Name: Nidhi Verma

Roll no: MT22044

Subject: Artificial Intelligence

[ASSIGNMENT-2 REPORT]

Project Name : Road Route System

Objective: Road Route System is used to find the route between two cities using the search techniques : 'DEPTH FIRST SEARCH' or 'BEST FIRST SEARCH'.

Introduction: Road Route System is build using Prolog. It searches a road route from any city to any other city using the data given. It calculates the distances for the cities that are directly connected (say, Ahmedabad to Indore) as well as for two cities that are not directly connected (say, Agartala to Hubli).

Description:

Input : It takes input from user that which search technique they want to apply to find the route between source and goal city. After entering their choice it ask for from which city to which city they wish to calculate the route and distance., ie. Source city and Goal city.

Output of program: It displays the route and total distance between the cities as entered by user**.**

Details of program:

- **Reading csv file:** Read the csv file and create dynamic facts of path from one city to another having three parameter, say path(Source, Goal, Distance).
- **Search Techniques Used:**
  1. Depth First Search
  2. Best First Search.
- **Logic behind program:**
  For Best first search, first it will compute a dynamic heuristic list for Source and Goal City and among those select the best Route and Distance.
  For Depth first search, it will work according to the fact ie, 'true' order.

- **How to run the program?**
    1. Type “ hola. ” and then press enter.
    2. It ask for your choice that which technique you wish to use to compute the route and distance. Type “ 1. ” for Depth First Search . Type “ 2. ” for Best First Search.
    3. Then it ask for from which city to which city you wish to compute route and distance. You need to type “ ‘Souce City’ ” and “ ‘Goal City’ “ and then press enter . It now shows the output as route and total distance between the cities.

Key concepts of prolog used in this Road Route System:

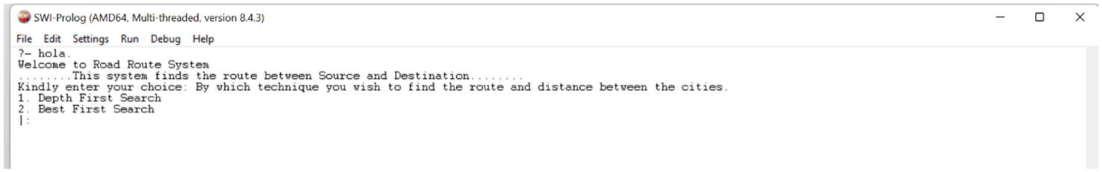
- **Input**: read input function to read the input from the user.
- **Output:** write output function is used to display/prints the output.
- **Lists**
- **Assert**
- **Recursion**
- **Backtracking**
- **Dynamic Fact:** path/3

Rules in this Road Route System:

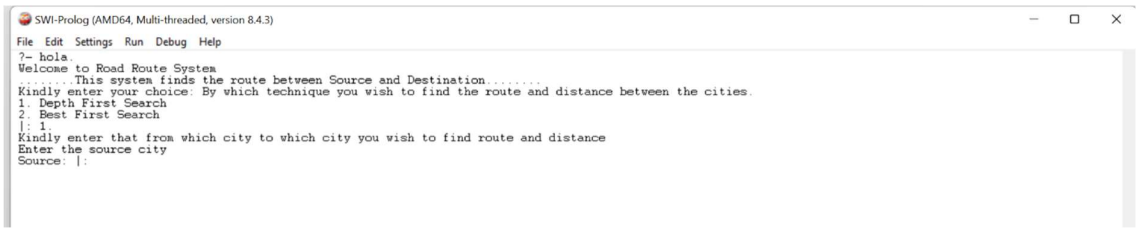
- **hola/0:** In this rule, it will call start/0 to find the dynamic routes between the cities by reading csv file
- **start/0**
- **cost/2:** it takes two parameter, first as list for which we calculate the cost (sum of list elements) and second parameter is ‘Cost’ which store the value of cost.
- **rowstolist/2**
- **answer/5**
- **true/2**
- **dfs/6:** computes the route and distance using different rules.
- **path/3 (dynamic fact)**
- **bestfirstsearch/4 :** bestfirstsearch/4 uses different rules to find the best route. It will call compute_heuristic/3 and min_distance/4, compute_heuristic contains the heuristic list of all possible routes from Start to Goal and min_distance will find the best route among all the paths.
- **adjacentNode/7**
- **min_distance/4 :** min_distance will find the best route among all the paths.
- **compute_heuristic/3 :** compute_heuristic contains the heuristic list of all possible routes from Start to Goal
- **compute_logs/4**

