinfo) {
    fprintf(stderr, "WARNING: Could not get current time. Current Time assumed to
be in same year as modification time" );
    timeinfo = modificationtime;
}

char buf1[1024];
if ((modificationtime->tm_year == curYear)) {
    if (((curday - modificationtime->tm_yday) < 30 )){
        strftime(buf1, sizeof(buf1), "%b %e %H:%M", modificationtime);
    }else{
        strftime(buf1, sizeof(buf1), "%b %e %Y", modificationtime);
    }
} else {
    strftime(buf1, sizeof(buf1), "%b %e %Y", modificationtime);
}
printf(" %s",buf1);

if (issymlink) {
    char buf[1024];
    ssize_t len; //typo in man page

```

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        if ((len = readlink(path, buf, sizeof(buf)-1)) != -1) {
            buf[len] = '\0';
        } else {
            fprintf(stderr, "ERROR: Could not read symlink %s: %s\n", path,
strerror(errno));
            return -1;
        }
        strcat(path, " -> ");
        strcat(path, buf);
    }
    printf(" %s\n", path );
}
if (!flag) {
    if (readdir(directory->d_type & DT_DIR) {
        if (strcmp(directoryname, ".") != 0 && strcmp(directoryname, "..") != 0) {
            directorySearch(path, flag);
        }
    }
} else {
    break;
}
errno = 0;
}
if(errno) {
    fprintf(stderr, "ERROR: Did not complete reading all the entries for starting directory of %s:
%s\n", dir, strerror(errno));
    return -1;
}
closedir (opendirectory);
}

```

```

int main(int argc, char *argv[]) {
    int flag = 1;
    char* startingdirectory;
    struct stat st;

    switch (argc) {
    case 1:
        startingdirectory = "./";
        break;
    case 2:
        startingdirectory = argv[1];
        break;
    default:
        fprintf(stderr, "ERROR: Invalid input argument specified (Possible errors include invalid
amount of arguments specified)");
        return -1;
    }
}

```

```

    }

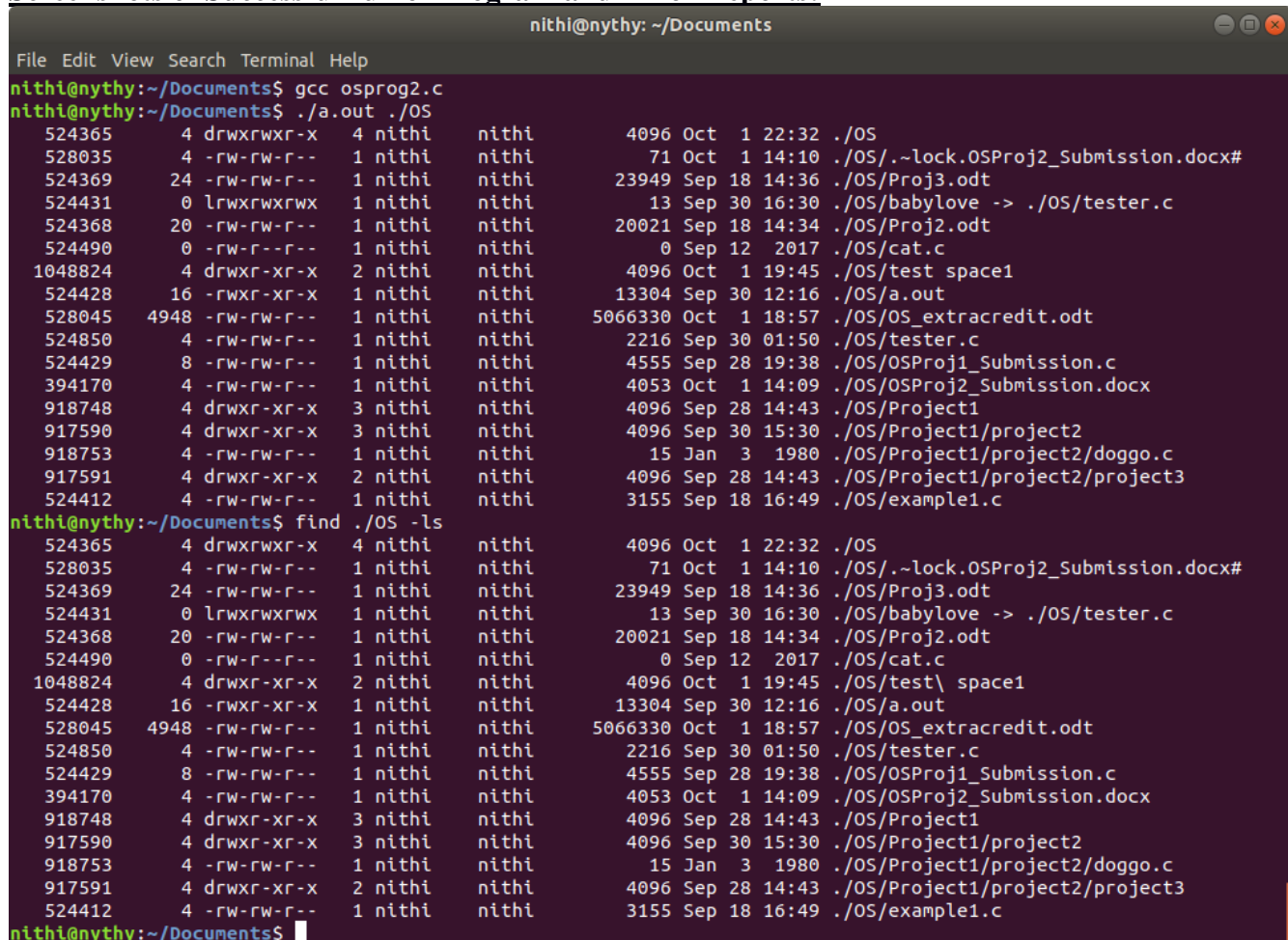
    if(stat(startingdirectory, &st)<0) {
        fprintf(stderr, "ERROR: Could not get the stat of %s: %s\n",startingdirectory,
strerror(errno));
        return -1;
    }

    directorySearch(startingdirectory, flag);
    flag = 0;
    directorySearch(startingdirectory,flag);
    return 0;

}

