Assignment:Real-time Programming with `pthreads`

20th February 2023

For this assignment, you will need the template code `critical.c` and `multithread.c`. Download these from the module's KEATS page and save it to your computer. Use the following command to compile the source code:

```
gcc filename.c -o filename -lrt -lpthread
```

where `filename` is the name of the source code file. The resultant executable should be run using `sudo`, *i.e.,* use the command:

```
sudo ./filename
```

Check that the above works for the source code provided, and complete the following exercises.

Examine the code for program `multithread.c` and make sure that you understand what it does.

1. Run the code and report the output. To run this program you need to use sudo (*i.e.,* use the command: `sudo ./multithread`). Briefly explain what this program does and how the scheduling gives rise to the observed behaviour.

   [7 marks]

2. Modify the `threadA` function so that after printing half the letters it the following two instructions are called:
   `param.sched_priority = priority_min+2;`
   `pthread_setschedparam(threadB_id,policy,&param);`
   Run the modified program and report the output. Explain the effect of this change on the observed behaviour.

   [8 marks]

3. Use use the `nanosleep` command to modify the original program so that `threadA` sleeps for 1 millisecond after printing half its letters. Run the code and report the output. Explain the effect of this change on the observed behaviour.

   [6 marks]

4. Compile and run the program `critical.c`. Report the output. Briefly explain what this program does and how the scheduling gives rise to the observed behaviour.

[3 marks]

5. Modify the code so that the mutexes are no longer "commented-out". Run the program and report the output. Briefly explain the execution of the modified program.

[6 marks]

Completed assignments should be submitted to KEATS on 4pm, 7th March 2023.

Your report must be **no longer than two A4-pages** (all pages contained in the file beyond this limit will be removed from the file and discarded prior to marking). It should be submitted as a single PDF with a minimum font size of 11pt, and margins of no less than 2cm.

This assignment is worth 30% of the module mark.