به نام بی نهایت عشق و زیبایی

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Workshop 01

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Introduction

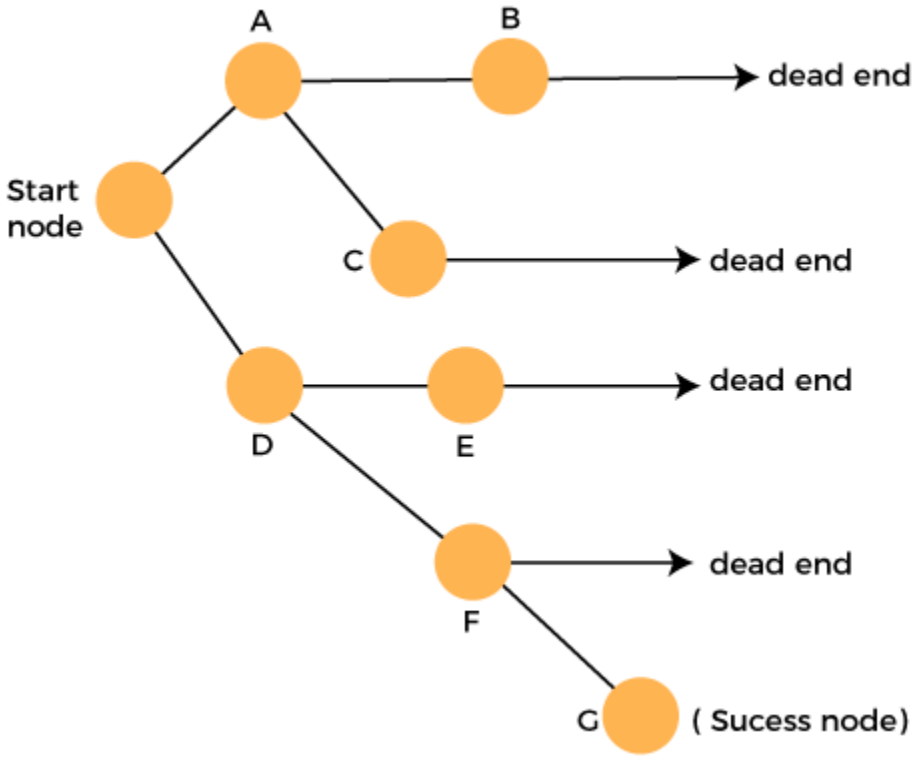
Here are the definition and some applications of backtracking method :

Back-tracking method is a technique that searches through all possible cases and finds the solution if it's valid!
The backtracking word comes from it is algorithm!! which is to continuously find the go through a path and if it does not fit the requirements , then it back tracks and tries another way.
Backtracking could be useful for solving many problems like finding all possible permutation of a string , solving a Sudoku table , finding all of the subsets of a Set or String , Hamilton cycle and so on.[1]

[1] For more information on the applications of backtracking check the website : https://www.geeksforgeeks.org/backtracking-algorithms/#when-can-be-backtracking-algorithm-used

Back-tracking

This technique is to going through every possible cases until we encounter the case that matches our conditions.
This technique begins with the starter node and then it jumps to the next node in which we have implemented it's Algorithm. After that we continuously jump until we encounter an dead end , In this case we **backtrack** to the latest node which had a successful result .



suppose we have the path which leads to node A and D from the starting point so we continuously check every path till we encounter a dead end then we backtrack to the last node in which there is another path to move forward.In this case we have checked the path AB – AC – DE – DF – DFG respectively.

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Common terms in backtracking :

- Success node : the node that has met our requirements (or the destination in which succession was found)
- Live node : the node which it's children can be generated and could be considered our answer.
- E node : the nodes which one of it's children is a success node.
- Dead node : the node that cannot be further generated because it has violated our conditions and rules.
- Explicit constraint : the rule that restricts each element to be chosen from the given set.

The difference between recursion and backtracking

Recursion is a technique that calls the same function again and again until you reach the base case. Backtracking is an algorithm that finds all the possible solutions and selects the desired solution from the given set of solutions.

Conditions

When we should use this method ?
Well generally we should use this Algorithm when we have multiple choices of doing certain tasks(Just like Sudoku) , where each decision leads to a new set of choices(or at least most of them).
One of the most useful situations that we can use this method is when we do not have enough information about our ways of approaching the problem , so we basically try out every possibility.

Sources

https://www.javatpoint.com/backtracking-introduction
https://www.geeksforgeeks.org/backtracking-algorithms/#what-is-backtracking-algorithm
Bing Co-pilot