

PHYS405
Advanced Computational Physics
Parallel Computing

Assignment # 6
Due: Friday, November 5, 2009

Purpose: Learn how to implement a hostless parallel algorithm.

Note: Please identify all your work.

This assignment consists in rewriting the code calculating the Mandelbrot Set in a static load balance approach using a hostless parallel algorithm.

In a hostless parallel algorithm, **all** nodes are treated on the same basis, except possibly for a brief dialogue with the user to start with and some post-processing of the data at the end of the calculation by node 0. In general, this paradigm is simpler to code than a master-slave approach. But it requires to find a way to divide the problem in parcels of equal complexity, therefore taking equivalent time to compute.

In the Mandelbrot Set adjacent lines of pixels in the image ought to take comparable times to compute. Therefore a static load balance algorithm follows by requesting the nodes (including node 0 – therefore a hostless algorithm) to calculate the lines in the image on a cyclic basis. For instance, if three (3) nodes are used, each node should compute the lines of pixels according to the following table:

node	lines
0	0, 3, 6, 9, ...
1	1, 4, 7, 10, ...
2	2, 5, 8, 11, ...

Part A Write a code to

- implement the hostless approach
- produce the Mandelbrot Set image by piping the data in *plot_image.py*
- reproduce the same image as the serial and master-slave versions from the notes in the web pages
- handle an arbitrary number of nodes
- handle an arbitrary size for the image (default: 700x500)

Part B Include *timing calls* in your code to prove (or disprove) the assumption that the approach described above really leads to a proper load balance. Quantify the time variations in the nodes when using from 2 to 16 nodes.

You could solve this assignment on borg0.physics.drexel.edu.