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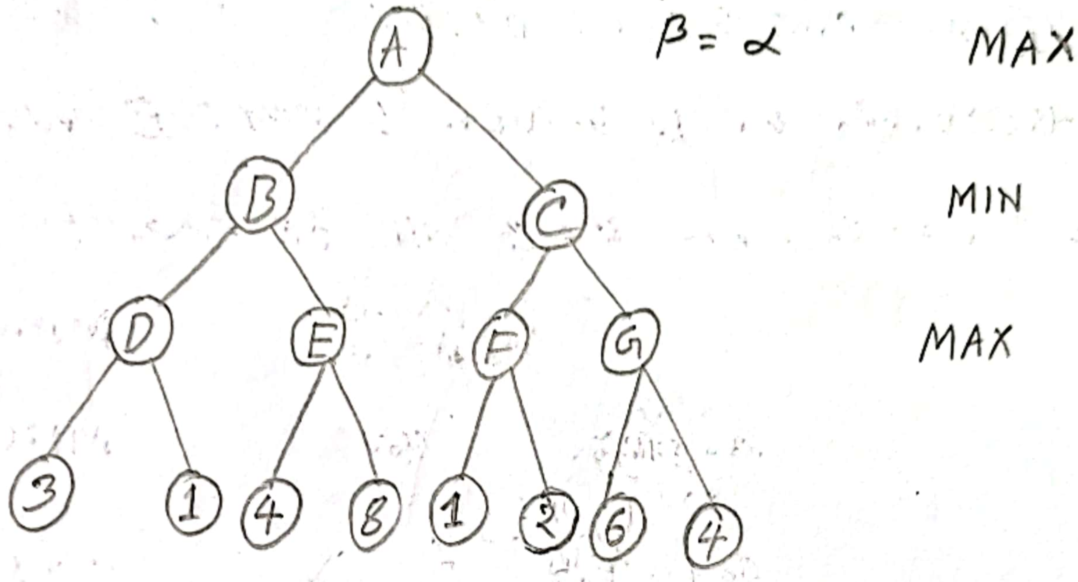
AI-G

①

1)

$A = -\alpha$
$\beta = \alpha$



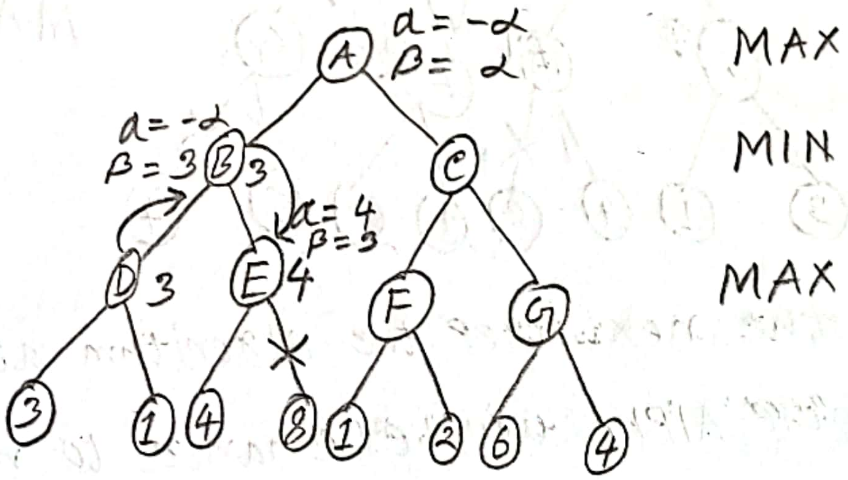
i) First start with the initial move. Then initially define the alpha and beta values as the worst case $A = -\alpha$ & $\beta = \alpha$. Prune the node only when alpha becomes greater than or equal to beta

ii) since the initial value of alpha is less than beta so we didn't prune it. now it's turn for MAX. so, at node D, value of alpha will be calculated. The value of alpha at node D will be max (3, 1). So, value of alpha at node D will be 3.

ii) now the next move will be on node B and it's turn for min now, so, at node B, the value of alpha beta will be min $(3, \alpha)$. so, at node B values will be alpha $= -\alpha$ and beta will be 3.

