Assignment 2

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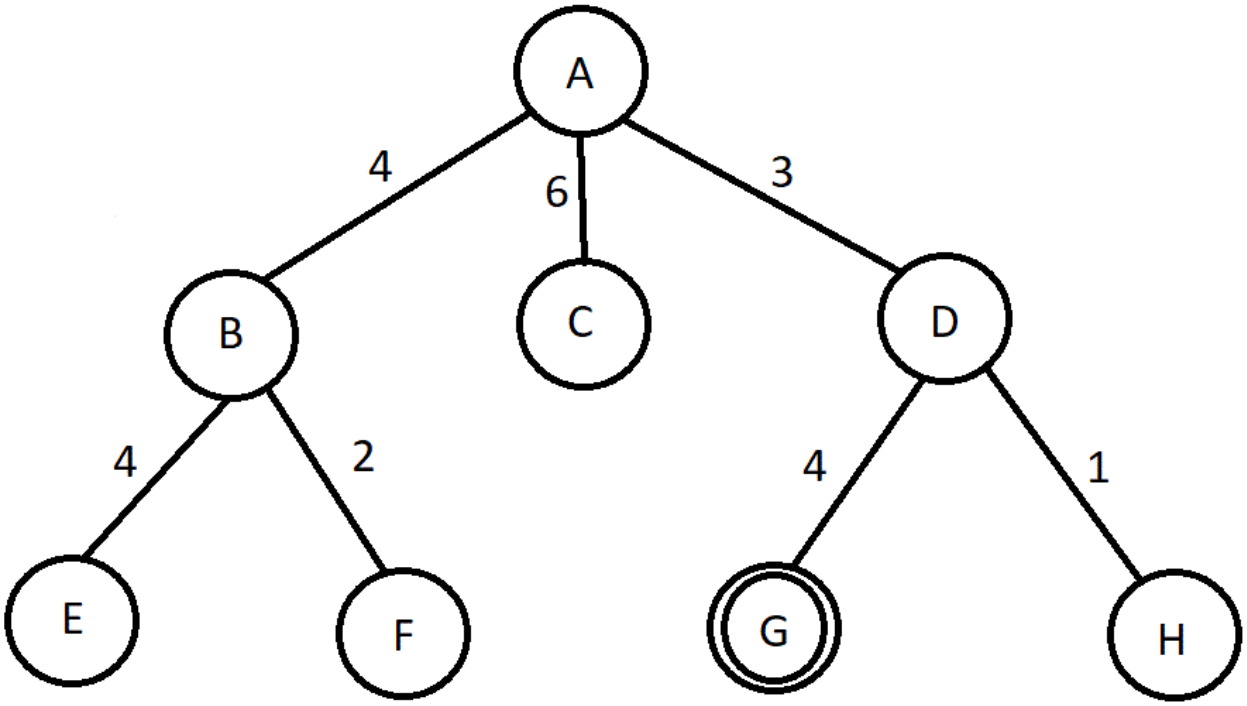
Answer 1:



Breadth first search:

Path: A B C D E F G

Depth first search:

Path: A B E F C D G

Iterative deepening search:

Path: Line = 0

A

Line = 1

A B C D

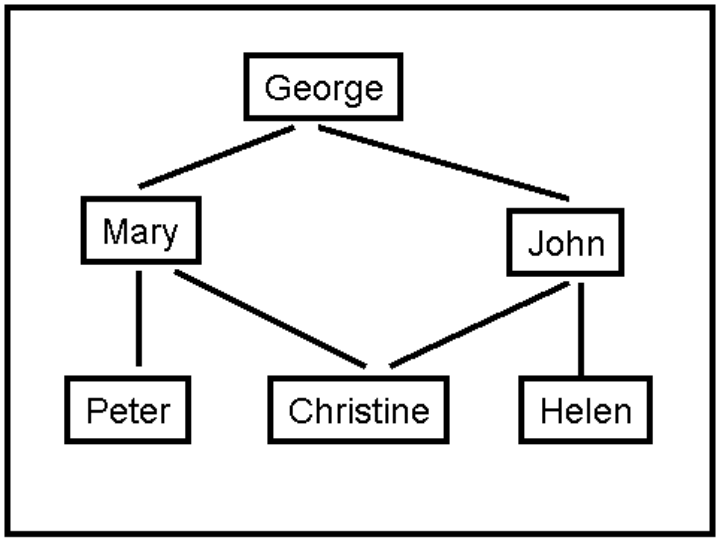
Line = 2

A B E F C D G

Uniform cost search:

