Project Name: Automobiles and Alternate Fuel Pumps

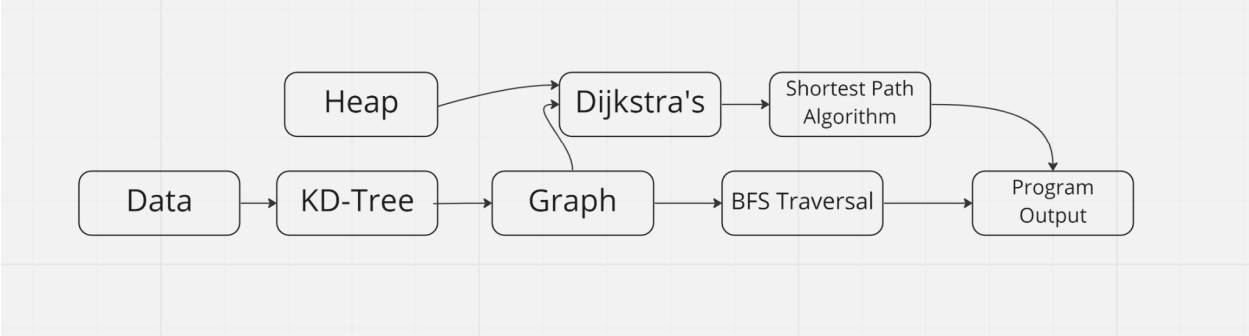
Motivation

Our motivation for this project is to think about the environment as they are damaged by the usage of fuels. To overcome this, we will analyze alternative fuels to find a better alternative to the current fuels.

Description of Functionality

The project functionality is that it makes the shortest path between two given ID corresponding to the Fuel Stations. One of the ID's will be corresponding to the start point and one of the others will be the destination point. We will construct the shortest distance path from the start point to the destination point which will inform us about the limitations of alternative fuel automobiles.

Program Architecture



The image above shows the architecture of the project where we started with the data and then used the KD-Tree to make the graph. The graph has an adjacency list and other functions which help us write other algorithms. The graph is used to write Dijkstra's algorithm which turns our graph into a shortest path tree. This tree is later used to write the algorithm for the shortest path between two nodes which is the output to the program. The other method runs the BFS Traversal which gives all the alternate fuel stations which can eventually be reached by the automobile in the given range of the automobile. This can also be shown through the program output.

Algorithm Functionality

The BFS traversal run can be used to check the reachability of all the alternate fuel stations from the given fuel station within the given range. This was useful to run through the entire dataset to get further information on the possibility of alternate fuel desserts through America. We ran several tests throughout the project and noticed that there were unconnected components within our tree reinforcing our belief that using the current technology we can't even

get to all parts of the United States on Ethanol. Here are the results of an electrical fuel station in Champaign-Urbana. We notice that within our community we have sufficient electricity fuel stations and are environmentally conscious. We also ran these tests for bigger datasets and noticed that we could not reach all the nodes further implying the presence of alternate fuel deserts.

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These are the ELEC stations you can visit:
2273    ELEC    123 W Hill St                                   IL      40.119161       -88.244185
7598    ELEC    615 W Marketview Dr                             IL      40.136567       -88.253800
14930   ELEC    2401 North Prospect Avenue                      IL      40.146204       -88.259828
17314   ELEC    1900 S 1st St                                   IL      40.093533       -88.237677
17315   ELEC    2013 S Neil St                                  IL      40.092448       -88.247278
17316   ELEC    217 N Neil St                                   IL      40.117990       -88.243955
17317   ELEC    509  E Healey St                                IL      40.111164       -88.230758
20205   ELEC    3310 Fields S Dr                                IL      40.072484       -88.308255
26689   ELEC    1401 W Green St                                 IL      40.109651       -88.226594
26690   ELEC    1083 W Pennsylvania Ave                         IL      40.101017       -88.222374
26691   ELEC    2021 S 1st St                                   IL      40.088819       -88.239863
26692   ELEC    3308 Mission Dr                                 IL      40.072306       -88.311422
26694   ELEC    2400 Bradley Ave                                IL      40.133406       -88.293768
32293   ELEC    3308 Mission Dr                                 IL      40.072039       -88.310966
51761   ELEC    211 W. Springfield Avenue                       IL      40.112202       -88.246056
51762   ELEC    401 W Curtis Rd                                 IL      40.068758       -88.255590
52789   ELEC    401 W Marketview Dr                             IL      40.136887       -88.248850
57453   ELEC    2511 W Springfield Ave                          IL      40.112825       -88.288773
62147   ELEC    2100 E University Ave                           IL      40.115628       -88.182804
65039   ELEC    1201 US-45                                      IL      40.115860       -88.224891
65040   ELEC    601 S Lincoln Ave                               IL      40.107668       -88.219884
65041   ELEC    77-91 Co Rd 1500 N 1st street                   IL      40.097783       -88.239972
65190   ELEC    60 Hazelwood Dr                                 IL      40.091126       -88.240192
The total number of ELEC stations you can visit you can visit from 3308 Mission Dr is 23.
Time taken: 0.0147387
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Another functionality of our program is building a tree with the shortest distance between two places to better inform our users of the possibilities of alternate fuels. We noticed that we can travel most of America with the usage of Ethanol fuel. For our testing, we ran the test through different parts of the United States and made sure that our tests were comprehensive in finding paths. We realized that vehicles with 300 miles of range can travel through America on Ethanol. Here is an example of a shorter path almost through halfway to America.

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The path from 9 Haines Rd to 202 8th St is:
2249    E85     9 Haines Rd                                     NY      41.238460       -73.701367
1857    E85     1923 Pulaski Hwy                                DE      39.609891       -75.709007
2060    E85     1395 W Patrick St                               MD      39.419638       -77.460062
1649    E85     1000 Clairton Blvd                              PA      40.320439       -79.941912
2254    E85     5991 Sunbury Rd                                 OH      40.160558       -82.878685
2084    E85     7339 W State Rd 28                              IN      40.276790       -85.810364
51392   E85     417 S CheStnut St                               IL      40.343210       -88.761441
51416   E85     2105 E Washington St                            IA      40.961277       -91.523713
21823   E85     903 N Sumner Ave                                IA      41.066823       -94.372216
51372   E85     1535 1st St                                     NE      40.654579       -97.273771
1721    E85     202 8th St                                      NE      40.928364       -100.165861
Time taken: 7.34764
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