P.t.o

In the next step, algrithms traverse the next successor of B which is node E, and the values of $a=-\alpha$, and $\beta=3$ will be passed.



iv) Now it's turn for MAX. so, at node E will look for MAX. The current value of alpha at E is $-\alpha$ and it will be compered with 4. so, max $(-\alpha, 4)$ will be 4. so, at node E, alpha = 4, beta = 4. Now see that alpha is greater than beta which is satisfying the pruning condition so we can prune the right successor of node E and algorithm will not be traversed and the value at node E will be 4.

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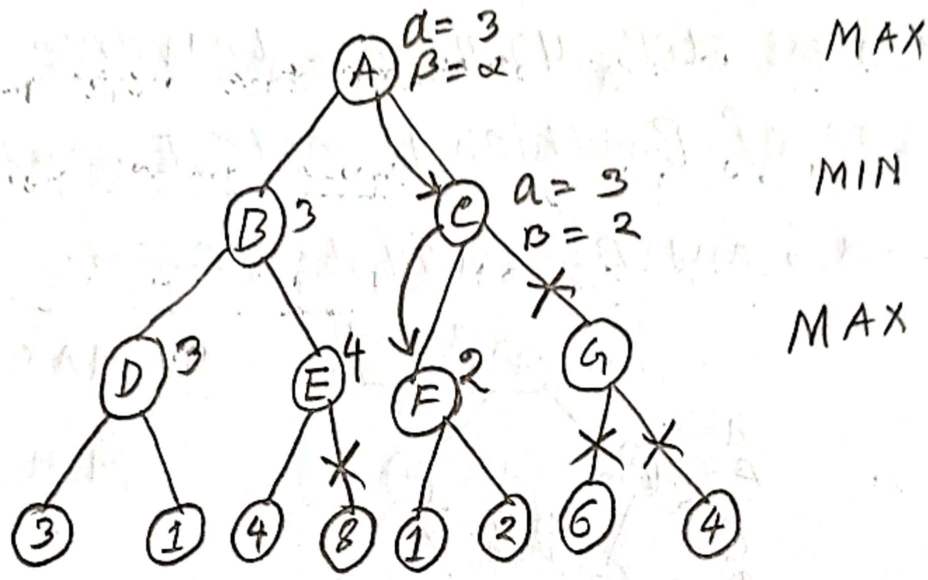
(3)



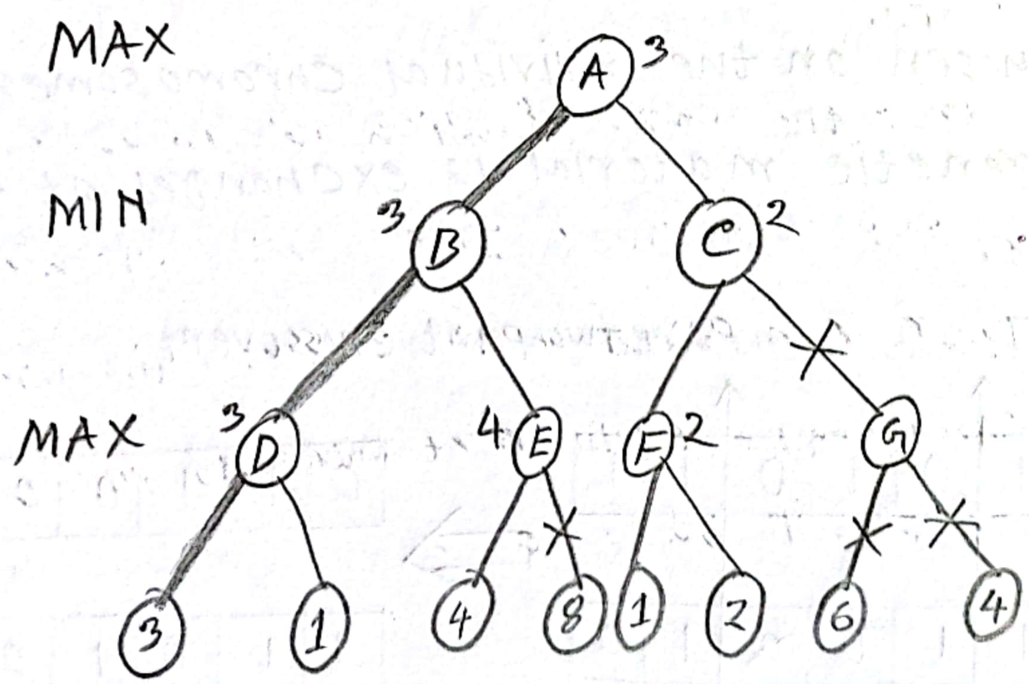
v) In the next step the algorithm again comes A node B. At node Alpha will be changed to maximum values as MAX $(-\alpha, 3)$. so now the value of alpha and beta at node A will be $(3, \alpha)$ respectively and will be transferred to node C. These same values will be tranferred to node F.

