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HPC ASSIGNMENT 4

TITLE: Parallel Searching Algorithm.

PROBLEM STATEMENT: Design & implement parallel algorithm utilizing all resources available for
1) Binary Search for sorted array
2) Best-first search that (traversal of graph to reach a target & in shortest possible path)

LEARNING OBJECTIVES:
To understand the parallel search algorithms, specifically binary & best fit search.

LEARNING OUTCOMES:
students will understand parallel search algorithms & implement them successfully.

SW & HW REQUIREMENTS:
64 bit OS Unix/Linus, i3 or higher processor, CUDA, nvcc, gcc, CPU, Google colaboratory, keyboard, mouse, monitor

THEORY:
1) Binary Search (sorted Array)
i) Binary search is a fast search algorithm with a runtime complexity of O(logn).
ii) It works on the principle of divide & conquer, it also requires a sorted array.
iii) BS looks for a particular item by comparing the middlemost item of collection.

iv] If a match occurs, then the index is returned.
v] If the middle is greater than item then the item is searched for the subarray to the left of middle item.
vi] Otherwise, it is searched to the right.
vii] For the ordered array that is the input, & 'x' processors, we part our array in x+1 parts.
viii] For $k < x$ processors, split the array into n/k groups & assign a processor to each group & run binary search on that group.
ix] Thus the time complexity is $O(\log n/k)$

(2) Best First Search

i] Best first search is an algorithm that traverses a graph to reach a target in the shortest possible path
ii] Unlike BFS, DFS, best first search follows an evaluation function to determine which node is the most appropriate to traverse next.
iii] In the parallel formulations of BFS, different processors concurrently expand the nodes in the open list.
v] However, in this case, the sequential termination criterion fails; and the open list access issue severly limit performance.

* Steps for Best First Search

1] Start with the root node, mark it visited.
2] Find the next appropriate node, mark it visited.
3] Go to next level & find the appropriate node & mark it visited.
4] Continue this process until the target is reached

CONCLUSION:
Parallel Binary Search & Best Fit Search was understood & implemented successfully.