Course COMP-8567
Assignment 01
Winter 2026
Due Date: Feb/11/2025, 11 PM
Marks: 50

Associated Learning Outcomes:
- Apply OS concepts to design algorithms to solve systems programming problems in a variety of different systems, such as Unix/Linux/Android environments.
- Correctly define systems programming problems and identify and apply appropriate solutions approaches.
- Design and implement solutions that use the hardware and/or kernel services to solve systems programming problems involving the latest computing technologies.

Note: Please check the following link for the **complete list** of learning outcomes for COMP 8567
https://ctl2.uwindsor.ca/cuma/public/courses/pdf/ee1b450a-23a6-4635-b0c6-40a47a21331f

Important Terms:
- In Linux, every directory other than the root directory (**/**) is a subdirectory**.**
  - Ex: /home/pranga is a subdirectory
  - Ex: /home/pranga/chapter3 is a subdirectory
- Likewise, the **main tree** of the file system is rooted at **/**, and any other tree rooted at any subdirectory is called a **subtree**

Mandatory Requirement:

You must use the **nftw() library function (defined in ftw.h)** that allows you to traverse a file tree. This library function will recursively visit all the files/directories present in the tree and will call your own function (a function that you pass as a parameter). You need to read the manual of nftw() before you start working on your assignment. Here are some good resources.

- https://man7.org/linux/man-pages/man3/nftw.3p.html
- https://man.freebsd.org/cgi/man.cgi?query=nftw&sektion=3&manpath=FreeBSD+6.0-current
- https://manual.cs50.io/3/nftw

NOTE: In the remainder of this document, dir and root_dir are the absolute path of a subdirectory that belongs to the subtree rooted at ~ (home directory of the user on delta) – It can also possibly be the home directory itself. Therefore, dir and root_dir can be any subdirectory that was created and belongs to the user and cannot be anything above the home directory on delta.

Write a C program **dtreew26,** that performs actions based on various command line arguments as listed below:

dtreew26 -flist [dir]

- List all files in dir the chronological order of creation (newly created files should be listed first)
    - Example: $dtreew26 -flist /home/pranga/chapter4 should list all files in /home/pranga/chapter4 in the reverse chronological order.

dtreew26 -tcount [filetype1] [filetype2] [filetype3] [dir] //filetype: could be one of the following: .c,.pdf,.txt, .zip upto three types.

- Lists the count of all files of type (filetype) in dir.
    - Example: $dtreew26 -tcount .pdf .c .txt /home/pranga/chapter4 should list the count of all .pdf, .c and .txt in /home/pranga/chapter4
    - Users can also input only one or two file types (but a min of 1 and max 3)
    - Example: $dtreew26 -tcount .c .txt /home/pranga/chapter4 should list the count of all .c and .txt in /home/pranga/chapter4

dtreew26 -srchf [filename] [root_dir]

- Lists the absolute paths of all files with the name [filename] in the entire directory subtree (The subdirectory/ its subdirectories/ and so on) rooted at root_dir.
    - Example: $dtreew26 -srchf ex1.c /home/pranga/chapter3 can output the following:

        /home/pranga/chapter3/ex1.c
        /home/pranga/chapter3/test/ex1.c
        /home/pranga/chapter3/backup/ex1.c //Depending on the contents

        Display an appropriate message if the file is not found.

dtreew26 -dircnt [root_dir]

- Lists the count of all directories present in the <u>entire subtree</u> rooted at root_dir

dtreew26 -sumfilesize [root_dir]

- Lists the total size of all files (in bytes) present in the entire subtree rooted at root_dir

dtreew26 -lfsize [dir]

- List all files in the directory subtree rooted at dir in the reverse order of file size (largest to smallest). For each file, list its absolute path and filesize in bytes

- Example: $dtreew26 -lfsize /home/pranga should list all files in the entire subdirectory rooted at /home/pranga (that is, the entire home directory, its folders and subfolders) in the reverse order of the file sizes (break tries alphabetically based on the filename)

dtreew26 -nonwr [dir]

- List all files in the directory subtree rooted at dir for which the user has no write permission. List them in alphabetical order
    - Example: $dtreew26 -nonwr /home/pranga should list all files for which the user has no write permission in the entire subdirectory rooted at /home/pranga (that is, the entire home directory, its folders, and subfolders) in alphabetical order

dtreew26 -copyd [source_dir] [destination_dir]

Note : In this case, source_dir and destination_dir can be any subdirectory of the directory treet rooted at ~ , but neither of them can be ~

- Copy the entire subdirectory rooted at source_dir to destination_dir and do not delete the directory (and contents) rooted at source_dir.
- The subdirectory structure at the destination must match the subdirectory structure at the source.

Example: $dtreew26 -copyd /home/pranga/chapter4 /home/pranga/chapter9/backup must copy the entire subtree rooted at chapter4 to backu. //chatpter4 (and its subdirectories & files (and their subdirectories & files and so on..) must be created under backup

dtreew26 -dmove [source_dir] [destination_dir]

- Move the entire subtree rooted at source_dir to destination_dir and delete the subtree rooted at source_dir.

dtreew26 -remd [root_dir] [file_extension]

- Deletes all files of a specific file extension in the subtree rooted at root_dir.
  Example: $dtreew26 -remd /home/pranga/temp .log should delete(remove) all .log files under /home/pranga/temp.

Submission Instructions (Note: Plagiarism Detection Tool: MOSS)

//Please check the Assignment Rubrics on Brightspace (under "Evaluation Rubrics") for more information on the evaluation criteria.

You need to submit the following:
1. a1_firstname_lastname_SID.c
3. Zoom/Google Drive recording <u>link</u> explaining the following (not more than 15 minutes)
   - Overall working of the code and various modules (around 8-9 minutes)
   - Execution of the code under various inputs/conditions as per the requirements of the assignment (around 6-7 minutes)
   - Other form of links/MP4 files will NOT be acceptable.
   - <mark>Include the link in the COMMENTS section</mark> when you submit your file onto Brightspace