```

### Screenshots of Successful run of Program and Error Reports:



```

nithi@nythy: ~/Documents
File Edit View Search Terminal Help
nithi@nythy:~/Documents$ gcc osprog2.c
nithi@nythy:~/Documents$ ./a.out ./OS
 524365      4 drwxrwxr-x  4 nithi  nithi      4096 Oct  1 22:32 ./OS
 528035      4 -rw-rw-r--  1 nithi  nithi        71 Oct  1 14:10 ./OS/..lock.OSProj2_Submission.docx#
 524369     24 -rw-rw-r--  1 nithi  nithi    23949 Sep 18 14:36 ./OS/Proj3.odt
 524431      0 lrwxrwxrwx  1 nithi  nithi       13 Sep 30 16:30 ./OS/babylove -> ./OS/tester.c
 524368     20 -rw-rw-r--  1 nithi  nithi    20021 Sep 18 14:34 ./OS/Proj2.odt
 524490      0 -rw-r--r--  1 nithi  nithi        0 Sep 12  2017 ./OS/cat.c
1048824      4 drwxr-xr-x  2 nithi  nithi     4096 Oct  1 19:45 ./OS/test space1
 524428     16 -rwxr-xr-x  1 nithi  nithi    13304 Sep 30 12:16 ./OS/a.out
 528045    4948 -rw-rw-r--  1 nithi  nithi   5066330 Oct  1 18:57 ./OS/OS_extracredit.odt
 524850      4 -rw-rw-r--  1 nithi  nithi     2216 Sep 30 01:50 ./OS/tester.c
 524429      8 -rw-rw-r--  1 nithi  nithi     4555 Sep 28 19:38 ./OS/OSProj1_Submission.c
 394170      4 -rw-rw-r--  1 nithi  nithi     4053 Oct  1 14:09 ./OS/OSProj2_Submission.docx
 918748      4 drwxr-xr-x  3 nithi  nithi     4096 Sep 28 14:43 ./OS/Project1
 917590      4 drwxr-xr-x  3 nithi  nithi     4096 Sep 30 15:30 ./OS/Project1/project2
 918753      4 -rw-rw-r--  1 nithi  nithi       15 Jan  3 1980 ./OS/Project1/project2/doggo.c
 917591      4 drwxr-xr-x  2 nithi  nithi     4096 Sep 28 14:43 ./OS/Project1/project2/project3
 524412      4 -rw-rw-r--  1 nithi  nithi     3155 Sep 18 16:49 ./OS/example1.c
nithi@nythy:~/Documents$ find ./OS -ls
 524365      4 drwxrwxr-x  4 nithi  nithi     4096 Oct  1 22:32 ./OS
 528035      4 -rw-rw-r--  1 nithi  nithi        71 Oct  1 14:10 ./OS/..lock.OSProj2_Submission.docx#
 524369     24 -rw-rw-r--  1 nithi  nithi    23949 Sep 18 14:36 ./OS/Proj3.odt
 524431      0 lrwxrwxrwx  1 nithi  nithi       13 Sep 30 16:30 ./OS/babylove -> ./OS/tester.c
 524368     20 -rw-rw-r--  1 nithi  nithi    20021 Sep 18 14:34 ./OS/Proj2.odt
 524490      0 -rw-r--r--  1 nithi  nithi        0 Sep 12  2017 ./OS/cat.c
1048824      4 drwxr-xr-x  2 nithi  nithi     4096 Oct  1 19:45 ./OS/test\ space1
 524428     16 -rwxr-xr-x  1 nithi  nithi    13304 Sep 30 12:16 ./OS/a.out
 528045    4948 -rw-rw-r--  1 nithi  nithi   5066330 Oct  1 18:57 ./OS/OS_extracredit.odt
 524850      4 -rw-rw-r--  1 nithi  nithi     2216 Sep 30 01:50 ./OS/tester.c
 524429      8 -rw-rw-r--  1 nithi  nithi     4555 Sep 28 19:38 ./OS/OSProj1_Submission.c
 394170      4 -rw-rw-r--  1 nithi  nithi     4053 Oct  1 14:09 ./OS/OSProj2_Submission.docx
 918748      4 drwxr-xr-x  3 nithi  nithi     4096 Sep 28 14:43 ./OS/Project1
 917590      4 drwxr-xr-x  3 nithi  nithi     4096 Sep 30 15:30 ./OS/Project1/project2
 918753      4 -rw-rw-r--  1 nithi  nithi       15 Jan  3 1980 ./OS/Project1/project2/doggo.c
 917591      4 drwxr-xr-x  2 nithi  nithi     4096 Sep 28 14:43 ./OS/Project1/project2/project3
 524412      4 -rw-rw-r--  1 nithi  nithi     3155 Sep 18 16:49 ./OS/example1.c
nithi@nythy:~/Documents$

```