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hw4 - cis 410 PP

Fork Join Pattern:

1. The fork join operation/pattern is a way to parallelize threads and computation. During this process a thread is forked into two, child and father, and then is given a computation to compute, which it does, and then finally it joins back up with other threads (fathers) to create a finally result. One thing is that when there is a grandchild or deeper, the parent in each respect must wait for its child's computation.

2.

a. Parent child
15 ----------> 14, 16, 21
21 ----------> 20, 22, 27

b. In floodfill, the amount of concurrency is dependent on the area you are flooding. Since you can fork three times or rather four with the last recursive call, you can ensure 25% of the the from the father tread which must wait, but its children (75%) can run concurrently.

c. In this parallel floodfill the program may run into issues of whether a cell was updated or not. This may cause redundancy or an incorrect result, but I feel that only redundancy will occur because the second check (or if) should prevent against incorrect results.

3. Parallel slack is the amount of extra parallelism available over the actual hardware. This is good because it improves delays from processors. This involves increasing the number of tasks and shortening the task length, which becomes parallel slack when the number of tasks exceed the number of processor. In fork join this is good to allow processors to work together during forking and joining, but at some point you start to hurt performance when increasing the parallel slack too large.

Pipeline Pattern:

1. Pipelines depend on a certain amount of data in a problem. When the size of the data reaches a certain point, or rather greater than the number of serial tasks, the level of parallelism decreases and becomes dependent on the size of the problem.

2. Stage bound workers work in stages, one after each to compute the problem. This may be the easiest and most straightforward implementation. Item bound is designed around a single resource with a computation which creates a problem with communication. The hybrid workers work in both stage and item bound designs switching depending on what fits best.