

48450 Real Time Operating Systems

Assignment 2 (20 marks)

Deadline for submission: 23:59 PM, 1 May 2018

1. Introduction

This assignment will involve the development of some application programs with real time file reading and writing. You are required to create a program that applies several key concepts in the subject of 48450 Real Time Operating Systems. A submission will be marked based on its merits and may be awarded a mark that is less than the total Mark 20 if it's of modest quality. You are required to include a reflective self-assessment in the conclusion and submit it by the due date.

All programs are implemented in C language.

This assignment is marked out of 20 and comprises 20% of the total score for this course.

2. Assignment details

Topic: Mutex, Shared memory and Pipe for real time file reading/writing - - Mark 20

This topic will involve the development of some application programs using threads and pipe concepts. Your assignment is required to include two programs, namely: **Prg_1 and Prg_2**

- (1) **Prg_1 (14 points):** You are required to create three threads (A, B and C) for reading data from one file and writing the data to another file through the pipe-line concept and your program runs the three threads (A, B and C) iteratively after you create a **pipe (required by the assignment)** . **At each time:**
 - 1 The thread A writes one line of characters from a given “data.txt” file to the pipe. Note: The “data.txt” text file shown in Figure 1.
 2. The thread B reads data from the **pipe** and passes the data for the thread C.
Note: There are several ways to pass the data for the operation of Thread C. You are required to try your best to find a solution.
 3. The thread C reads the line of characters from B and detects whether the characters are from the **File header region** or from the **Content region**. If the characters are not from the **File header region**, they will be written into a “src.txt” file. Otherwise the characters will be discarded. **Note:** To detect the end of file header region, in thread C, you are also required to detect the “end header” – do your smart way to address this issue.

The Prg_1 needs to calculate its total running time from the beginning to the end. Once the program reach to the end, the running time information should be written to a shared memory named “shared”.

The three threads run A->B->C iteratively. When Thread A reaches to the end of the source file, It indicates that the three threads A, B and C will finish.

Your program is required to include mutex, thread and pipe whereby necessary. Please note: The threads A, B and C must run in mutual exclusively based on the three semaphore statuses -- ‘write’, ‘read’ and ‘justify’. This is to avoid the contents under/overflow within the pipe.

Your program is also need to use a ‘struct’ to pass the parameters to the threads. The source file can be downloaded from UTSONline. This text file contains two parts which are shown in Figure 1. A gain, you only need to write the data of content region to “src.txt”.

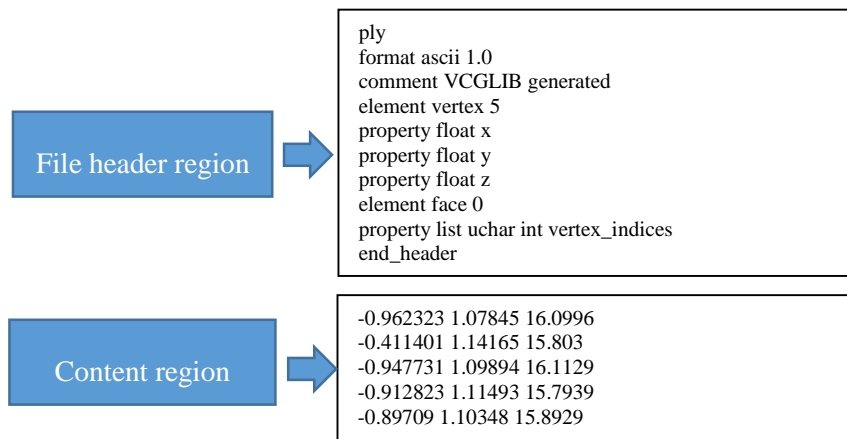


Figure 1. The overall structure the given text file

- (2) **Prg_2 (6 pints):** You are required to write a program that reads the information from shared memory used in the **Prg_1** and output the information from the memory to your PC/Laptop monitor.

Experiment: If you do not apply mutex, what the result will be by only using the three threads and the pipe?
You are required to write a brief analysis in your final report

3. Assignment Deadline and Submission

The deadline to submit this assignment is 23:59 PM, 1 May 2018

You are required to submit two formats of the assignment:

1. Upload your full assignment report.
2. Upload your 'C' code file

If you use makefile for compiling your program, you are required to upload the makefile files as well