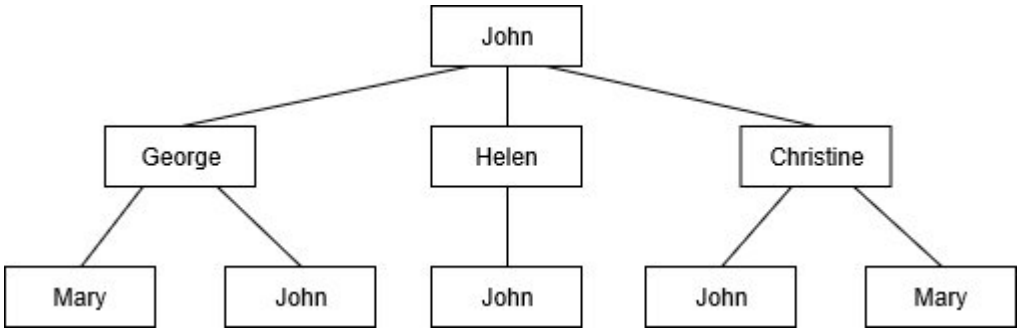
Path: A(0) D(3) B(4) H(4) F(6) C(6) G(7)

Answer 2:



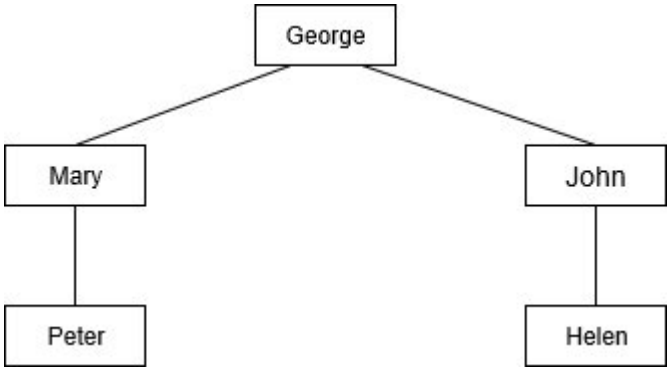
i. Breadth first search, Iterative deepening search and Uniform cost search will find the correct number of degrees between two people in the graph.

ii.

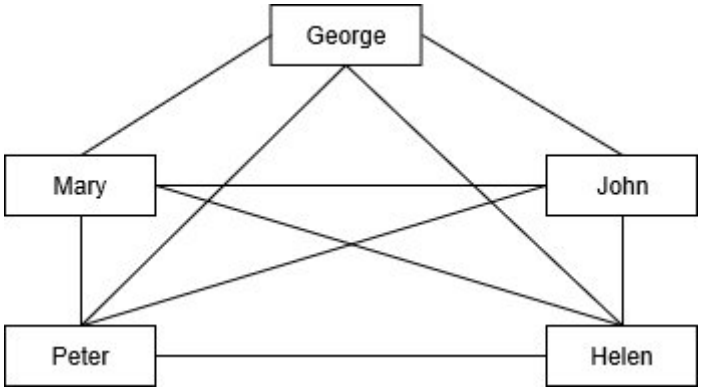


There is no one-to-one correspondence between nodes in search tree and vertices in SNG, because vertex John corresponds to multiple nodes in search tree.

iii.

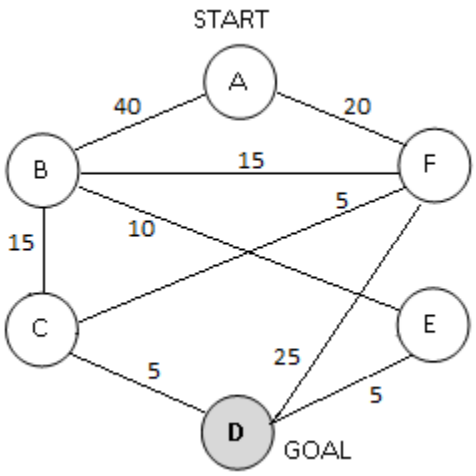


iv.



v. Every node in search tree takes 1KB of memory. As there are 1 million peoples in SNG, i.e. 10^6 peoples.
Therefore, 1 GB = 10^6 KB
Branching factor, b = 10
Depth of tree, d = 6
Convert tree search to graph search, as the worst-case space complexity of BFS is O(b^d), the memory to store the search node will not exceed 1GB

Answer 3:



h(A) = 30

h(B) = 15

h(C) = 5

h(D) = 0

h(E) = 5

h(F) = 10

A heuristic is admissible if the value is less or equal to its value.

