

Assignment 1

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Aim:-

Design and implement parallel breadth first search and depth first search based on existing algorithms using openMP. Use a tree or an undirected graph or BFS and DFS.

Objectives:-

Students should be able to understand and implement searching algorithms like BFS and DFS.

Outcomes:-

Students will be able to design and implement parallel breadth first search and depth first search based on existing algorithm using OpenMP.

Pre-requisites:-

64 bit open source Linux

Programming languages - C++ / Java / Python / R.

Theory:-

Graph Traversals:-

Graph traversal means visiting every vertex and edge exactly once in a well-defined order. While using certain graph algorithms, you must ensure that each

vertex of the graph is visited exactly once. The order in which the vertices are visited which are important and may depend upon the algorithm or question that you are solving.

- Breadth First Search (BFS):-

Graph traversal means visiting every vertex and edge.

It is a graph traversal algorithm used to explore all nodes of graph or tree systematically starting from the root node or a specified starting point, and visiting all the neighbouring nodes at the current depth level before moving on to the next depth level.

BFS is a traversing algorithm where you should start traversing from a selected node and traverse graph layerwise, thus exploring the neighbour nodes, you must then move towards next-level neighbour nodes.

Example of BFS:-

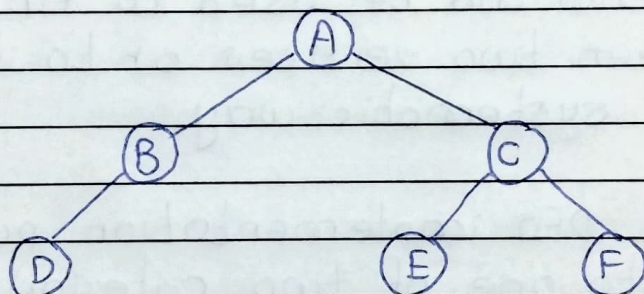
Now, let's take a look at steps involved in traversing a graph by using Breadth-First Search.

Step 1: Take an empty queue.

Step 2: Select a starting node and insert it into the queue.

Step 3: Provided that the queue is not empty, extract the node from queue and insert its child nodes into queue.

Step 4: Print the extracted node.



Output: A, B, C, D, E, F.

Parallel Breadth First Search:-

- i) To design and implement parallel breadth first search, you will need to divide the graph into smaller sub-graphs and assign each sub-graph and to a different processor or thread.
- ii) Each processor or thread will then perform a breadth first search on its assigned sub-graph concurrently with

iii) Two methods:

Vertex by vertex or
level by level.

• Depth First Search (DFS) :-

DFS is a popular graph traversal algorithm that explores as far as possible along each branch before backtracking.

This algorithm can be used to find the shortest path between two vertices or to traverse a graph in a systematic way.

A standard DFS implementation puts each vertex of graph into one of two categories

i) Visited.

ii) Not visited

Example of DFS :-

Step 1: Create a stack with the total number of vertices in the graph as the size.

Step 2: Choose any vertex as traversal's beginning point. Push a visit to that vertex and add it to the stack.

Step 3: Push any non-visited adjacent vertices

of a vertex' at the top of stack to the top of stack

Step 4: Repeat step 3 and 4 until there are no more vertices to visit from the vertex at top of stack.

Step 5: IF there are no new vertices to visit, go back and pop one from stack using backtracking.

Step 6: Continue using steps 3, 4, 5 until the stack is empty

Step 7: When the stack is entirely unoccupied, create the final spanning tree by deleting the graph's unused edges.

Conclusion:-



We have implemented parallel breadth first search based on existing algorithm using OpenMP.