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// Camille Chow
// hunt.c
// ECE357 Assignment 2
// 10/8/17

#include <sys/stat.h>
#include <sys/types.h>
#include <dirent.h>
#include <stdio.h>
#include <errno.h>
#include <string.h>
#include <unistd.h>
#include <fcntl.h>
#include <limits.h>

//Global Variables
ino_t target_ino;
off_t target_size;
dev_t target_dev;
char* target_name;
const int buff_size = BUFSIZ;

//Function to compare contents of files
//returns 1 if identical
//returns 0 if not identical
//returns -1 on error
int compareFiles(char* path) {

    int fd1, fd2;
    char* b1[buff_size], b2[buff_size];

    //open files
    if ((fd1 = open(target_name, O_RDONLY)) < 0) {
        fprintf(stderr, "Warning: Can't open target file '%s' for reading: %s\nCan't check for duplicate\n", target_name, strerror(errno));
        return -1;
    }
    if ((fd2 = open(path, O_RDONLY)) < 0) {
        fprintf(stderr, "Warning: Can't open file '%s' for reading: %s\nCan't check if duplicate\n", path, strerror(errno));
        return -1;
    }

    int n,m;
    //read to buffer
    while ((n = read(fd1, b1, buff_size)) != 0 && (m = read(fd2, b2, buff_size)) != 0) {
        if (n < 0) {
            fprintf(stderr, "Error reading from target file '%s': %s\nCan't check for duplicate\n", target_name, strerror(errno));
            return -1;
        }
        else if (m < 0) {
            fprintf(stderr, "Error reading from target file '%s': %s\nCan't check if duplicate\n", path, strerror(errno));
            return -1;
        }
    }
}
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    }
    else if (memcmp(b1,b2,n) != 0) {
        return 0;
    }
}
return 1;
}

//Recursive searching function
void searchFiles(char *directory) {

    DIR *dir;
    struct dirent *entry;

    if (!(dir = opendir(directory))) {
        fprintf(stderr, "Warning: Could not open directory %s: %s\n", directory,
            strerror(errno));
        return;
    }

    while ((entry = readdir(dir)) != NULL) {

        //current path
        char path[PATH_MAX];
        sprintf(path, "%s/%s", directory, entry->d_name);

        //if entry is another directory, recursively search
        if (entry->d_type == DT_DIR) {
            if (strcmp(entry->d_name, ".") == 0 || strcmp(entry->d_name, "..") ==
                0)
                continue;
            searchFiles(path);
        }

        //symlink handling
        else if (entry->d_type == DT_LNK) {

            //find contents of link
            char link[PATH_MAX];
            if (readlink(path,link,sizeof(link)) < 0) {
                fprintf(stderr, "Warning: Could check contents of symlink %s: %s
                    \n", path, strerror(errno));
                continue;
            }

            //run stat on link
            struct stat st;
            if (stat(link,&st) < 0) {
                fprintf(stderr, "Warning: Could not run stat on contents of
                    symlink %s (%s): %s\n", path, link, strerror(errno));
                continue;
            }

            mode_t mode = st.st_mode;
            ino_t ino = st.st_ino;
            off_t size = st.st_size;

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dev_t dev = st.st_dev;

if ((mode & S_IFREG) != 0) {
    //resolves to target
    if (ino == target_ino && dev == target_dev) {
        printf("%s\tSYMLINK RESOLVES TO TARGET\n",path);
    }
    //resolves to duplicate
    else if (size == target_size && compareFiles(link) == 1) {
        printf("%s\tSYMLINK (%s) RESOLVES TO DUPLICATE\n",path,link);
    }
}
else {
    printf("%s links to something not a file, skipping\n", path);
}

}
//regular file handling
else if (entry->d_type == DT_REG) {

    //run stat on entry
    struct stat st;
    if (stat(path,&st) < 0) {
        fprintf(stderr, "Warning: Could not run stat on file %s: %s\n",
            path, strerror(errno));
        continue;
    }

    ino_t ino = st.st_ino;
    off_t size = st.st_size;
    dev_t dev = st.st_dev;

    //get permissions
    mode_t mode = st.st_mode;
    char* perm_string;

    if ((mode & S_IROTH) != 0) {
        perm_string = "OK READ by OTHER";
    }
    else {
        perm_string = "NOT READABLE by OTHER";
    }

    //check for hardlink
    if (ino == target_ino && dev == target_dev) {
        printf("%s\tHARD LINK TO TARGET\t%s\n",path,perm_string);
    }

    //check for duplicate
    else if (size == target_size && compareFiles(path) == 1) {
        nlink_t links = st.st_nlink;
        printf("%s\tDUPLICATE OF TARGET (nlink=%d)\t%s\n",path,links,
            perm_string);
    }
}
//other file type

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        else {
            printf("%s not a directory, regular file, or symlink, skipping\n",
                path);
        }
    }
    closedir(dir);
}

//main loop
int main(int argc, char**argv) {

    if (argc != 3) {
        fprintf(stderr, "Incorrect number of input arguments\n");
        return -1;
    }

    target_name = argv[1];
    char* starting_directory = argv[2];

    DIR* dir;
    struct stat st;

    if (stat(target_name,&st) < 0) {
        fprintf(stderr, "FATAL ERROR: Could not run stat on target file '%s': %s\n",
            target_name, strerror(errno));
        return -1;
    }
    else if (!(dir = opendir(starting_directory))) {
        fprintf(stderr, "FATAL ERROR: Could not open directory '%s': %s\n",
            starting_directory, strerror(errno));
        return -1;
    }
    target_ino = st.st_ino;
    target_size = st.st_size;
    target_dev = st.st_dev;

    searchFiles(starting_directory);

    return 0;
}
```