Assignment 2

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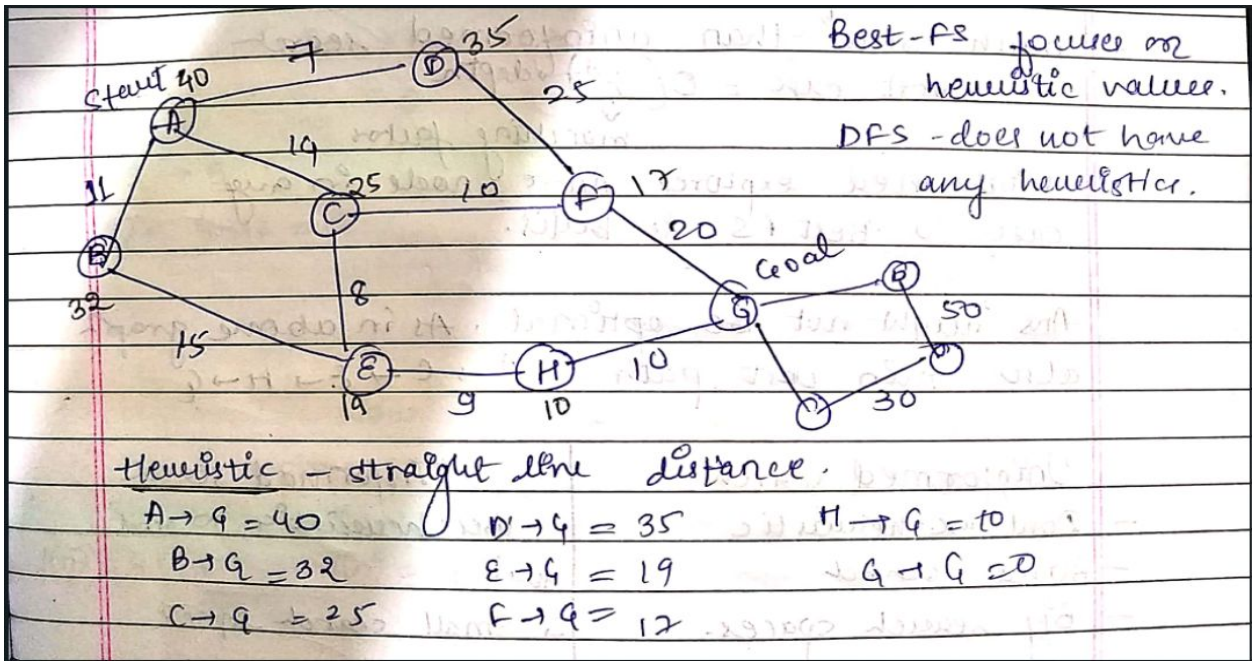
MT19073

Note: For both the searching techniques I have used prolog functions and concepts like lists, recursion, backtracking, cut, assert, retract, retractall, member, append and text styling.

Question 1. Depth First Search.
We do not take any heuristic in DFS as it is an uninformed searching technique.
To store the facts corresponding to edges I have used the read_csv function and read the csv file given in the assignment and created facts using assert command.

Question 2. Best First Search.
As best first search is an informed searching technique, I have used the shortest distance between a node and goal node as heuristic value. Shortest path between pairs of vertices is calculated using Dijkshtra's single source shortest path algorithm. After finding the heuristic value, facts are created like heuristic(City1, City2, Shortest path cost). To store the facts corresponding to edges I have used the read_csv function and read the csv file given in the assignment and created facts using assert command.

As in the given dataset it was not easy to verify whether the searching algorithms are performing correctly or not, I have taken a simple graph and performed depth first search as well as best first search for the below graph so that we can verify that our program is working correctly.



