Sweep Schedule

Kris Garrett

March 22, 2016

1 Priorities

Two sets of priorities are created: (i) intra-angle and (ii) inter-angle. The prioritization heuristics come from the original Tycho code described in "An Algorithm for Parallel S_n Sweeps on Unstructured Meshes" by Shawn Pautz.

First, intra-angle priorities are found. This means we split all the cell-angle pairs into sets of cells where each set corresponds to a distinct angle. Then each set has priorities applied to every cell. Second, a global priority is set for each cell-angle pair as a function of the intra-angle priority for each cell and the angle index.

1.1 Intra-angle Priorities

There are 5 priority types here. All use the B-level in the graph for the given angle. The B-level is defined as the longest path to get to a graph leaf. A leaf has B-level 1.

Random Assign a random priority to each cell.

B-Levels Cell priority equals the b-level.

BFDS - Breadth First Descendant Seeking Priority equals the highest b-level of any descendant on another process. If the cell has no descendants on another process, the priority is zero.

DFDS - Depth First Descendant Seeking If a cell has no descendants on another process, the priority is zero. If the cell has a child on another process, the priority is the highest b-level of the children on the other process *plus* a constant greater than or equal to the number of levels of the graph. Otherwise, the cell has priority one less than the max of the priority of its children.

DFHDS - Depth First Highest Descendant Seeking If a cell has no descendants on another process, the priority is zero. If the cell has a child on another process, the priority is the highest b-level of the children on the other process *times* a constant greater than or equal to the number of levels of the graph. Otherwise, the cell has priority one less than the max of the priority of its children.

1.2 Inter-angle Priorities

Given the intra-angle priorites, there are 3 types of inter-angle priorities.

Interleaved This makes the global priority equal to the intra-angle priority. This will interleave the ordering of cell-angle pairs in angle.

Global This makes the global priority equal to the intra-angle priority plus a constant large enough to ensure each angle of lower index are prioritized before angles of higher index.

Local Highest b-level is prioritized first.

2 SweepSchedule

A sweep schedule is made which given priorities, orders the calculations for the sweep. The idea is that a *step* is something that can be solved in each process without communication between processes. These steps are to be done on each process together. A maximum of *MaxCellsPerStep* cell-angle pairs may be computed for each step and each process. Then communication of boundary data between processes is done and the process repeats.