**Project 2: TSP – Search with BFS and DFS**

* Learning objectives:
  + Search Techniques for graphs
  + BFS and DFS algorithms
* Background
  + A Traveling Salesperson Problem (TSP) is an NP-complete problem. A salesman is given a list of cities and a cost to travel between each pair of cities (or a list of city locations). The salesman must select a starting city and visit each city exactly one time and return to the starting city. His problem is to find the route (also known as a Hamiltonian Cycle) that will have the lowest cost.

For this lab we are looking at a special case of TSP in which not all cities are connected and the salesperson only needs to find the best path to a target city not visit all cities.

* Problem
  + For the given dataset (11PointDFSBFS.tsp), starting at the first city (city 1) find the shortest path to the goal city (city 11).
  + Implement Breadth First Search (BFS) and Depth First Search (DFS) algorithms
  + Visit cities in numerical order if you need to break a tie. You can hardcode connected edges into your algorithm for this problem, see table below

*Table 1: Cities connected by a one way path of Euclidian distance (left = from, top = to).*

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **pt** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** |
| **1** |  | x | x | x |  |  |  |  |  |  |  |
| **2** |  |  | x |  |  |  |  |  |  |  |  |
| **3** |  |  |  | x | x |  |  |  |  |  |  |
| **4** |  |  |  |  | x | x | x |  |  |  |  |
| **5** |  |  |  |  |  |  | x | x |  |  |  |
| **6** |  |  |  |  |  |  |  | x |  |  |  |
| **7** |  |  |  |  |  |  |  |  | x | x |  |
| **8** |  |  |  |  |  |  |  |  | x | x | x |
| **9** |  |  |  |  |  |  |  |  |  |  | x |
| **10** |  |  |  |  |  |  |  |  |  |  | x |

* Deliverables
  + Project report (3-4 pages) describing results of your experiments and your implementation. Which algorithm was faster in finding the target city? How long did it take (time and transitions)?
  + Well-commented source code for your project. You can use any language you like, but I reserve the right to ask you to demo performance of your algorithm on a new dataset.
  + You don’t have to include a GUI with visual representation of the solutions for this project, but it might be useful for your future TSP related projects in this course.