COMP90025 Parallel and Multicore Computing

Project 1B - Mandelbrot Set

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Summary

- The first project is individual and is divided into small parts, this is Part B.
- A sequential algorithm for computing the number of points in the Mandelbrot Set has been provided on LMS. The program reads an arbitrary number of regions from the command line and outputs, for each region, the number of points that lie within the set.

Example

```
$./mandelbrot -2.0 1.0 -1.0 1.0 100 10000 -1 1.0 0.0 1.0 100 10000
2538
3509
```

The general format is:

```
madelbrot real_lower real_upper img_lower img_upper num maxiter
```

Tasks

- You are required to write an MPI+OpenMP program that computes and outputs, in the same way, the number of points in the regions of the Mandelbrot Set as given on the command line.
- You should aim to have your program run as fast as possible. In doing so, you may alter the calculations of the program, so long as the final output is correct.
  - The Mandelbrot Set admits some mathematical simplifications that you can readily find online, e.g. see the Optimizations section here: `https://en.wikipedia.org/wiki/Mandelbrot_set`.
- Write at most 1000 words that outlines how you achieved parallelism/high performance. Include tables and/or charts of your own measurements that support your discussion.

Assessment

- Project 1 B is worth **13%** of your total assessment. It is individual work.
- Assessment of the report (5/13) is based on the level of details and presentation.
- Assessment of the program (8/13) is based on correctness and performance. Incorrect programs (i.e. that give incorrect outputs or that fail to compile/run) will attract few if any marks. The top 10 fastest running programs, when given a mystery work load (you will not be told the work load in advance, however the program will be tested on 4 x 32 core machines), will be given a bonus mark; i.e. the maximum mark for this project part is 14/13.
- Low end tie-breakers in the top 10 will not receive bonus marks. E.g. if everyone in the top 10 has the same run time then no bonus marks will be awarded. And e.g. if the last 5 in the top 10 (i.e. 6 to 10) have the same run time then they will not receive bonus marks.

Submission

- Submit a PDF of your report (use PDF only, no other format will be assed) via LMS on or before **Saturday 16th September**. As well you will need to submit your program via LMS. Instructions for doing this will be given closer to the deadline.
- Use 10pt font, single line spacing, 1 inch margins all around and double column. Use appropriate headings and clearly label and refer to tables/figures. Clearly put your name and login name at the top of the report.