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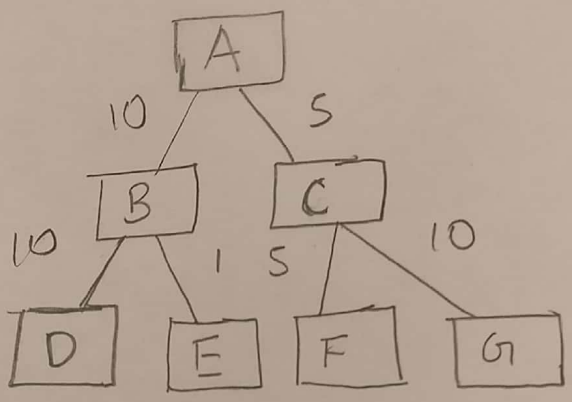
(CSE 5360-001)

ARTIFICIAL INTELLIGENCE

ASSIGNMENT-2

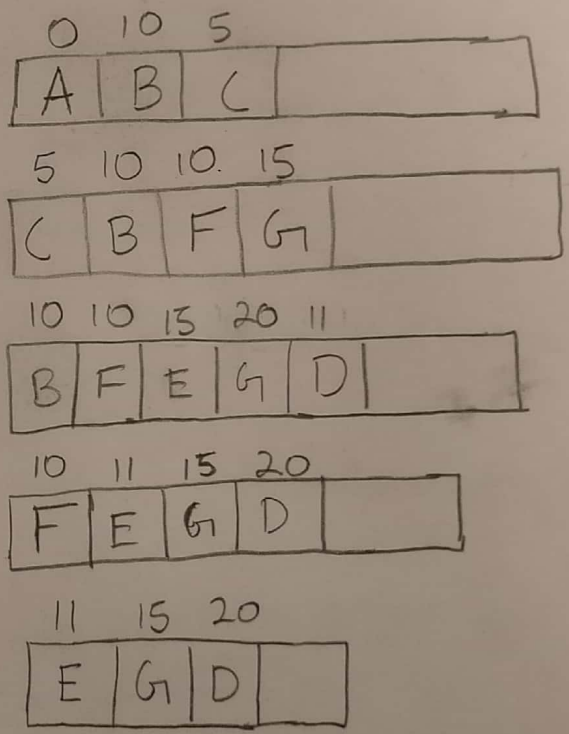
1

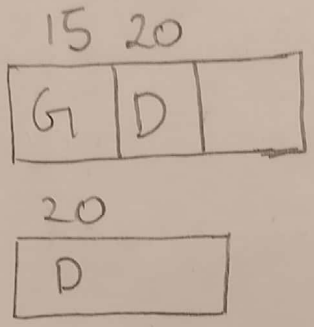


BFS → A B C D E F G

DFS → A B D E C F G

Uniform Cost Search:





IDS :

Iteration 1 : A

Iteration 2 : ABC

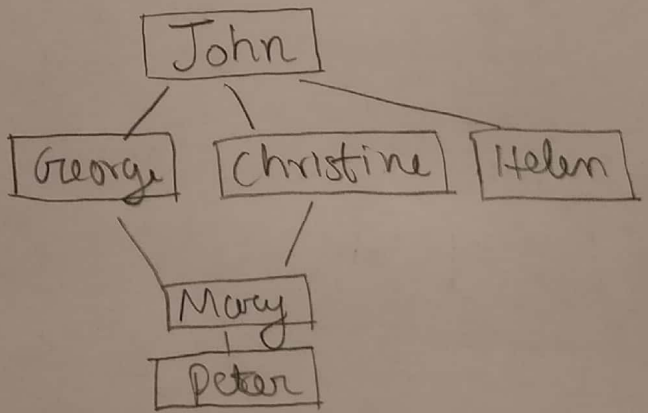
Iteration 3 : ABCDEFGH

2) (i) The search techinques that guarantee of finding the correct number of degrees of seperation are