vi) At node F the value of alpha will be compared to the left branch which is 1. so max (1, 3) will be 3 and then compared with right child which is 2, and MAX $(3, 2) = 3$ till α remains 3, but the node value of F will become 2.

p.t.o

vii) now node F will return the node value 2 to C and will compare to beta value at C. now it's turn for MIN. so, MIN(α, 2) will be 2. now at node C, α=3. and β = 2 and alpha is greater than beta which satisfies the pruning condition. so, the next successor of node C. And G will be pruned and the algorithm didn't compute the entire subtree G.

Now, C will return the node value to A and the best value of A will be MAX(2,3) will be 3.



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2) Genetic Algorithm

→ Abstraction of real Biological Evolution.

→ solve complex problems.

→ Focus on optimization.

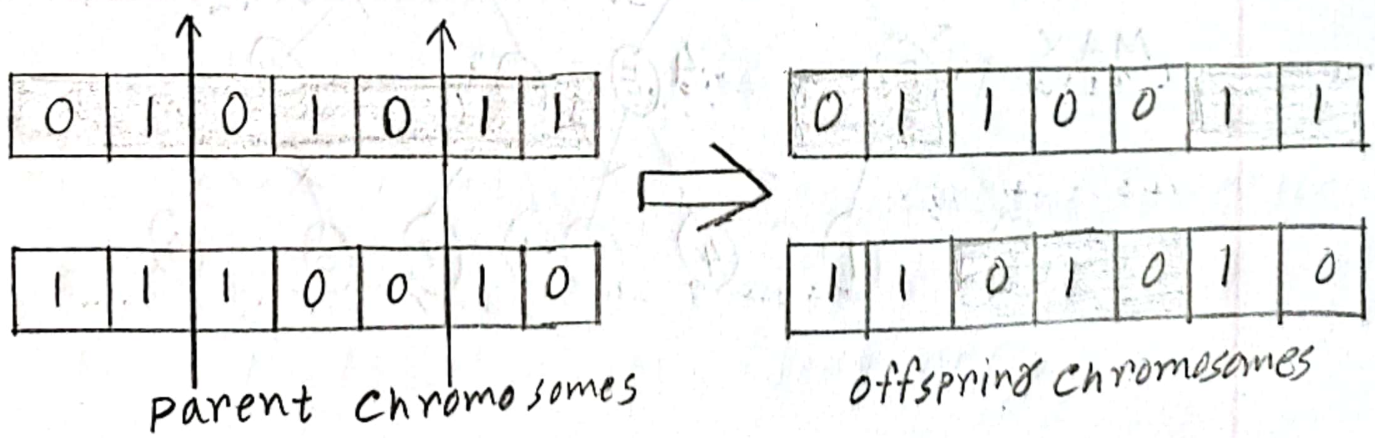
→ population of possible solutions for a given problem.

→ From a group of individuals, the best will survive

→ Phenotype $\xrightarrow{\text{Encode}}$ Genotype $\xrightarrow{\text{Decode}}$ Phenotype

Two-point crossover: This is a specific case of a N-point crossover technique. Two random points are chosen on the individual chromosomes (strings) and genetic material is exchanged at these points.

Two point crossover:



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3) 4-Queens to be on a 4x4 Chassboard, satisfying the constraint no two queens should be in the same row, same colomn, or in same diagonal.

The solution space accoding to the external constraints consists of 4 to the power 4, 4-tuples, $s_i = \{1, 2, 3, 4\}$ and $1 <= i < 4$, where as according to the internal constraints they consist of 4! solution permutation of 4.

Backtracking:

4-Queens problem through backtracking by taking it as a bounding function in use the criterion that if $(x_1, x_2, --- x_i)$ is a path a current E-node, then all the chilldren nodes with parent-child labelings $x(i+1)$ are such that $(x_1, x_2, x_3 -- x(i+1))$ represents a chess board configuration in which no queens are attacking.

