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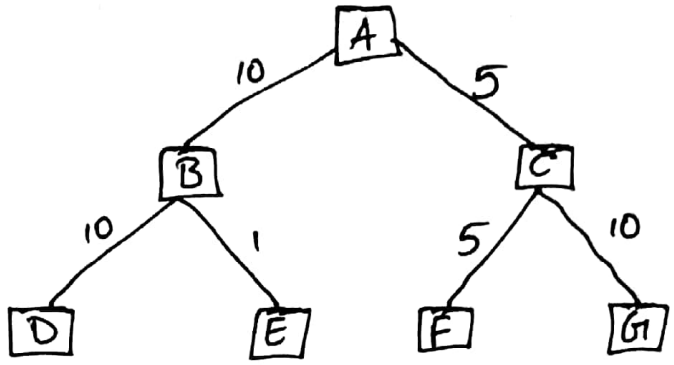
Id : 1001374263

Assignment - 2

① 

(i) BFS: ABCDEFG (or) ACBG

(ii) DFS: ABDECFG (or) ACG

(iii) IDS:

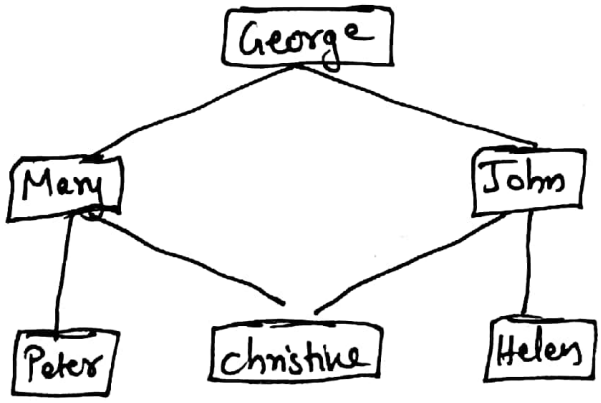
- A
- ABC
- ABDECFG

(iv) Uniform Cost Search:

A(0) C(5) B(10) F(10) E(11) G(15)

(or)

A(0) C(5) F(10) B(10) E(11) G(15)

② 

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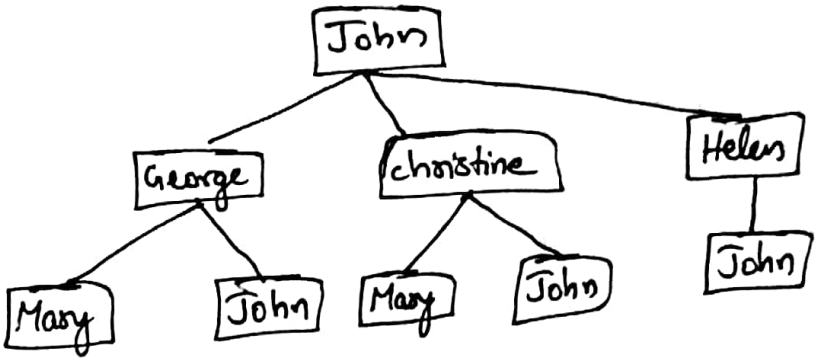
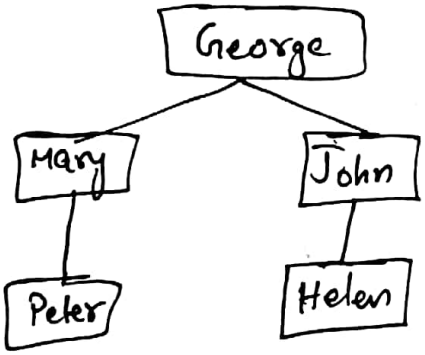
(i) BFS and UCS finds correct number of degrees between any two people in the graph. IDS doesn't find if it starts at large initial depths. DFS won't find because it searches on the basis of depth.

(ii)



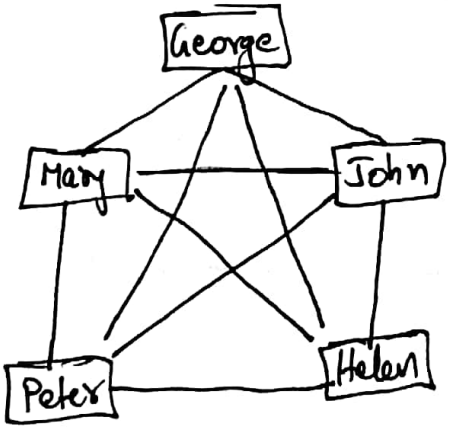
There is no one to one correspondence between the nodes and vertices because there is are chances of loops getting formed. For ex: John corresponds to multiple nodes in the search tree.

