INF236 PARALLEL ALGORITHMS - ASSIGNMENT 1 2014

Requirements:

- The assignment is due February 26 at 4 p.m.
- Your answer is to be uploaded at the course page at MiSide
- For each problem, the answer is to contain: (1) a brief report on how the problem was solved, (2) benchmark report, (3) program file.
- Grading system: 0–100 points. Passing the assignment with at least 40 points is a prerequisite for admission to the exam. The total score on all three compulsory assignments counts 50% of the final grade.

Problem 1

Write an MPI-program that computes the number of pairs of consecutive odd integers less than or equal to an input value n that both are prime numbers. For example, if $n = 20$, the answer is 4, because we find the pairs (3,5), (5,7), (11,13), and (17,19). To check whether any given number m is prime, use the naive primality test, which amounts to running through all integers $q \leq \sqrt{n}$ until some q that divides m is found.

Write a test report containing measurements of the speedup of your program as a function of p. Use values of n in the range $10^6 - -10^8$.

Problem 2

Write an MPI-program for computing the Mandelbrot Set (see Section 3.2.2 in the book of Wilkinson and Allen and/or notes from the lecture of February 10). Your program should respect the master-slave format, where the master process is responsible for assigning computational tasks to the slaves. Compare this approach to an approach with static task assignment (you can use/modify the code discussed in class on February 10, which is uploaded to MiSide). In your experiments, vary the size m of the grid, the number of iterations n in the computation of pixel values, and the number of processes p. Include a sequential algorithm ($p = 1$). Address the questions

- For what values of m and n is a parallel approach worthwhile?
- For what values of m, n and p is a dynamic task assignment faster than static task assignment?

Provide time measurements of your programs for a range of values of m, n and p. As a starting point, you may consider $m = 200 \times 200$ and $n = 10^6$.