Report:02
BFS Algorithm problem solving

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***Abstract*—BFS is one of the classical graph theory algorithms, typically expressed under the imperative style. However, it has applications in other domains such as artificial intelligence. All known algorithms of BFS use iteration.**

This article focuses on the information maintained by BFS during exploration of an arbitrary graph component. To better understand the structure of this information, BFS is re-defined both recursively and iteratively. Also provided in this article is an analysis and comparison of the various BFS algorithms presented.

***Index Terms*—BFS**

I. Introduction

Breadth-first search (BFS) is an algorithm that is used to graph data or searching tree or traversing structures. The full form of BFS is the Breadth-first search.

The algorithm efficiently visits and marks all the key nodes in a graph in an accurate breadthwise fashion. This algorithm selects a single node (initial or source point) in a graph and then visits all the nodes adjacent to the selected node. Remember, BFS accesses these nodes one by one.

Once the algorithm visits and marks the starting node, then it moves towards the nearest unvisited nodes and analyses them. Once visited, all nodes are marked. These iterations continue until all the nodes of the graph have been successfully visited and marked.

II. Rules of BFS Algorithm

A standard BFS implementation puts each vertex of the graph into one of two categories:

1.Visited
2.Not Visited

The purpose of the algorithm is to mark each vertex as visited while avoiding cycles.The algorithm works as follows:

*Start by putting any one of the graph's vertices at the back of a queue.

*Take the front item of the queue and add it to the visited list.

*Create a list of that vertex's adjacent nodes. Add the ones which aren't in the visited list to the back of the queue.

*Keep repeating steps 2 and 3 until the queue is empty.

*The graph might have two different disconnected parts so to make sure that we cover every vertex, we can also run the BFS algorithm on every node

III. Advantage of BFS Algorithm

There are numerous reasons to utilize the BFS Algorithm to use as searching for your dataset. Some of the most vital aspects that make this algorithm your first choice are:

*BFS is useful for analyzing the nodes in a graph and constructing the shortest path of traversing through these.

*BFS can traverse through a graph in the smallest number of iterations.

*The architecture of the BFS algorithm is simple and robust.

*The result of the BFS algorithm holds a high level of accuracy in comparison to other algorithms.

*BFS iterations are seamless, and there is no possibility of this algorithm getting caught up in an infinite loop problem.

IV. Summary

A graph traversal is a unique process that requires the algorithm to visit, check, and/or update every single un-visited node in a tree-like structure. BFS algorithm works on a similar principle.The algorithm is useful for analyzing the nodes in a graph and constructing the shortest path of traversing through these.The algorithm traverses the graph in the smallest number of iterations and the shortest possible time.BFS selects a single node (initial or source point) in a graph and then visits all the nodes adjacent to the selected node. BFS accesses these nodes one by one.The visited and marked data is placed in a queue by BFS. A queue works on a first in first out basis. Hence, the element placed in the graph first is deleted first and printed as a result.The BFS algorithm can never get caught in an infinite loop.Due to high precision and robust implementation, BFS is used in multiple real-life solutions like P2P networks, Web Crawlers, and Network Broadcasting.

V. Conclusion

Breadth Search Algorithm comes with some great advantages to recommend it. One of the many applications of the BFS algorithm is to calculate the shortest path. It is also used in networking to find neighbouring nodes and can be found in social networking sites, network broadcasting, and garbage

collection. The users need to understand the requirement and the data pattern to use it for better performance.

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