AUGUST 25TH, 2015 LECTURE QUESTIONS

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Question 1. To come up with a simple model, we will make the following assumptions:

- the class is distributed in n rows and m columns
- the time (t_{init}) to start the process does not depend on the number of people
- the time to compute rows is proportional to the number of people in each row (i.e. the number of columns)
- the time for the instructor to gather counts is proportional to the number of rows
- the time for the instructor to do the arithmetic is proportional to the number of rows

Thus we get that the total time to count attendance is:

$$t_{\text{total}} = t_{\text{init}} + a * m + b * n + c * n$$

Question 2. In the serial case, we now assume that:

- the class is distributed in n rows and m columns
- the time to start is now 0 since the person counting already knows the counting procedure and does not need to explain it to themselves
- the time for the instructor to count attendance is proportional to the total number of people

Thus we get that the total time for the serial case is:

$$t_{\text{total}} = a * m * n$$

Note that this a is the same as in Question 1

Question 3. The parallel method takes less time when:

$$t_{\text{init}} + a * m + b * n + c * n < a * m * n$$

Now we will estimate some parameter values:

- t_{init} = time to explain procedure = 30sec

- a = time to count each person = 0.5sec/person
- b = time to gather count from row = 1 sec/person
- c = time to do arithmetic = 1 sec/row

Then the parallel method takes less time when:

$$30 + 0.5 * m + 2 * n < 0.5 * m * n$$

If we further assume that the number of rows and columns are the same (i.e. m=n), then the parallel method takes less time when:

$$30 + 2.5 * n < 0.5 * n^2$$

this occurs whenever $n > 10.6394$, in other words whenever there are at least 11 rows and columns, and thus at least 121 people.