Assignment 8 Report

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1

The output of gprof can be found in the files `serial_output.txt` and `parallel_output.txt`.

2

For the serial output, the program ran in 40.06 s. It spent most of its time in the `get_max_diff` function, and `apply_average` function, spending 22.64 s (56.58% of total time) and 16.71 s (41.77% of total time) in each respectively. Each of these functions loop over the whole grid of points, and have been parallelized with openmp.

3

Timing results from running on Teach with different numbers of cores can be found in `runtime.txt`.

4

I used Jupyter to do a quick fit to the data. Fitting to

$$S = \frac{T_{\text{serial}}}{T(P)} = \frac{1}{f + (1-f)/P}\,, \tag{1}$$

where S is the speed up, T_{serial} is the runtime on 1 core, $T(P)$ is the runtime on P cores, and f is the serial fraction gives $f = 0.096$. Figure 1 shows the Teach speed ups, and fit result.

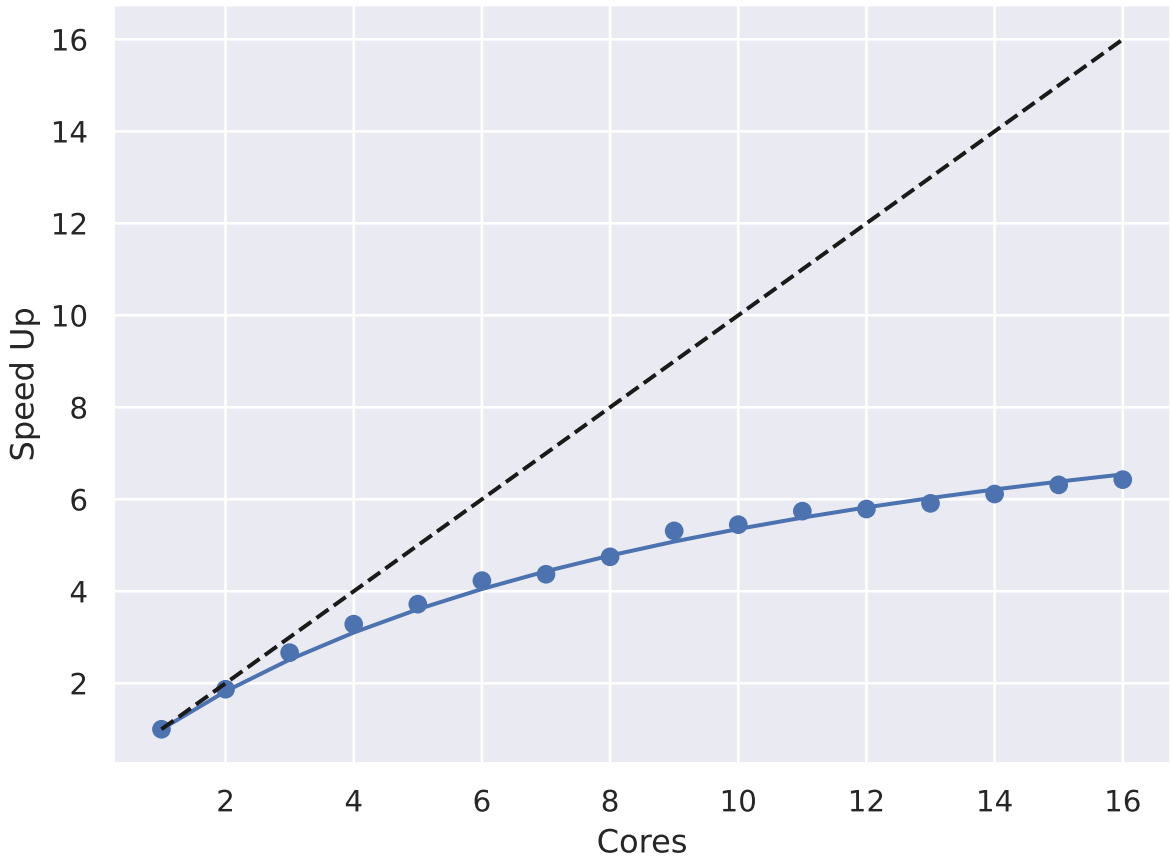

Figure 1: Speed up as a function of cores. The points are from runtime data on Teach. The solid line is the fit using Eq. (1). The dashed line shows embarrassingly parallel scaling.