CS416: Systems Programming, Spring 2024

Programming Assignment 2

Due Date: May 26, 11:59 PM

In lectures 9, 10, and 11, you have learned about thread management using various system calls (e.g., pthread_create and pthread_join) while in lectures 5 and 6, we have learned about file manipulation using multiple system calls. In this exercise, you need to write a program utilizing such system calls for the following problem.

Assume that CS416 has three sections and the GJU eLearning system has generated the students' scores for an exam in three different files:

- **CS416_Section1_Midterm.txt**
- **CS416_Section2_Midterm.txt**
- **CS416_Section3_Midterm.txt**

Assume that the file format is as follows (multiple lines and each line is comma-separated, including student name and student grade):

Abdullah Omar, 25 Ahmad Khaled, 26 Abbas Ali, 27

Write a C program that uses the following pseudo code

- **The main program creates three secondary threads, and each thread reads one of the files.**
- **Each thread reads the corresponding file and updates a global shared array with the analysis summary in a certain element in the array. The analysis summary must be stored in a structure to include the following:**
  - **the number of students enrolled in a section**
  - **the total of students' scores.**
- **The main program reads the global shared array to generate the final output in a file to report the following:**
  - **The average of students scores in each section**
  - **The overall average of students scores**

Important note: the global shared array must be created in the dynamic memory space (i.e., using malloc or calloc) as you learned in lecture 7.

Notes:

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- For file management, you have to use “Only” the system calls you learned in the class. Otherwise, your assignment grade will be converted to zero immediately.
- Your program should not assume that a section file contains a fixed number of rows. In particular, your program should read all data in a file until reaching the end of a file.
- You can use mutex if needed to implement the program correctly.

Submission Instructions:

- The submission should include one directory which includes the related C program files (*.c, *.h, and *.txt).
- Please compress the directory in a compressed file and name it in the following format:

  programming_assign2_firstName_LastName.zip

- Please use eLearning to submit your homework.