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Question: Describe and differentiate BFS, DFS, and UCS with an example…

Describe and differentiate BFS, DFS, and UCS with an example. Show necessary simulations.

Expert Answer ⓘ

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3 answers

Solution

• BFS :-
  – BFS Stands for Breadth-First Search.
  – BFS is an sorting algorithm, that is used
    for searching a data structure for a node
    that satisfies given property.
  – It starts at the root and goes to the all
    nodes at the present depth & moving on to
    the nodes at the next depth level.

Algorithm

Step 1 : SET STATUS = 1 (ready state)
          for each node in Graph
Step 2 : Enqueue the Starting node A
          and set its STATUS = 2
          (waiting state)
Step 3 : Repeat Steps 4 and 5 until
          Queue is empty
Step 4 : Dequeue a node N. Process it
          and set its STATUS = 3
          (processed state)
Step 5 : Enqueue all the neighbours of N that
          are in the ready state
          (whose STATUS = 1) and set their STATUS = 2
          (waiting state)
          [END OF LOOP]

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in graph.

- Step2: Push the starting node A on the stack and set its STATUS = 2 (waiting state)
- Step3: Repeat Steps 4 and 5 until STACK is empty.
- Step4: Pop the top node N. Process it and set its STATUS = 3 (processed state)
- Step5: Push on the stack all the neighbours of N that are in ready state (whose STATUS = 1) & set their STATUS = 2 (waiting state)
  [END of LOOP]
- STEP 6: EXIT.

Example :-

consider, graph G along adjacency lists, calculate the order to print all the nodes of graph starting from A by using (DFS).

Adjancy L
A : B
$: C, E
C : D, G
D : A, H
E : G
F : C
G : B, A, F
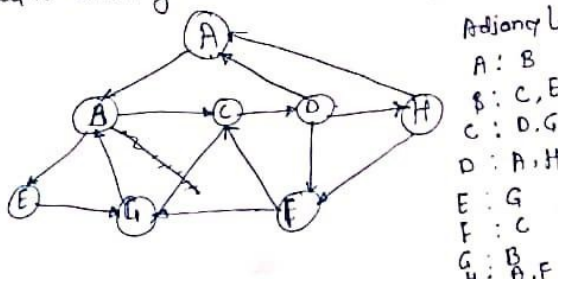
Repeat the same steps

④ QUEUE1 = {C, F}
   QUEUE2 = {A, B, D}

⑤ QUEUE1 = {F, E, G}
   QUEUE2 = {A, B, D, B C}

⑥ QUEUE1 = {E, G}
   QUEUE2 = {A, B, D, C, F}

⑦ QUEUE1 = {G}
   QUEUE2 = {A, B, D, C, F, E}

Solution → The minimum path will be, A
           A → B → C → E

DFS :-

Solution :-

- DFS :- Depth First Search (DFS) algorithm starts with the initial node of the graph G, and goes to deeper and deeper until we find the destination node.
- The algorithm, then backtracks from the dead end towards the most recent node is yet to be completely unexplored.
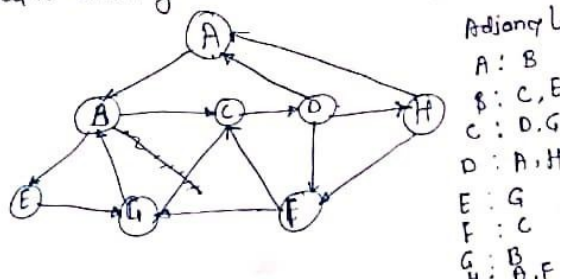- The DFS uses Stack as data structure.

in graph.

- Step2 : Push the starting node A on the stack and set its STATUS = 2 (waiting state)
- Step3 : Repeat Steps 4 and 5 until STACK is empty.
- Step4 : Pop the top node N. Process it and set its STATUS = 3 (processed state)
- Step5 : Push on the stack all the neighbours of N that are in ready state (whose STATUS = 1) & set their STATUS = 2 (waiting state)
   [END OF LOOP]
- STEP 6 : EXIT.

Example :-
consider, graph G along adjacency lists, calculate the order to print all the nodes graph starting from A by using (DFS).

Adjacy L
A : B
B : C, E
C : D.G
D : A, H
E : G
F : C
G : B, A.F

Solution :-
PUSH A onto the Stack
① STACK : A
Pop the top element of the stack A & print it PUSH all the neighbours of A onto stack that are in ready state.

② print A
   STACK : B
Pop the top element of the stack i.e. B & PUSH all the neighbours of B into stack.

③ print B
   Stack : C, E
   Same do all the steps.
④ print E
   Stack : G, C

⑤ print G
   Stack : C

⑥ print C
   Stack : D

⑦ print D
   Stack : E, H

⑧ print H
   Stack : F

⑨ print F
   Stack ← stack now becomes empty.

UCS :-
- Uniform-Cost search Algorithm :- Is a algorithm used for traversing a weighted tree or graph.
- The primary goal of UCS algorithm is to find a path to the goal node which has the lowest cumulative cost.
- Uniform-cost-Search expands nodes according to their path costs form the root node.
- It can be used to solve any graph/tree where the optimal cost is in demand.
- UCS algorithm is implemented by the priority queue. It gives maximum priority to the lowest cumulative cost.

Example :-
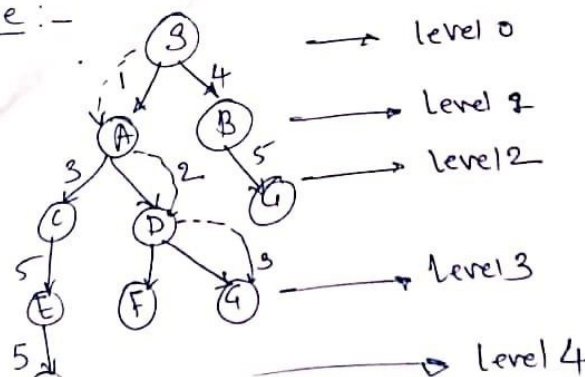
UCS is complete, such as if there is solution, UCS will find it.

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Answer the questions, considering the following graph: a. Represent the following graph using

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Let a and b be positive integers. Suppose a function
Q is definded recursively as
follows: Q(a, b) = 0 if a < b
Q(a, b) = Q(a-b, b) + 1, if b <=

See answer

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