Steps to run the program:

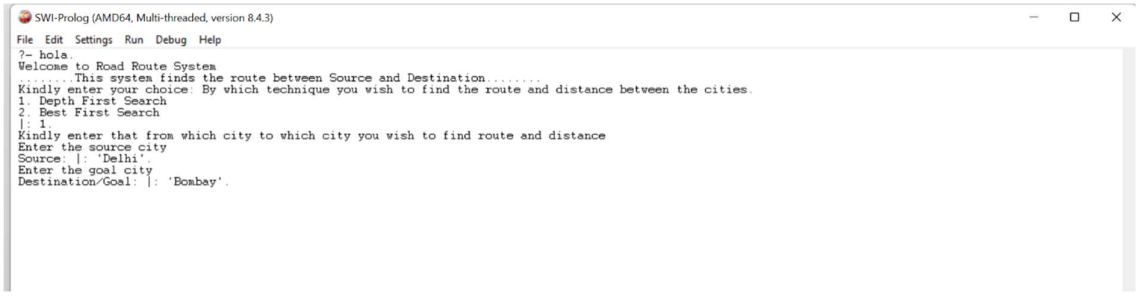
1. **In SWI Prolog type hola.**



2. **Input your choice : 1. Or 2.**



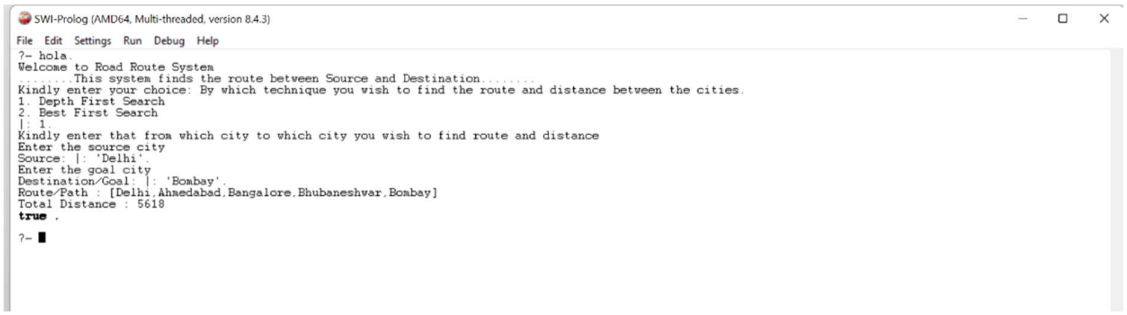
3. **Input source city and goal city for which you wish to compute route and distance. Format of input: 'Source City'. and 'Coal City'. Eg- 'Delhi' followed by dot and 'Bombay' followed by dot.**



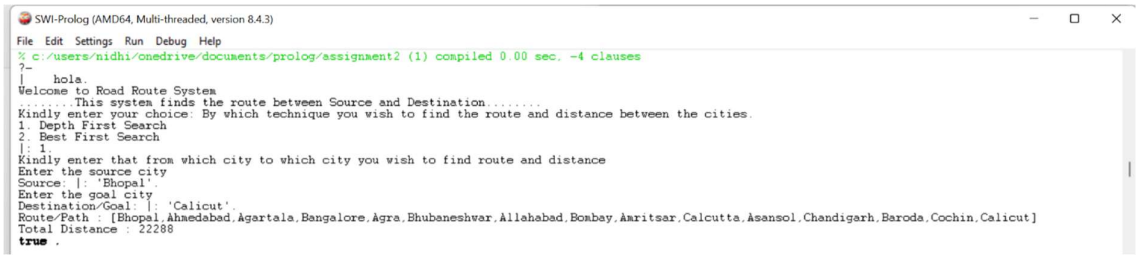
Output Screenshots:

1. **DFS:**

- **When there is direct path exists between cities.**
  Eg: ' Delhi' to 'Bombay'.

