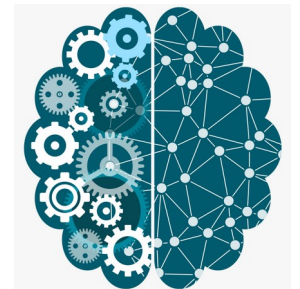


Generate and Test

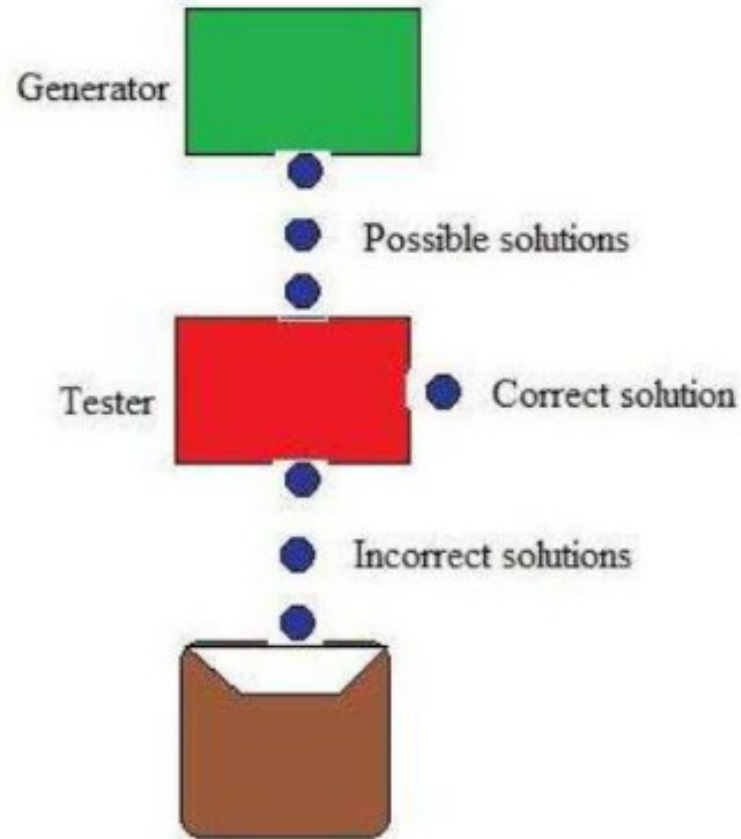
Tushar B. Kute,
<http://tusharkute.com>



Generate and Test Search

- Generate-and-test search algorithm is a very simple algorithm that guarantees to find a solution if done systematically and there exists a solution.
- Algorithm: Generate-And-Test
 - 1. Generate a possible solution.
 - 2. Test to see if this is the expected solution.
 - 3. If the solution has been found quit else go to step 1.

Generate and Test Search



Generate and Test

- Potential solutions that need to be generated vary depending on the kinds of problems
- For some problems the possible solutions may be particular points in the problem space and for some problems, paths from the start state

Generate and Test

- Generate-and-test, like depth-first search, requires that complete solutions be generated for testing
- In its most systematic form, it is only an exhaustive search of the problem space.
- Solutions can also be generated randomly but solution is not guaranteed
- This approach is what is known as British Museum algorithm: finding an object in the British Museum by wandering randomly.

Systematic Generate and Test

- While generating complete solutions and generating random solutions are the two extremes there exists another approach that lies in between
- The approach is that the search process proceeds systematically but some paths that unlikely to lead the solution are not considered.
- This evaluation is performed by a heuristic function

Systematic Generate and Test

- Depth-first search tree with backtracking can be used to implement systematic generate-and-test procedure
- As per this procedure, if some intermediate states are likely to appear often in the tree, it would be better to modify that procedure to traverse a graph rather than a tree

Generate and Test Planning

- First, the planning process uses constraint-satisfaction techniques and creates lists of recommended substructures.
- Then the generate-and-test procedure uses the lists generated and required to explore only a limited set of structures.
- Constrained in this way, generate-and-test proved highly effective.