Heuristic 1:

h(A) = 50

It is not an admissible heuristic. The admissible heuristic is 30

h(B) = 35

It is not an admissible heuristic. The admissible heuristic is 15

h(C) = 5

It is an admissible heuristic.

h(D) = 0

It is an admissible heuristic.

h(E) = 45

It is not an admissible heuristic.

h(F) = 10

It is an admissible heuristic.

Heuristic 2:

h(A) = 70

It is not an admissible heuristic. The admissible heuristic is 30

h(B) = 70

It is not an admissible heuristic. The admissible heuristic is 15

h(C) = 70

It is not an admissible heuristic. The admissible heuristic is 5

h(D) = 70

It is not an admissible heuristic. The admissible heuristic is 0

h(E) = 70

It is not an admissible heuristic. The admissible heuristic is 5

h(F) = 70

It is not an admissible heuristic. The admissible heuristic is 10

Heuristic 3:

h(A) = 40

It is not an admissible heuristic. The admissible heuristic is 30

h(B) = 20

It is not an admissible heuristic. The admissible heuristic is 15

h(C) = 5

It is an admissible heuristic.

h(D) = 0

It is an admissible heuristic.

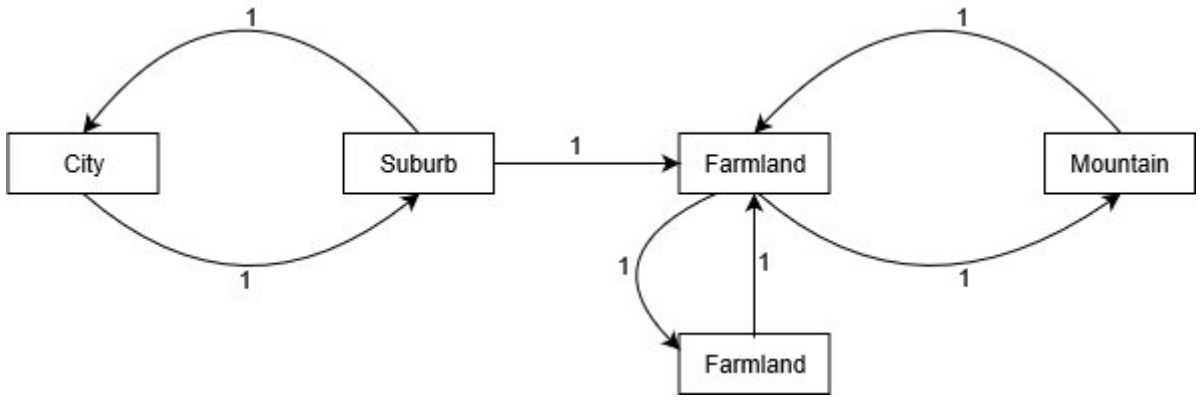
h(E) = 5

It is an admissible heuristic.

h(F) = 20

It is not an admissible heuristic. The admissible heuristic is 10

Answer 4:



Heuristics for states are as follows:

h(city) = 3

h(suburb) = 2

h(farmland) = 1

h(mountain) = 0

Answer 5:

a. We can say that the shortest solution is longer than 100 moves. Also, every node take 1 KB of memory. Therefore, no search method can guarantee to store search node in 50 KB memory; as the shortest solution will require 100 KB memory.

b. We have, b = 4,
d = 101 to 208,
C* = 101 to 208,
E = 1,
m = ∞

Space complexities for various search methods are as follows:
Breadth first search = O(b^(d+1)) = 2.57 * 10^61 KB to 6.77 * 10^125 KB
Depth first search = O(bm) = ∞ KB
Iterative deepening search = O(bd) = 404 KB to 832 KB
Uniform cost search = O(b^(C*/E)) = 6.43 * 10^60 KB to 1.69 * 10^125 KB

Iterative deepening search can guarantee that it will never require more than 1200 KB memory to store search node.

Answer 6:

Figure 5: Sometimes greedy search will perform better than A* and sometime it will perform same as A*, depending on start and end states.

For ex. From state 0,0 to 8,8 A* will visit both state 0,1 and 1,0, but greedy won't; in this case greedy will perform better than A*

Figure 6: Greedy search performs sometimes better, sometimes worse, and sometimes the same as A*, depending on the start and end states.

Greedy search will perform better than A*, for state 2,6 to 5,8

Greedy search will perform worse than A*, for state 2,0 to 2,2

Greedy search will perform same as A*, for state 2,2 to 2,7