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PES1UG20CS385

MI - Unit-1 Assignment

1) a) We define our environment as a real plane consisting a group of convex polygon obstacles.

Agent is any point in the plane.

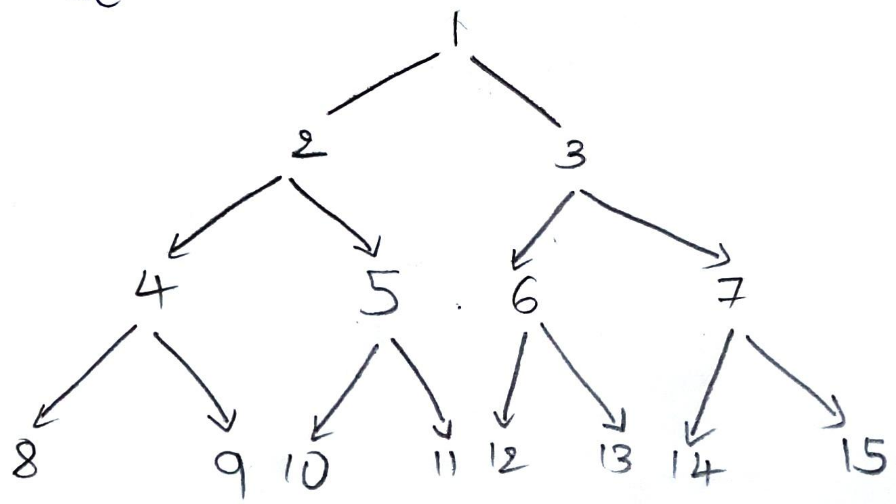
Goal state is position ~~in the plane~~ (x', y') and initial state is (x, y). Path cost has to be minimum. hence goal state is the shortest path.

Our state space has all the points (x', y') that lie on the plane given that infinite number of obstacles exist. Otherwise there would be infinite states (x', y') in out state space.

Considering that the goal is reachable, there would be infinite paths for infinite states.

But only one straight line shortest optimal path can exist b/w two vertices of any two polygons.

2) a)



b: Breadth first : 1 2 3 4 5 6 7 8 9 10 11

Depth Limited : 1 2 4 8 9 5 10 11

Iterative deepening : 1; 1 2 3; 1 2 4 5 3 6 7; 1 2 4 8 9 5 10 11

c: f(x) = { If (x = 1)

{ Function ()

}

else If (even(x))

{ f(floor(x/2))

}

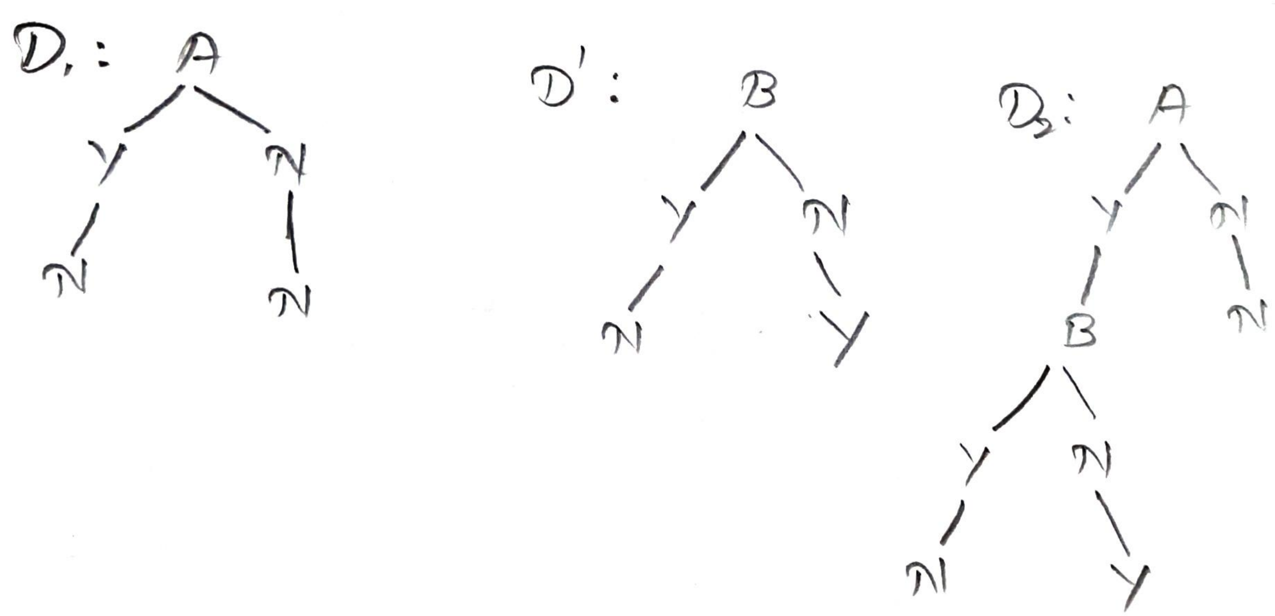
LEFT else f(floor(x/2)) RIGHT }.