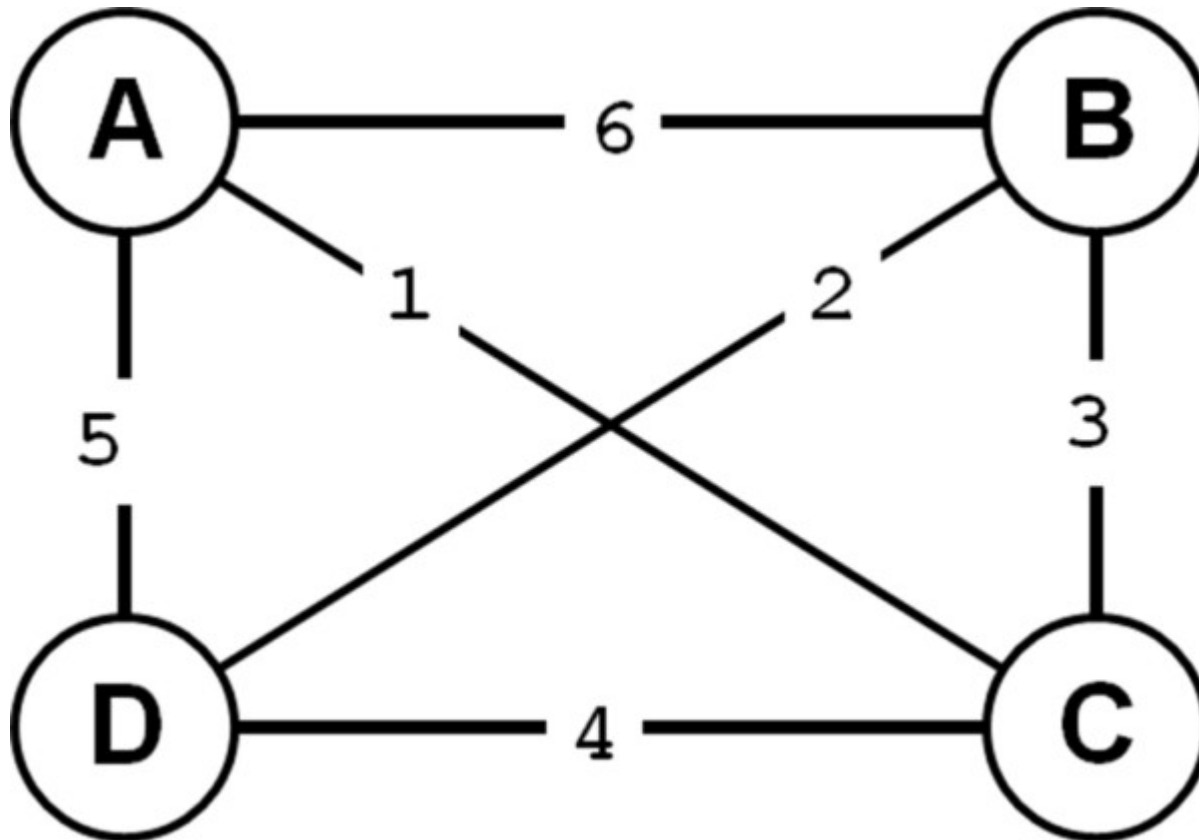
Example:

- Example: coloured blocks
- “Arrange four 6-sided cubes in a row, with each side of each cube painted one of four colors, such that on all four sides of the row one block face of each color are showing.”
- Heuristic: If there are more red faces than other colours then, when placing a block with several red faces, use few of them as possible as outside faces.

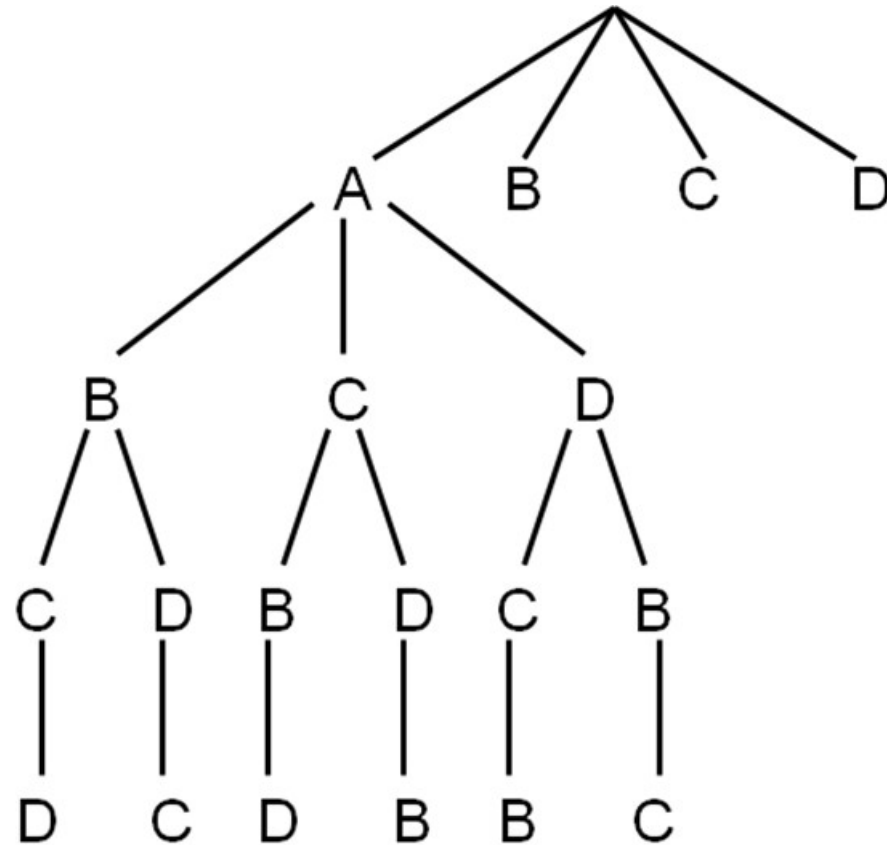
Example:

- Example – Traveling Salesman Problem (TSP)
- A salesman has a list of cities, each of which he must visit exactly once. There are direct roads between each pair of cities on the list. Find the route the salesman should follow for the shortest possible round trip that both starts and finishes at any one of the cities.
 - Traveler needs to visit n cities.
 - Know the distance between each pair of cities.
 - Want to know the shortest route that visits all the cities once.

Example:



Example:



Search flow with Generate and Test

Example:

Search for	Path	Length of Path
1	ABCD	19
2	ABDC	18
3	ACBD	12
4	ACDB	13
5	ADBC	16
Continued		

Finally, select the path whose length is less

Thank you

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