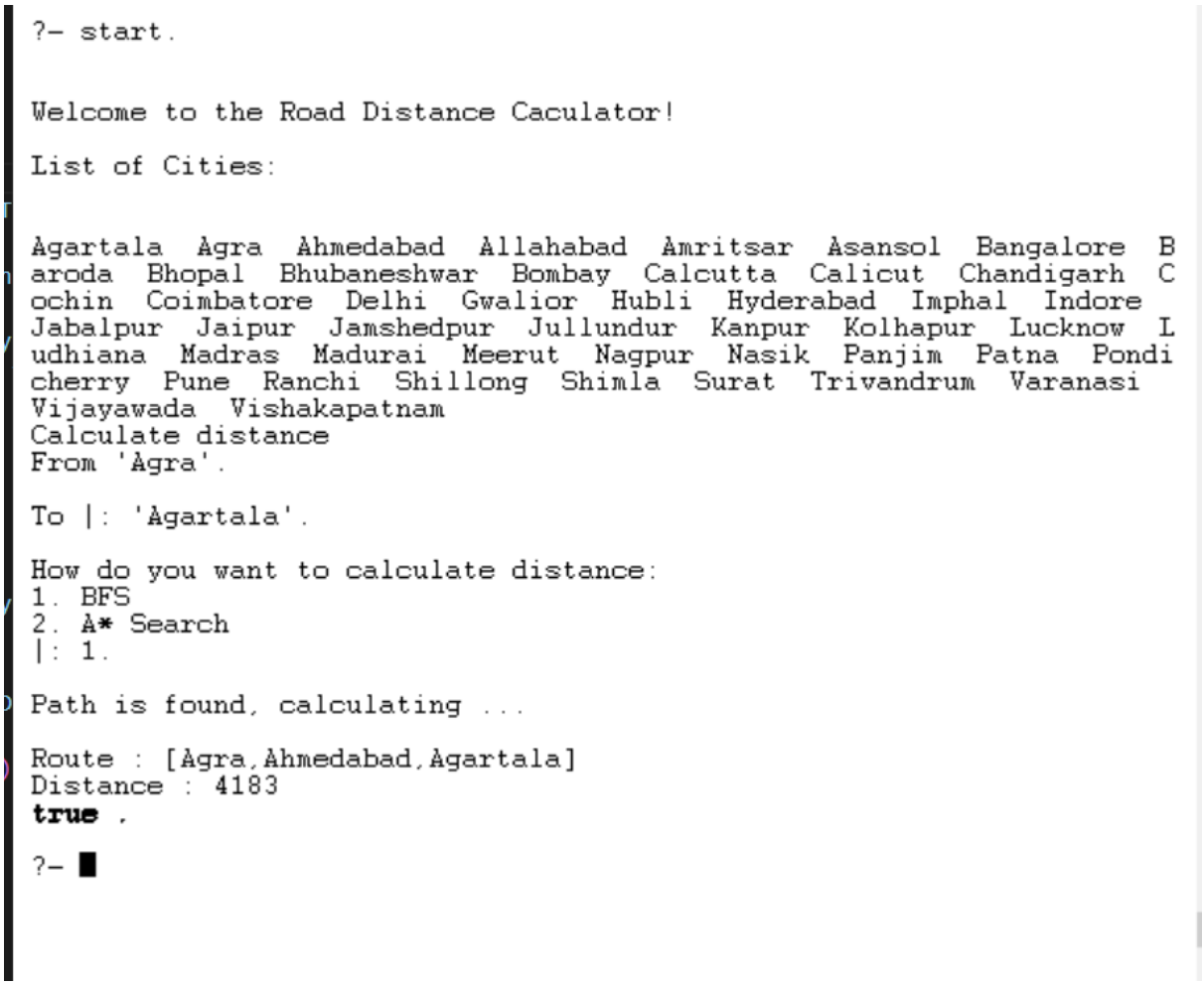
Assignment 2 Report

Option chosen is:

b. Show Breadth First Search and A* search on this data.

1. **Breadth-First Search**

Here I have implemented the bfs algorithm to calculate and print the distance between source city and destination city. It traverses through the branches and neighbours accordingly and gives the result as distance in km.