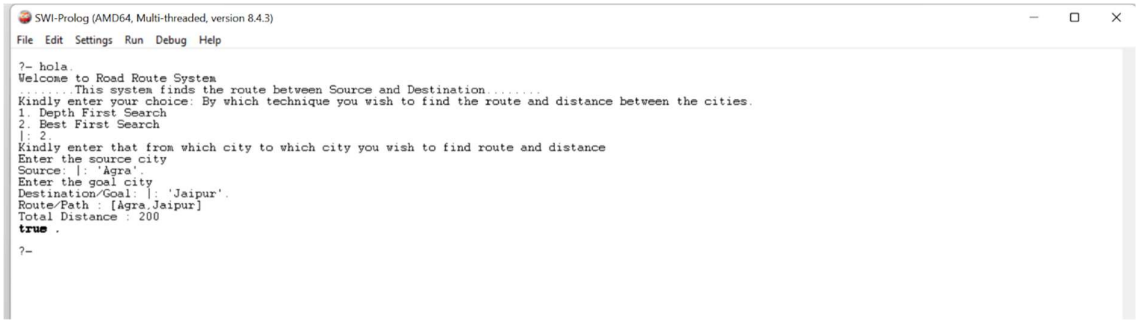


- **When there is no direct path between cities.**
  Eg: 'Bhopal' to 'Calicut'

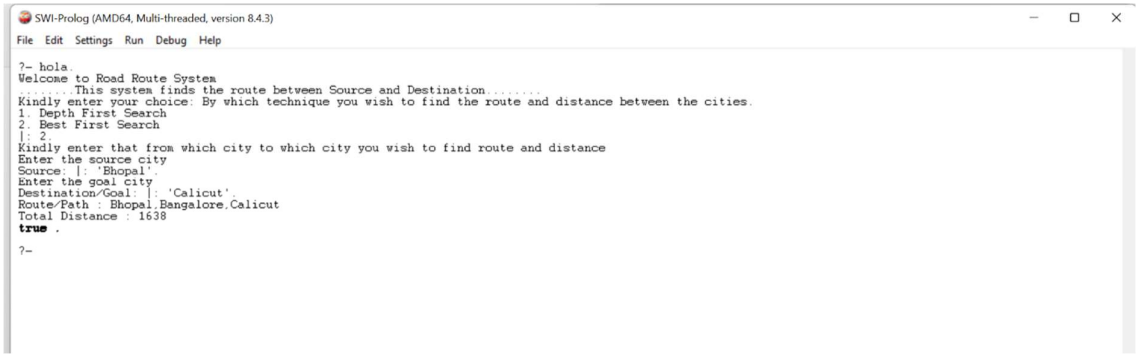


2. BEST FIRST SEARCH:

- **When there is direct path exists between cities.**
  Eg : here direct path exists between Agra and Jaipur.



- **When there is no direct path exists between the cities:**
  Eg: 'Bhopal' to 'Calicut'


SWI-Prolog (AMD64, Multi-threaded, version 8.4.3)
File Edit Settings Run Debug Help
?- hola.
Welcome to Road Route System
.....This system finds the route between Source and Destination.....
Kindly enter your choice: By which technique you wish to find the route and distance between the cities.
1. Depth First Search
2. Best First Search
|: 2.
Kindly enter that from which city to which city you wish to find route and distance
Enter the source city
Source: |: 'Bhopal'.
Enter the goal city
Destination/Goal: |: 'Calicut'.
Route/Path : Bhopal,Bangalore,Calicut
Total Distance : 1638
true .
?-