(a) Iterative deepening Search

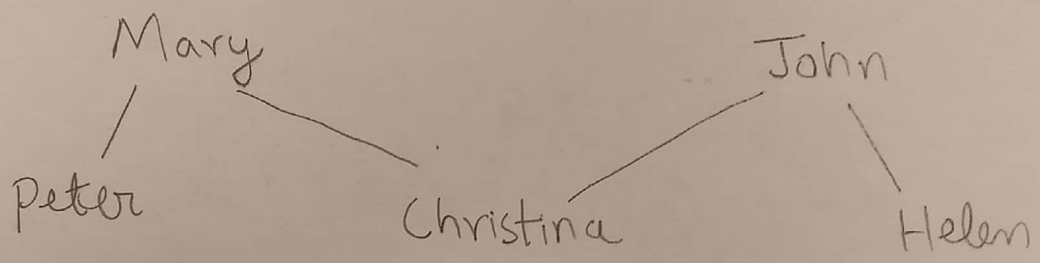
(b) BFS (Breadth First Search)

(ii)



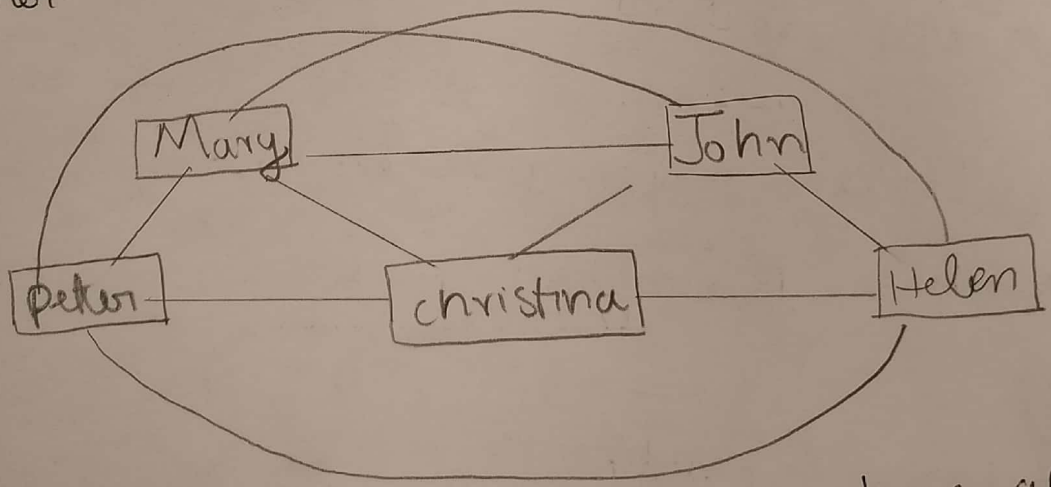
Since the Node "Mary" is mapped to two nodes there is no one-to-one correspondence between node(i.e) George and Christina are mapped to Mary.

2 (iii)



Here "Peter & Helen" are two people having 4 degree of seperation from each other.

2. (iv)

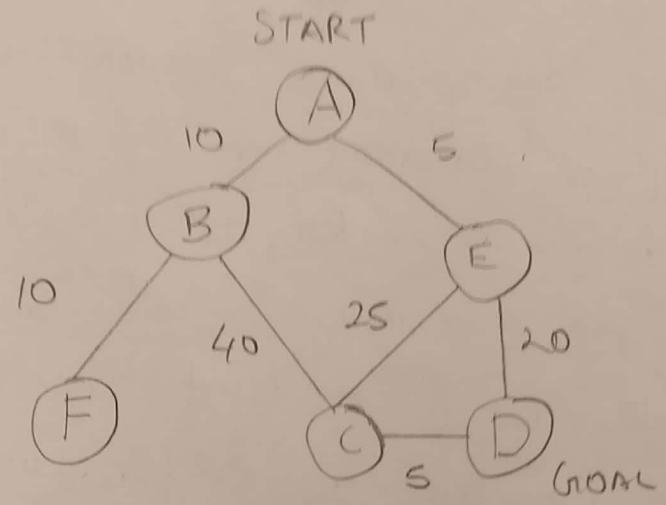


Thus the above 5 nodes have all one degree of seperation.

2 (v) Given that each node takes 1KB of memory and requires one million nodes.

In order to implement bredth first search with a memory constraint of no more than 1GB, the branching factor (b) of each node must be 10 and the maximum depth 'd' of the graph should be 6 so that the maximum number of nodes will be 10^6 (i.e) 1 million nodes and the memory. Since we need to save memory we need not expand the already visited nodes by keeping a list of already visited nodes.

