CS 5220 – 2015-09-22 Preclass Questions

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September 21, 2015

0. It took me ≈ 2 hours to complete on September 21.

1. When discussing the monte carlo simulation that computes the expected minimum distance between pairs of points, some of the details of expected value and variance were rushed. I think it would have been better to analyze the toy example that computes $\frac{\pi}{4}$ rather than tackle the more complicated example.

2. a) Each processor p performs $\frac{N}{p}$ trials each of which takes t_t time. Since the processors can perform the trials in parallel, all trials finish in $\frac{Nt_t}{p}$ time. Similarly, a total of $\frac{N}{b}$ batches must update global counters for a total of $\frac{Nt_u}{b}$ time. This yields a total of

$$\frac{Nt_t}{p} + \frac{Nt_u}{b}$$

   b) A run with $p = 1, b = 32$ takes 0.008289 seconds across 1000032 trials. A run with $p = 32, b = 1$ takes 0.287262 seconds across 1000030 seconds. Substituting into formula above, we get

$$0.008289 = \frac{1000032t_t}{1} + \frac{1000032t_u}{32}$$
$$0.287262 = \frac{1000030t_t}{32} + \frac{1000030t_u}{1}$$

   Solving these equations we find that $t_t = -6.88606 \times 10^{-10}$ seconds and $t_u = 2.87275 \times 10^{-7}$ seconds.

   c) In this model, we want the batch size to be as large as possible because this minimizes the amount of global synchronization we need to do. In practice, I would sweep across values of b and use the one that yields the smallest running time for a fixed N.

3. See `workq.c`.