2. A* search

Here I have implemented the A* search algorithm to calculate and print the distance between source city and destination city. It follows f(n) = g(n) + h(n) to do so, where g(n) is the distance till that city, h(n) is the heuristics.

```
?- start.

Welcome to the Road Distance Caculator!

List of Cities:
Ahmedabad,Bangalore,Bhubaneshwar,Bombay,Calcutta,Chandigarh,Cochin,Delhi,Hyderabad,Indore,Jaipu
jim,Patna,Pondicherry,Pune

Calculate distance
From 'Vishakapatnam'.

To |: 'Vijayawada'.

How do you want to calculate distance:
1. BFS
2. A* Search
|: 2.

Path is found, calculating ...

currently on Vishakapatnam
Vijayawada
[Vishakapatnam,Bhubaneshwar]
currently on Bhubaneshwar
Vijayawada
[Vishakapatnam,Bhubaneshwar,Jamshedpur]
currently on Jamshedpur
Vijayawada
[Vishakapatnam,Bhubaneshwar,Jamshedpur,Calcutta]
currently on Calcutta
Vijayawada
[Vishakapatnam,Bhubaneshwar,Jamshedpur,Calcutta,Asansol]
currently on Asansol
Vijayawada
[Vishakapatnam,Bhubaneshwar,Jamshedpur,Calcutta,Asansol,Patna]
currently on Patna
Vijayawada
[Vishakapatnam,Bhubaneshwar,Jamshedpur,Calcutta,Asansol,Patna,Varanasi]
currently on Varanasi
Vijayawada
[Vishakapatnam,Bhubaneshwar,Jamshedpur,Calcutta,Asansol,Patna,Varanasi,Lucknow]
currently on Lucknow
Vijayawada
[Vishakapatnam,Bhubaneshwar,Jamshedpur,Calcutta,Asansol,Patna,Varanasi,Lucknow,Kanpur]
currently on Kanpur
```

SWI-Prolog (AMD64, Multi-threaded, version 8.4.3)

File Edit Settings Run Debug Help

```
Vijayawada
[Vishakapatnam,Bhubaneshwar,Jamshedpur]
currently on Jamshedpur
Vijayawada
[Vishakapatnam,Bhubaneshwar,Jamshedpur,Calcutta]
currently on Calcutta
Vijayawada
[Vishakapatnam,Bhubaneshwar,Jamshedpur,Calcutta,Asansol]
currently on Asansol
Vijayawada
[Vishakapatnam,Bhubaneshwar,Jamshedpur,Calcutta,Asansol,Patna]
currently on Patna
Vijayawada
[Vishakapatnam,Bhubaneshwar,Jamshedpur,Calcutta,Asansol,Patna,Varanasi]
currently on Varanasi
Vijayawada
[Vishakapatnam,Bhubaneshwar,Jamshedpur,Calcutta,Asansol,Patna,Varanasi,Lucknow]
currently on Lucknow
Vijayawada
[Vishakapatnam,Bhubaneshwar,Jamshedpur,Calcutta,Asansol,Patna,Varanasi,Lucknow,Kanpur]
currently on Kanpur
Vijayawada
[Vishakapatnam,Bhubaneshwar,Jamshedpur,Calcutta,Asansol,Patna,Varanasi,Lucknow,Kanpur,Allahabad]
currently on Allahabad
Vijayawada
[Vishakapatnam,Bhubaneshwar,Jamshedpur,Calcutta,Asansol,Patna,Varanasi,Lucknow,Kanpur,Allahabad,Nagpur]
currently on Nagpur
Vijayawada
[Vishakapatnam,Bhubaneshwar,Jamshedpur,Calcutta,Asansol,Patna,Varanasi,Lucknow,Kanpur,Allahabad,Nagpur,Jabalpur]
currently on Jabalpur
Vijayawada
[Vishakapatnam,Bhubaneshwar,Jamshedpur,Calcutta,Asansol,Patna,Varanasi,Lucknow,Kanpur,Allahabad,Nagpur,Jabalpur,Hyderabad]
currently on Hyderabad
Vijayawada
[Vishakapatnam,Bhubaneshwar,Jamshedpur,Calcutta,Asansol,Patna,Varanasi,Lucknow,Kanpur,Allahabad,Nagpur,Jabalpur,Hyderabad,Vijayawada]
ending
Route : _30
Distance : _32
true .

?-
```