3



Heuristic 1:

$h(A) = 5$
$h(B) = 40$
$h(C) = 10$
$h(D) = 0$
$h(E) = 10$
$h(F) = 0$

Paths

$A \to E \to D : 25 + 0 = 25$

$A \to E \to C \to D : 35 + 0 = 35$

$A \to B \to C \to D : 55 + 0 = 55$

$A \to B \to C \to E \to D : 95 + 0 = 95$

Hence admissable.

Heuristic 2:

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

Paths

A → E → D : 30

A → E → C → D : 40

A → B → C → D : 60

A → B → C → E → D : 100

Since the value we found is greater than the actual cost it is not Admissable.

To make it admissable we have to make h(D) = 0.

Heuristic 3:

h(A) = 35
h(B) = 30
h(C) = 20
h(D) = 0
h(E) = 0
h(F) = 50

Paths:

A → E → D : 25

A → E → C → D : 35

A → B → C → D : 55

A → B → C → E → D : 95

Admissable.

Heuristic 4:

h(A) = 50
h(B) = 50
h(C) = 50
h(D) = 50
h(E) = 50
h(F) = 50

Paths

A → E → D = 75

A → E → C → D = 85

A → B → C → D = 105

A → B → C → E → D = 145

Since the value we found is more than the actual cost, it is not Admisable

To make it admissable we have to make

h(D) = 0

Heuristic 5:

h(A) = 0
h(B) = 0
h(C) = 0
h(D) = 0
h(E) = 0
h(F) = 0

Paths

A → E → D : 25

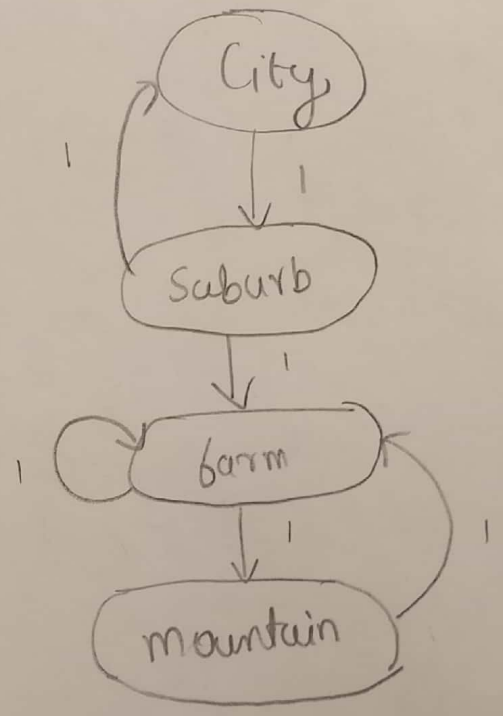
A → B → C → D : 55

A → B → C → E → D : 145

A → E → C → D : 35

Admissable.

4



h(city) = 3
h(suburb) = 2
h(farm) = 1
h(mountain) = 0

(or)

h(city) = 0
h(Suburb) = 0
h(farm) = 0
h(mountain) = 0

5

The space complexity of the searches will be,

Breadth first search = $O(b^{d+1})$

Depth first search = $O(b^d)$

Uniform cost search = $O(b^{T(x)/\epsilon})$

Iterative deepening search = $O(b*d)$

Best case scenario $d = 101$ and

Worst case scenario $d = 208$

BFS $= O(b^d)$

Best case $= O(4^{101})$ very large

Worst case $= O(4^{208})$ very large

DFS $= O(bm)$

Best case $= O(4 * 101)$

$= O(404)$

$= 404$ KB

Worst case $= O(4 * 208)$

$= O(832)$

$= 832$ KB

But as the depth increases the search turns into an infinite loop.

Uniform Cost Search : $O(b^d)$

Best case : $O(4^{101})$ very large

Worst case : $O(4^{208})$ very large

even if we assign cost of 1 to each path, it expands every other node and therefore it occupies more memory.

Iterative Deepening search : $O(bd)$

Best case scenario : $O(4 \times 101) = O(404) = 404\ KB$

Worst case : $O(4 \times 208) = O(832) = 632\ KB$

a) less than or equal to 50 KB : no search methods req

b) less than 1200 KB : iterative deepening search.