(iii)



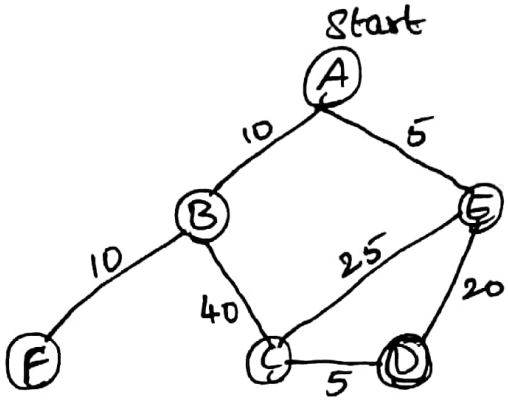
Peter and Helen have four degrees of separation.

(iv)



(2) (v) Maintain a list of visited nodes (or) people, so there will be no need to generate successor nodes when revisiting nodes corresponding to that person.

(3)



True distances to the goal state:

h(A) = 25
h(B) = 35
h(C) = 5
h(D) = 0
h(E) = 20
h(F) = 45

The heuristic value should be less than true value to be admissable

Heuristic 1:

h(A) = 5
h(B) = 40 (change to 35 or less)
h(C) = 10 (change to 5 or less)
h(D) = 0
h(E) = 10
h(F) = 0

Heuristic 2:

h(A) = 8
h(B) = 5
h(C) = 3
h(D) = 5 (change to 0)
h(E) = 5
h(F) = 0

Heuristic 3:

h(A) = 35 (should be 25 or less)

h(B) = 30

h(C) = 20 (should be 5 or less)

h(D) = 0

h(E) = 0

h(F) = 50 (Should be 45 or less)

Heuristic 4:

h(A) = 50 (should be 25 or less)

h(B) = 50 (should be 35 or less)

h(C) = 50 (should be 5 or less)

h(D) = 50 (should be 0)

h(E) = 50 (should be 20 or less)

h(F) = 50 (should be 45 or less)

Heuristic 5:

h(A) = 0

h(B) = 0

h(C) = 0

h(D) = 0

h(E) = 0

h(F) = 0

Heuristic 5 is admissable as it is.

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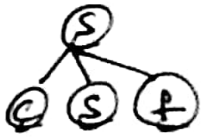
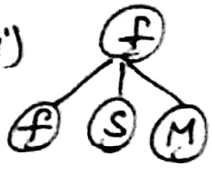
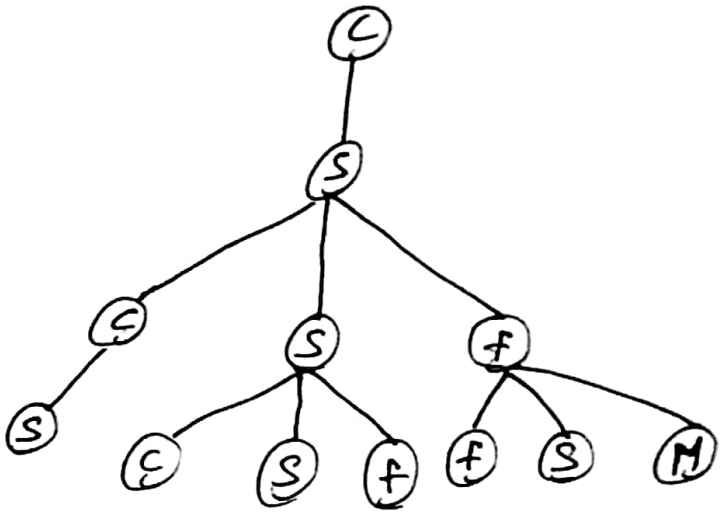
(4) Conditions (i)  (ii)  (iii)  (iv) 



Heuristics

$h(C) = 3$ (C) → (S) → (f) → (M)

$h(S) = 2$ (S) → (f) → (M)

$h(f) = 1$ (f) → (M)

$h(M) = 0$ (M)

(5) Branching factor for corner nodes is $4 \times 2 = 8$

Branching factor for nodes with 3 branches is $12 \times 3 = 36$

Branching factor for rest of the nodes is $9 \times 4 = 36$

Total branching factor is 80

Average branching factor is $\frac{80}{25} = 3.2 \simeq 4$

Minimum depth is 100

Maximum depth is 208

$80 \quad 100 < d < 208.$

Id: 1001374263 (6)

(a) The space complexity of

BFS = $O(b^d)$

DFS = $O(bm)$ where m is maximum depth

UCS = $O(b^{1+\lfloor C^*/\epsilon \rfloor})$

IDS = $O(bd)$

where b is branching factor

d is depth of the shallowest solution.

BFS = $O(b^d)$

= $4^{100} > 50KB$

DFS = $O(bm)$

= $4 \times \infty$

= ∞

UCS = $O(4^{1+\lfloor C^*/\epsilon \rfloor})$

is exponential which will be more than 50KB

IDS = $O(bd)$

= $4 * 100$

= 400 KB is least

= 4×208

= 832 is highest

So none of them are less than 50 KB

(b) Using above calculated information, IDS will never need more than 1200KB since it needs only 832 KB.

Rest all require more than 1200KB.