The output of DFS for above graph is shown below:

```
?- consult("D:/Artificial_Intelligence/assign2/Depth_first.pl").
Warning: d:/artificial_intelligence/assign2/depth_first.pl:15:
Warning:    Singleton variables: [V]
true.

?- start.
Enter the starting city:
|    a.
Enter destination city
|    g.

DFS path is :  [a,b,e,h,g]
Total search cost :  45
true .

?- start.
Enter the starting city:
|    b.
Enter destination city
|    e.

DFS path is :  [b,e]
Total search cost :  15
true .

?- start.
Enter the starting city:
|    a.
Enter destination city
|    f.

DFS path is :  [a,c,f]
Total search cost :  24
true .
```

The output of Best First Search for above graph is shown below:

```
?- start_bfs.
Enter the Souce City :
|    a.
Enter the Destination City :
|    g.

Best First Search path is :  [a,c,f,g]
Total cost is :  44
true.

?- consult("D:/Artificial_Intelligence/assign2/ques2.pl").
true.

?- start_bfs.
Enter the Souce City :
|    a.
Enter the Destination City :
|    g.

Best First Search path is :  [a,c,f,g]
Total cost is :  44
true.

?- start_bfs.
Enter the Souce City :
|    a.
Enter the Destination City :
|    e.

Best First Search path is :  [a,c,e]
Total cost is :  22
true.
```

Screenshots for the given dataset.

```
?- start.
Searching Algorithms
You want to perform Depth First Search or Best First Search?
1 Depth First Search.
2 Best First Search.
|    2.
Enter the Souce City :
|    agra.
Enter the Destination City :
|    agartala.

Best First Search path is :  [agra,patna,agartala]
Total cost is :  2566
true.

?- start.
Searching Algorithms
You want to perform Depth First Search or Best First Search?
1 Depth First Search.
2 Best First Search.
|    1.
Enter the Souce City :
|    agra.
Enter the Destination City :
|    agartala.

DFS path is :  [agra,ahmedabad,agartala]
Total search cost :  4183
true.
```

```
?- start.
Searching Algorithms
You want to perform Depth First Search or Best First Search?
1 Depth First Search.
2 Best First Search.
|    1.
Enter the Souce City :
|    agra.
Enter the Destination City :
|    amritsar.

DFS path is :  [agra,ahmedabad,agartala,bangalore,allahabad,bhubaneshwar,amritsar]
Total search cost :  13007
true.

?- start.
Searching Algorithms
You want to perform Depth First Search or Best First Search?
1 Depth First Search.
2 Best First Search.
|    2.
Enter the Souce City :
|    agra.
Enter the Destination City :
|    amritsar.

Best First Search path is :  [agra,chandigarh,amritsar]
Total cost is :  687
true.
```

```
?- start.
Searching Algorithms
You want to perform Depth First Search or Best First Search?
1 Depth First Search.
2 Best First Search.
|    2.
Enter the Souce City :
|    agra.
Enter the Destination City :
|    baroda.

Best First Search path is :  [agra,ahmedabad,baroda]
Total cost is :  997
true.

?- start.
Searching Algorithms
You want to perform Depth First Search or Best First Search?
1 Depth First Search.
2 Best First Search.
|    1.
Enter the Souce City :
|    agra.
Enter the Destination City :
|    baroda.

DFS path is :  [agra,ahmedabad,agartala,bangalore,allahabad,bhubaneshwar,amritsar,bombay,asansol,calcutta,baroda]
Total search cost :  19059
true.
```

```
?- start.
Searching Algorithms
You want to perform Depth First Search or Best First Search?
1 Depth First Search.
2 Best First Search.
|    1.
Enter the Souce City :
|    hyderabad.
Enter the Destination City :
|    agra.

DFS path is :  [hyderabad,agartala,ahmedabad,agra]
Total search cost :  7513
true.

?- start.
Searching Algorithms
You want to perform Depth First Search or Best First Search?
1 Depth First Search.
2 Best First Search.
|    2.
Enter the Souce City :
|    hyderabad.
Enter the Destination City :
|    agra.

Best First Search path is :  [hyderabad,agra]
Total cost is :  1246
true.
```