3: From the problem statement, ID3 could extend D_1 into D_2 means that D_2 can be constructed from D_1 by replacing a leaf of D_1 with a decision tree D'

Statement is False.

We can't simply say that D_1 is more general than D_2 if D_2 is an elobration of D_1.

Counter example for proof :



4c A^* algorithm is a breadth first search algorith
The first solution is $g(n)$ which calculates the path cost b/w the start node and the current node. The second solution is $h(x)$ which is a heuristic to calculate the estimated path cost from the current node to the goal node

$$F(n) = g(n) + h(n)$$

A^* continues to re-evaluate both $g(x)$ & $h(x)$ in order to get the minimal path cost.

A heuristic is admissable only if it is optimistic meaning that under estimation or correct estimation is possible but over estimation is not

Hence we can say that A^* is complete and optimal on graphs that are locally finite where the heuristics are admissible and monotonic.

A^* optimality ~~by~~ is proved by contradiction. First it is assumed that g is an optimal goal state with path cost $f(g)$ such that $g(s) > f(g)$. We assume that A^* selects suboptional goal state 's' instead of other node 'n'

Since h is admissible $f(g) >= f(n)$

If n is not chosen over s by A^*, $f(n) >= f(s)$

Since s is a goal state, $h(s) = 0 \Rightarrow f(s) = g(s)$ / $f(s) = g(s) + h(s)$

Thus $f(g) > g(s)$. This contradicts suboptional choice. Hence A^* is ~~optio~~ optimal

5c a) Age and Income are numeric columns with large variation hence will not be considered for calculation.

Total entropy = 0.9403

Information gain (Income) = 0.210

Information gain (Type) = 0.343

Information gain (Credit rating) = 0.435

Credit rating will ~~not~~ be root node

Entropy (Credit rating = low) = 0 ; Ends here.

Entropy (Credit rating = High) = 0.99

⇒ Information gain (Credit rating = High, type) = 0.198

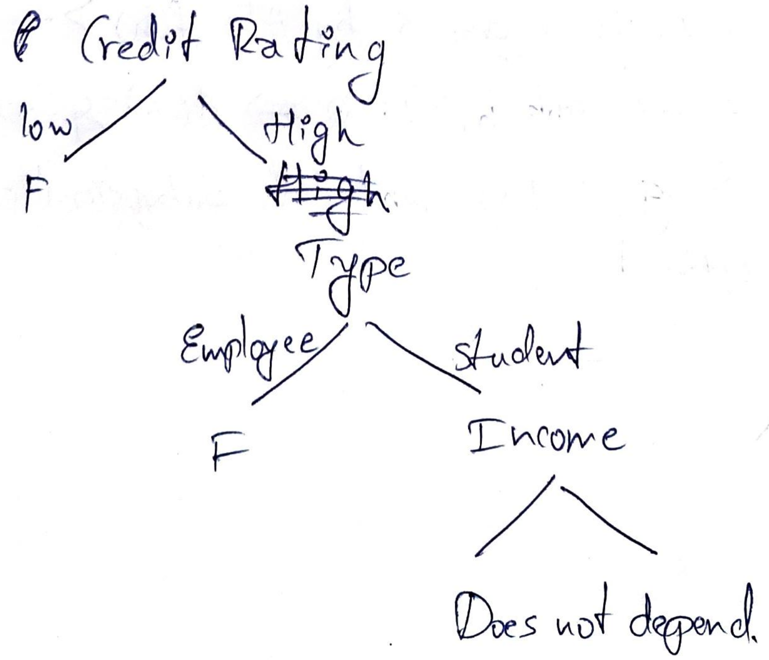
Information gain (Credit rating = High, Income) = 0.198

Either can be ~~re~~second node.

Let Type be the second node

Entropy (Type = ~~Entropy~~ Employee) = 0 / False.

⇒ Income will be the final node



b: Hence, Decision Rule:

If Credit rating is High & type is student, Agent will ~~by by~~ buy computer.

c: Consistent Hypothesis: $\forall$ Credit Rating = low, Agent doesn't ~~by~~ buy computer

6: Size of

a: Instance space = |Income| × |Type| × |Credit Rating|

$= 3 \times 2 \times 2$

$= 12$

b: No. of semantically different hypothesis $= (4 \times 3 \times 3) + 1$

$= 37$

c: No. of syntatically different hypothesis $= 5 \times 4 \times 4$

$= 80$

d: Size of concept space $= 2^{12}$