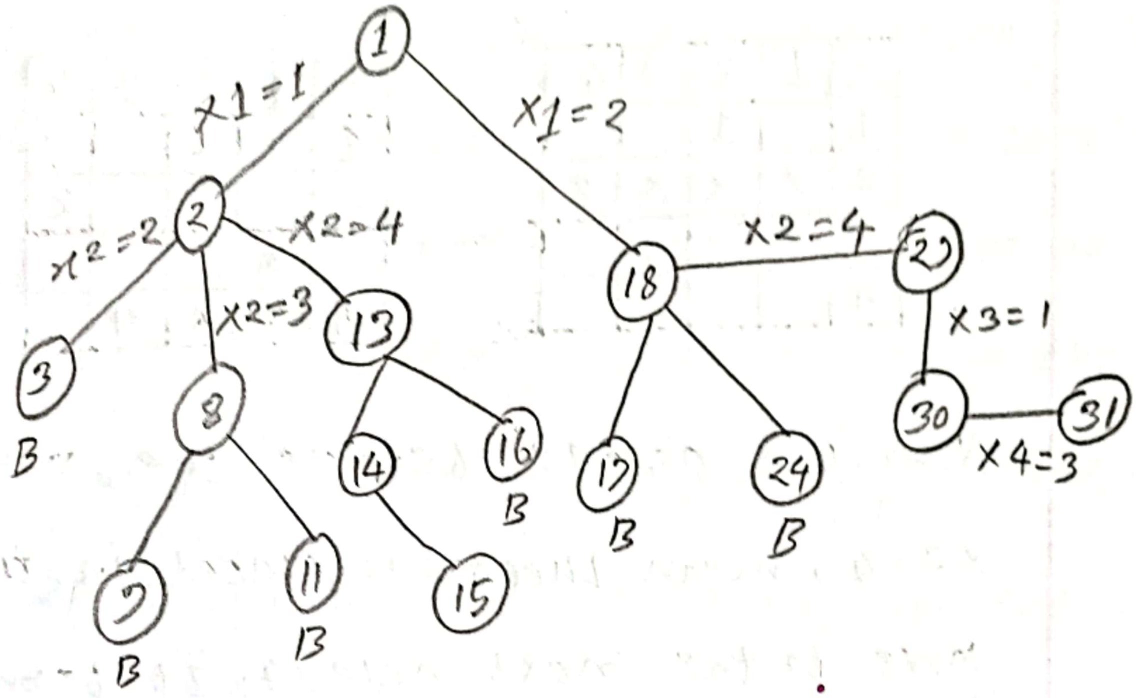
so we generated the next child. The node

P.t.o

number 2 is generated and path is now 1, then the queen 1 is placed in the first row and in the first column. now, node 2 becomes the next E-node or line code. try the next node in the ascending nodes. the node 3 which is having X2=2 mean queen 2 is placed in the second column but by this the queen 1 and 2 are on the same diagonal, so node 3 becomes dead here so we backtrack it and try the next node which is possible. Here, X2=3 means the queen 2 is placed in the 3rd column. It satisfies all the constraint so it become the next live node.

After this try for next node 7 having X3=2 which means the queen 3 placed in the 2nd column, but by this the 2 and 3 queen are on the same diagonal so it becomes dead. next node 11 with X3=4, but again the queen 2 and 3 are on the same diagonal so it is also a dead node.

The B denotes the dead node



Then, the possible position for the queen 3 and if not any position satisfy all the constraints then backtrack to the previous live node

	1	2	3	4
1	1			
2				
3				
4				

	1	2	3	4
1	1			
2	x	x	2	
3				
4				

	1	2	3	4
1	1			
2			2	
3	x	x	x	x
4				

	1	2	3	4
1	1			
2				2
3	x	3		
4				

	1	2	3	4
1	1			
2				2
3		3		
4	x	x	x	x

	1	2	3	4
1		1		
2				
3				
4				

P.t.o

	1	2	3	4
1		1		
2	x	x	x	2
3				
4				

	1	2	3	4
1		1		
2				2
3	3			
4	x	x	4	

Now, the node 13 become the new live node with $x2=4$, mean queen 2 is placed in the 4th column. Move to the next node 14. It becomes the next live node with $x3=2$ mean the queen 3 is placed in the 2nd column. next move to the next node 15 with $x4=3$ as the live node. But this makes the queen 3 and 4 on the same diagonal resulting this node 15 is the dead node so we have to backtrack to the node 14 and then backtrack to the node 13 and try other possible node 16 with $x3=3$ by this also we get the queen 2 and 3 on the same diagonal so the node is the dead node.

