

Readme file for Branch and Bound Algorithm Code

Input:

These are all the inputs available to our program :-

1. No of bases in our model of the refueling operation
2. Latitudes and Longitudes coordinates of all the bases involved
3. Information of all the bases involved
4. Directed Acyclic Graph of the bases telling about the paths available from one base to another
5. A topological ordering of the directed acyclic graph found using the `topological_ordering` function
6. No. of requests involved in the complete scenario by the cruiser aircrafts. For each requests involved, we are provided with the following information :-
 1. Latitudes and Longitudes coordinates of the start of the refueling operation
 2. Latitudes and Longitudes coordinates of the desired end of the refueling operation
 3. Amount of fuel required by the cruiser aircraft
 4. Start time of the refueling operation
 5. Length of the total refueling path of the cruiser aircraft calculated by distance function using start and end coordinates as input

Output:

We get the minimum fuel consumption possible as an output of our program.

Functions Involved:

1. **Pricing Loop** :- Branch and bound algorithm using a branch and price framework executed on each branch and bound node with the required inputs to calculate the expected fuel requirement of the system.

2. **Labeling Scheme** :- A sub-function called by the iteration of pricing loop function to check the feasibility of the iteration i.e. branch and bound path. It is used to find the shortest path length under the given constraints. It requires the fuel and cost function for its computation.
3. **Topological Sorting** :- This function is used to find the topological ordering of the given directed acyclic graph. In our program we use this function to be able to get the 5th input to be calculated with the help of the 4th input matrix.
4. **Distance function** :- Taking the initial and final , latitudes and longitudes coordinates , this function returns the arc path length involved between the points. We use this to find the total path length involved in the refueling operation to calculate the initial fuel mass.

The first two functions are the required functions to implement the branch and bound algorithm whereas the last two functions we use to lessen the input data as well as the computations performed by the user.