

## A3 (20 marks)

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### Focus: OpenMP (up to work-sharing part 1)

Q1. [10 marks] Download the *ImageProcessing.zip* file from Connect. Unzip and copy contents to a new C project. Read the “readme.txt” for copyright info and for some background about the library used.

The first three statements in the main function define the input and output images and the required processing. Play with the values of these constants and check the output.

Your goal is to reduce the processing time by dividing the workload among several threads (e.g., 4 threads) using OpenMP (but don't use the `parallel for` directive). To verify the correctness of your code, check the output image as well as the processing time (printed out in the console). Report the processing times for 2, 4, 8, 16 threads as a comment in your code.

Q2. [10 marks] (Adapted from Pacheco-11) Download `omp_trap_1.c` and modify it twice so that:

- a) you perform reduction manually with your own code after the function call. i.e. Don't use the `reduction` operator. Instead find the *local* result for each thread and then combine at the end into a global result (an example is shown in the textbook PACHECO-11 page 222 and in the lecture notes in the first slide in “Using the Reduction Clause” section).
- b) Repeat a but with the `reduction` operator.

For both (a) and (b), compare the execution time of the parallel block using `omp_get_wtime()` which returns the number of seconds that have passed since some time in the past. For details on taking timings, see Section 2.6.4 of the textbook PACHECO-11.

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### Submission Instructions

For this assignment, you need to do the following:

- 1- *Programming questions*: Create one C file for *each* programming question and write your answer inside that file. Your files should have the same name as the question number (e.g., Q1.c)
- 2- *Non-programming questions*:
  - a. If there are any discussion/essay questions related to a programming question, write your answers as comments at the end of your code for that question.
  - b. For all other non-programming questions (i.e., not related to any programming question), write your answers to all of them in *one* Word document file,
- 3- After solving all questions, compress all your files into one zip folder and give a name to the zipped file that matches your ID (e.g., 1234567.zip).
- 4- Submit the zipped file **to Blackboard Connect**.

Note that you can resubmit an assignment, but the new submission overwrites the old submission and receives a new timestamp.