P.t.o

so, backtrack to the node 2 but no other node is left to try so the node 2 is killed so we backtrack to the node 1 and try another sub-tree having X1 = 2 which means queen 1 is placed in the 2n column. Now again with the similar reason, nodes 19 and 24 are killes and so we try for the node 29 with x2 = 4 means the queens 2 is placed in the 4th column then we try for the node 30 with x3 = 1 as a live node and finally we proceed to next node 31 with x4 = 3 means the queen 4 is placed in 3rd column. Here, all the constraints are satisfied, so the desired result for 4 queen is {2, 4, 1, 3}

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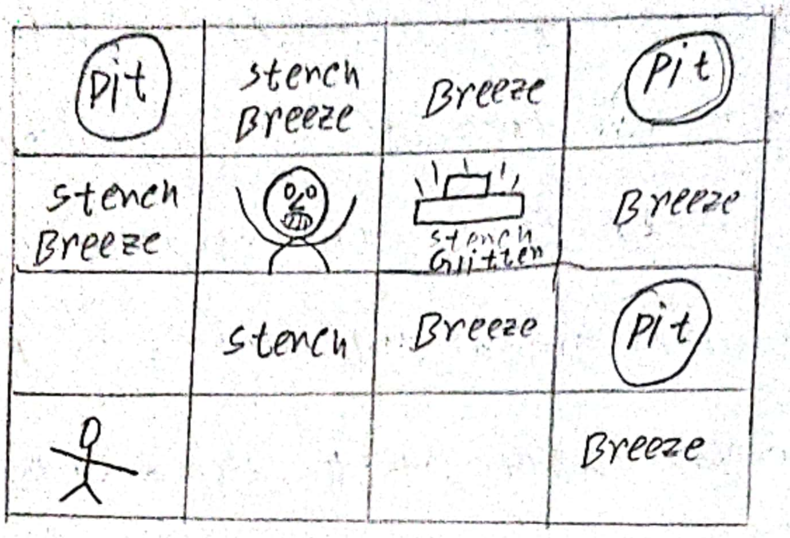
4)



Answer:

As the wumpus world shown there is the Agent which will start move from (1,1). from the (1,1) they will go straight upper to (1,2) visit. But there will nothing to found in the (1,2). Then going upper straight again will found (1,3). where the agent can't visit other room because room agent perceives some stench breeze, the pit can be in (1,4), so we will add symbol P. to say that is this pit room. Now agent will stop thinking

p.t.o

and will go back (1,2) and (1,1) which has been already visited. symbol A is used to agent symbol B for the breeze, glitter for G, visit for V, pit for P, wumpus for W.

Then, next Let's suppose agent move to the room (1,2) at that room along side (1,3) with stench. which means there must be a wumpus. But can't be (1,2) by rule of games because intially the game is started by (1,2), going forward to visit (3,2) there will found B. The room (3,2) wil have the pit a longside that means which have to go back track. Then, Back to (2,2) there was assume of a wumpus. (2,1) doesn't hold anything so the upper (2,3) room having the wumpus. so now it can be shooted. Now the in (2,3) to upper (2,4)

p.t.o

which means it will found pit along Left right both room. so the agent will come back to (2,3) then only visited point was (3,3) After visiting (3,3) the agent will go back to (2,3) room again, Then back to (2,2) room then (1,2) room and finally to the (2,2) room.

A= Agent, S= stench, B= Breeze, SB= stench Breeze, P= pit, V= visited, G= Glitter, W= wumpus

1,4	2,4	3,4	4,4
1,3 OK	2,3	3,3	4,3
1,2	2,2	3,2	4,2
1,1 A OK	2,1	3,1	4,1

1,4	2,4	3,4	4,4
1,3 V OK	2,3	3,3	4,3
1,2 P?	2,2	3,2	4,2
1,1 OK	2,1	3,1	4,1

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1,4	2,4	3,4	4,4
1,3 SBV OK	2,3 W?	3,3	4,3
1,2 P?	2,2 S	3,2 B	4,2
1,1 V OK	2,1 P?	3,1	4,1

1,4	2,4	3,4	4,4
1,3 SBV OK	2,3 WV	3,3	4,3 BV
1,2 P? V	2,2 S V	3,2 BV	4,2
1,1 V OK	2,1	3,1 P?	4,1