Preliminaries

- SurveyMonkey
- IBM Lecture by Nobel Laureate Robert Curl: The Problems in Living with Technology
  Tonight 7pm, Olin 1
Data vs Task Parallelism

Working definition:

- Data parallel computation: parallelism is applied by performing the same operation to different items of data at the same time; the amount of parallelism grows with the size of the data.

- Task parallel computation: parallelism is applied by performing distinct computations – or tasks – at the same time. Since the number of tasks is fixed, the parallelism is not scalable.
Block Cyclic Distribution
Block Cyclic Distribution

- The number of blocks per row (BLOCKS_PER_ROW) should not be evenly divisible by the number of processors (NUM_THREADS).

- We can either set the block size and determine the number of blocks per row, or vice versa.

- To guarantee that
  \[ \text{BLOCKS\_PER\_ROW} \% \text{NUM\_THREADS} = 0, \]
  we could simply say
  \[ \text{BLOCKS\_PER\_ROW} = \text{NUM\_THREADS} - 1. \]
Block Cyclic Distribution

- There is no such restriction on the number of blocks per column.
- We will lay down the blocks one row (of blocks) at a time.
- So it is probably more natural to refer to the number of rows of blocks (NUM_BLOCK_ROWS) rather than the number of blocks per column.
Block Cyclic Distribution

Determine the row and column indices of each block bidx in order, and then assign that block to thread bidx%NUM_THREADS
Block Cyclic Distribution

```c
bidx = 0;

for (ridx=0; NUM_BLOCK_ROWS; ridx++) {
    r1 = ridx*BLOCK_HEIGHT;
    r2 = (ridx+1)*BLOCK_HEIGHT;
    if (ridx == NUM_BLOCK_ROWS-1) r2 = NUM_ROWS;
    for (cidx=0; BLOCKS_PER_ROW; cidx++) {
        c1 = cidx*BLOCK_WIDTH;
        c2 = (cidx+1)*BLOCK_WIDTH;
        if (c2 == NUM_BLOCKS_PER_ROW-1) c2 = NUM_COLS;
        addBlockToThread(bidx%NUM_THREADS,
                         r1, r2, c1, c2);
    }
    bidx++;
}
```
Advice for Write-Ups

Basic Structure

Introduction: The introduction should briefly state the problem and solution. You may assume that the professor and your classmates are the audience for the paper. This means the introduction can be brief. Use it to provide coherence for the write-up and to explain any terms you introduce (for example, I use BOARD_SIZE for the write-up instead of TILES because the explanation is clearer with the board size).

Results: The results section should include the figures and a description of the experiments used to collect the data. All commentary about the data should be left for the discussion section.

Discussion: The discussion section should include in depth analysis of the data and a brief conclusion.
Advice for Write-Ups

Prize clarity above all else! Do not be so informal as to lack precision, but do not attempt to be so formal that you lose clarity. Remember, the goal of a write-up is to communicate your results and analysis – not to win a contest for using sophisticated words.

Use an active voice and do not be afraid of the first person. For class, it is perfectly acceptable to use “I”, but for more formal work, “we” is appropriate.

Be concise. Use enough words to make your point clearly, but not so many that the reader becomes bogged down in verbiage.
Advice for Write-Ups

- **Graphs**
  - Label the axes in your graphs.
  - In general, sparse experimental data should be plotted without any line-fitting (and some would even argue there should be no lines connecting the data points). We want to be careful not to impose any function on the data that is not there. For example, when the number of processors is on the x-axis, we should not have a line implying there is data for 1.5 processors. There is no such thing as 1/2 a processor 😊

- If you refer to any published papers or books, be sure to cite them.