**IT3160E INTRODUCTION TO ARTIFICIAL INTELLIGENCE**

**CAPSTONE PROJECT**

**Class: 131117**

**Lecturer: Than Quang Khoat**

1. **GROUP INFO**

|  |  |  |
| --- | --- | --- |
| **Name** | **Student ID** | **Task** |
| Nguyen Khanh Trung | 20205133 | * Team Management * Implementing GBFS * Data Analysis * Writing Report |
| Nguyen Phuong Quang | 20205191 | * Researching and importing Data * Implementing UCS |
| Hoang Van Phuong | 20200478 | * Generating Test Case and Exporting Data * Visualization * Making SlideShow |
| Bui Van Thanh | 20200585 | * Implementing A\* * Data Analysis |

1. **PROBLEM DESCRIPTION**

Problem: Route Planning

*Overview*

We’re a writing a program to find the shortest route between two Vietnamese cities (e.g. Hanoi and Hai Phong). The intelligent vehicle can only travel between 2 adjacent cities, and the objective is to minimize the number of kms between two cities.

*Approach*

We’re writing the program to solve the problem through implement three different appropriate search algorithms: Uniform-cost Search (UCS), Greedy Best First Search (GBFS) and A\* search with the heurist function Estimated straight-line distance from n to the end\_city.

The program will have several outputs for each of the search algorithms:

* Time complexity (number of nodes expanded in order to solve the route planning problem)
* Space complexity (number of nodes kept in memory)
* The path used to solve the route planning problem (solution) if there was a solution
* The cumulated number of km of the solution (if any)

There’ll also be deep analysis and comparison between the three algorithms and visualization for the solution.

1. **DETAILS**

*Input*

The city map and heuristic distance will then be read from two json files: neighbor.json and sld.json, having the following format:

File neighbor.json

{

City\_1: {

Neighbor\_City\_1: Distance\_1,

Neighbor\_City\_2: Distance\_2,

…

},

City\_2: {

Neighbor\_City\_1: Distance\_1,

Neighbor\_City\_2: Distance\_2,

…

},

…

}

File sld.json

{

City\_1: {

Neighbor\_City\_1: Heuristic\_Distance\_1,

Neighbor\_City\_2: Heuristic\_Distance\_2,

…

},

City\_2: {

Neighbor\_City\_1: Heuristic\_Distance\_1,

Neighbor\_City\_2: Heuristic\_Distance\_2,

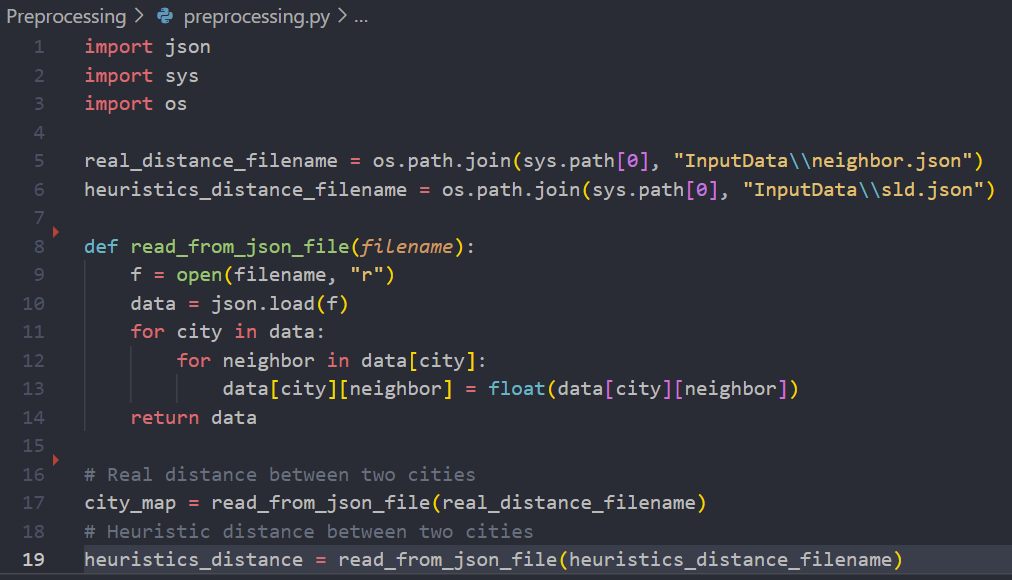
…

},

…

}

Data from the two files will be read by the preprocessing.py file containing the ***json*** library into 2 variables: city\_map and heuristics\_distance



*Algorithms*

The starting city and ending city will be fixed randomly.

*Output*

The program will have several outputs:

* Time complexity (number of nodes expanded in order to solve the route planning problem)
* Space complexity (number of nodes kept in memory)
* The path used to solve the route planning problem (solution) if there was a solution
* The cumulated number of km of the solution (if any)

*Algorithms*

We’re planning to use Uniform-cost search, Greedy best first search and A\* search algorithm with the heuristic function h(n) = the estimated straight-line distance (flying distance) from n to the goal city.

*Applications*

Optimized Travelling, Delivery and many more.