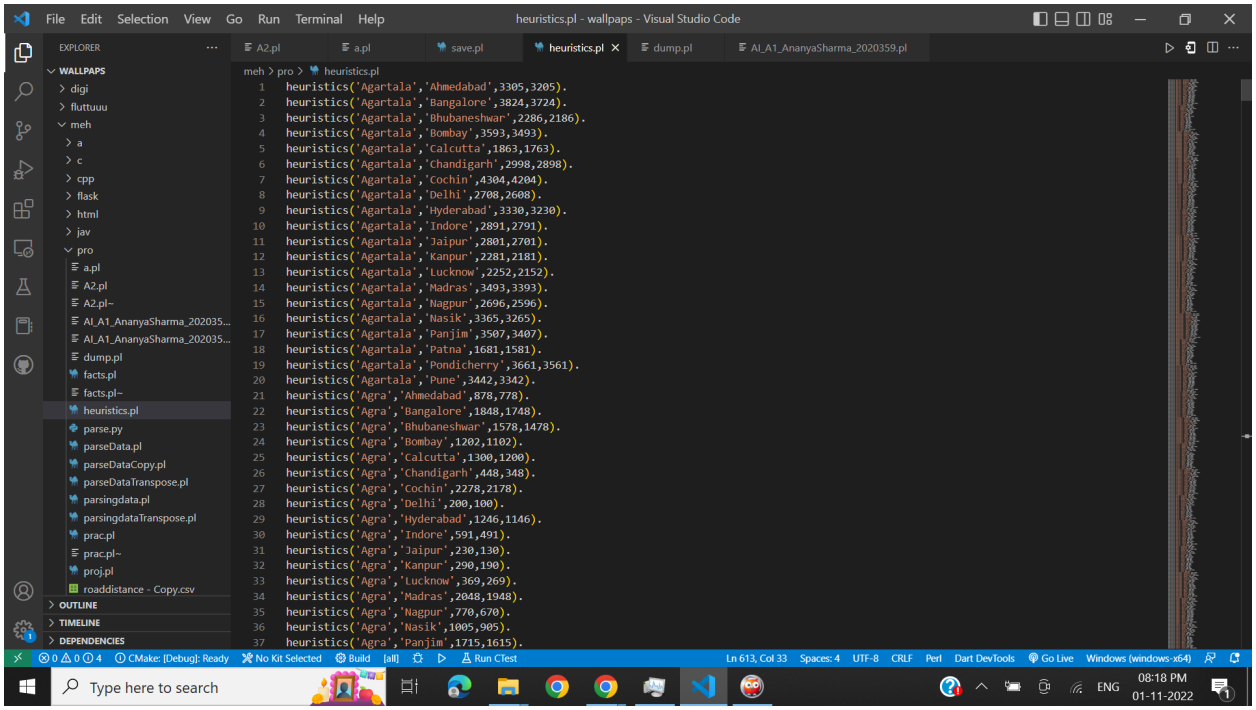
3. **Features used:**

```
  findall(
      Distance_fn - X,
      (

         get_heuristics(From_city , X , Distance_between_cities ,
Node_Heuristics),
         From_city \== X,
         not(member(X , Psf)),

         Distance_fn is Distance_between_cities + Node_Heuristics

      ),
      PairList
   ),
```

```
  sort(PairList , Sorted_List),

   get_head(Sorted_List , Head),

   remove_head(Sorted_List , Returned_List), !,

   pairs_keys_values([Head] , [Key] , [Value]),


   append(Psf, [Value], New_psf),

   not(member(Value , Psf)), !,


    write(New_psf),nl,
```

Lists, Write/ Read, Recursion, Backtracking, Pair, Key-Value list.
Library functions append, pairs, member etc,

4. **Heuristics:**



The heuristics used is **Distance_between_cities - 100.**