

Report Assignment 1.2
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1- Give the representation of a solution (answer) of the problem

- The class City represents a city in the map being used in the search algorithms. It has three attributes:
 - name: A string representing the name of the city.
 - connections: A list representing the cities that can be reached from the current city.
 - h_n: An integer representing the heuristic value of the city.
- $X = \{x_1, x_2, x_3, \dots, x_n\}$ denotes the set of variables, where (n) is the number of cities.
- Each variable (xi) is a binary variable that takes the value 1 if city (i) is selected to be included in the path, and 0 if not included.
- $x_i = \{0, 1\}$ denotes the domain of each variable.
- The constraint in the problem is that no two adjacent cities in the path can be the same. This ensures that each city is visited exactly once and there are no repeated cities in the solution.
- $C = \{x_1 \neq x_2, x_2 \neq x_3, \dots\}$ denotes the constraint of the problem

2- Give the equation of f(n) used in Greedy Best-first Search (or Explain how to calculate f(n)).

- $f(n) = h(n)$
 - f(n) is equal to the heuristic function h(n).
 - h(n) is a heuristic function that estimates the cost from city n to the goal city, which is the straight line distance.
 - Straight line distance = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

3- Give the equation of f(n) used in A* (or Explain how to calculate f(n)).

- $f(n) = g(n) + h(n)$
 - f(n) It represents the estimated total cost of the cheapest solution through city n.
 - g(n) is the actual cost of the path from the start city to city n.
 - h(n) is a heuristic function that estimates the cost from city n to the goal city, which is the straight line distance.
 - Straight line distance = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

4- Explain both algorithms and the differences between them.

- Calculating $f(n)$
 - GBF is a greedy algorithm that only considers the estimated distance to the goal city when selecting the next city, whereas A^* considers the heuristic estimate and the actual cost of reaching that city from the start city.
- Solution
 - A^* is generally more likely to find an optimal solution because it uses more information to guide the search.