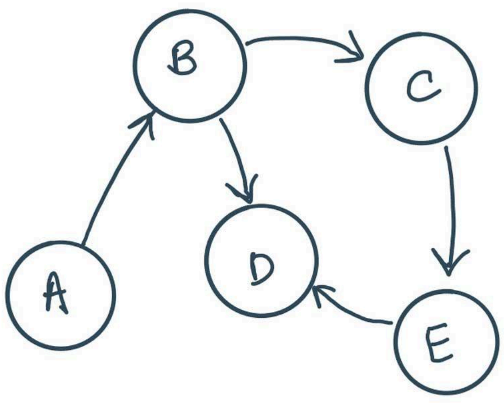

Depth first search starting from node A

Node A
Node B
Node D
Node C
Node E

Graph traversal algorithms

Term	Definition	Example Sentence
traversal (noun)	the act of moving across or through something, especially in a systematic way	The traversal of the maze required careful planning and strategy.
redundancy (noun)	the state of being unnecessarily repetitive or superfluous	To improve efficiency, the team eliminated redundancy in the code.
invariant (noun)	a property or condition that remains unchanged under a particular transformation or operation	The conservation of energy is an important invariant in physics.
reachable (adjective)	able to be reached or accessed	The remote village was only reachable by boat.
revisit (verb)	to visit or consider again, especially after an interval	The author revisited the topic in her latest book.

Graph traversal algorithms

Graph traversal algorithms are an important concept in computer science [1]. These algorithms involve visiting each vertex in a graph in a specific order [1]. Unlike tree traversal, graph traversal may require visiting some vertices more than once [1]. This is because it is not always known before transitioning to a vertex if it has already been explored [1]. To prevent unnecessary redundancy and increase efficiency, it is necessary to remember which vertices have already been explored [1]. This can be done by associating each vertex with a "color" or "visitation" state during the traversal [1]. If a vertex has already been visited, it is ignored and the path is not pursued further [1].

There are different types of graph traversal algorithms [1]. One common algorithm is depth-first search (DFS) [1]. DFS visits the child vertices before visiting the sibling vertices, traversing the depth of the graph [1]. Another algorithm is breadth-first search (BFS), which explores nodes in the order of their distance from the roots [4]. BFS uses a queue-like structure to maintain the order of scanning nodes [4]. These algorithms can be used to solve various problems, such as finding all nodes reachable from a given set of root nodes [4].

Graph traversal algorithms can be implemented using different data structures and techniques [2]. For example, the tricolor algorithm is a common approach to graph traversal [4]. It assigns colors to nodes and maintains a key invariant: there are no edges from white nodes to black nodes [4]. This algorithm can be used to ensure that all reachable nodes in the graph are visited [4]. Another approach is to use a stack or queue to keep track of the order in which nodes are visited [3]. By carefully selecting the order of visiting nodes and avoiding revisiting already visited nodes, these algorithms can efficiently traverse graphs.

In conclusion, graph traversal algorithms are used to visit each vertex in a graph in a specific order [1]. These algorithms can be implemented using different data structures and techniques [2]. Depth-first search (DFS) and breadth-first search (BFS) are two common graph traversal algorithms [1][4]. By carefully selecting the order of visiting nodes and avoiding revisiting already visited nodes, these algorithms can efficiently traverse graphs [3].

[1] Graph traversal - Wikipedia
https://en.wikipedia.org/wiki/Graph_traversal
[2] Graph Data Structure And Algorithms - GeeksforGeeks
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https://www.cs.cornell.edu/courses/cs2112/2012sp/lectures/lec24/lec24-12sp.html
[5] 14.3. Graph Traversals — CS3 Data Structures & Algorithms
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[6] Graph Traversal in Python: BFS,DFS,Dijkstra,A-star parallel ...
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Reading Summary

- Graph traversal algorithms are used to visit each vertex in a graph in a specific order.
- Depth-first search (DFS) and breadth-first search (BFS) are two common graph traversal algorithms.
- By carefully selecting the order of visiting nodes and avoiding revisiting already visited nodes, these algorithms can efficiently traverse graphs.

Multiple Choice Questions

Question #1	Question #2	Question #3
What is one reason why graph traversal algorithms may require visiting some vertices more than once?	Which algorithm explores nodes in the order of their distance from the roots?	What is the purpose of using a stack or queue in graph traversal algorithms?
A. To increase efficiency and prevent redundancy. B. To explore nodes in the order of their distance from the roots. C. To assign colors to nodes and maintain a key invariant. D. To solve problems like finding all nodes reachable from a given set of root nodes.	A. Depth-first search (DFS). B. Breadth-first search (BFS). C. The tricolor algorithm. D. The stack or queue approach.	A. To increase efficiency and prevent redundancy. B. To explore nodes in the order of their distance from the roots. C. To assign colors to nodes and maintain a key invariant. D. To keep track of the order in which nodes are visited.

Short Answer Questions

Question #1	What is the purpose of graph traversal algorithms in computer science?

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Question #2	How does depth-first search (DFS) differ from breadth-first search (BFS) in terms of the order in which they visit nodes?

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Question #3	What are some techniques or data structures that can be used to implement graph traversal algorithms?

Open Ended Questions

Question #1	Reflect on a time when you had to visit multiple places or make multiple decisions in a specific order. How did you approach the situation? How did it compare to graph traversal algorithms?

Question #2	Think about a complex problem or project you have worked on. How did you ensure that you didn't waste time by repeating unnecessary steps? How does this relate to the concept of remembering already explored vertices in graph traversal algorithms?

Question #3	Consider a situation where you had to explore different options or paths before reaching a solution. How did you decide which path to take first? How does this decision-making process resemble depth-first search (DFS) or breadth-first search (BFS) algorithms?

This Diffit resource was created by Ruari Mears