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**Department: Information Technology**

**Year: UG-III (5th Semester)**

**Subject: Artificial Intelligence Laboratory**

**Assignment: 4.1 : UCS and Iterative Lengthening**

**Date: 30.09.2021**

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Assignment Details:

Please use the following graph for the assignment. [Attached in Classroom announcement]

Things to do:

1. Implement both the algorithms

2. Execute both the implementations on traveling in Romania problem.

3. Write a document based on your observations of outputs of point 2 and compare and comment on the output..

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Observations and Discussion:

1. **Input file: input\_Graph\_83.txt**

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Arad Bucharest 500

Arad 0 75 0 118 0 0 0 140 0 0 0 0 0 0 0 0 0 0 0 0

Zerind 75 0 71 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

Oradea 0 71 0 0 0 0 0 151 0 0 0 0 0 0 0 0 0 0 0 0

Timisoara 118 0 0 0 111 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

Lugoj 0 0 0 111 0 70 0 0 0 0 0 0 0 0 0 0 0 0 0 0

Mehadia 0 0 0 0 70 0 75 0 0 0 0 0 0 0 0 0 0 0 0 0

Dobreata 0 0 0 0 0 75 0 0 0 0 120 0 0 0 0 0 0 0 0 0

Shibiu 140 0 151 0 0 0 0 0 80 0 0 99 0 0 0 0 0 0 0 0

Rimnicu-Vilcea 0 0 0 0 0 0 0 80 0 97 146 0 0 0 0 0 0 0 0 0

Pitesti 0 0 0 0 0 0 0 0 97 0 138 0 101 0 0 0 0 0 0 0

Craiova 0 0 0 0 0 0 120 0 146 138 0 0 0 0 0 0 0 0 0 0

Fagaras 0 0 0 0 0 0 0 99 0 0 0 0 211 0 0 0 0 0 0 0

Bucharest 0 0 0 0 0 0 0 0 0 101 0 211 0 90 85 0 0 0 0 0

Giurgiu 0 0 0 0 0 0 0 0 0 0 0 0 90 0 0 0 0 0 0 0

Urziceni 0 0 0 0 0 0 0 0 0 0 0 0 85 0 0 142 0 0 98 0

Vaslui 0 0 0 0 0 0 0 0 0 0 0 0 0 0 142 0 92 0 0 0

Iasi 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 92 0 87 0 0

Neamt 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 87 0 0 0

Hirsova 0 0 0 0 0 0 0 0 0 0 0 0 0 0 98 0 0 0 0 86

Eforie 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 86 0

1. **Output**

**[Uniform Cost Search]**

The Path between Arad and Bucharest is [Arad] ---> [Shibiu] ---> [Rimnicu-Vilcea] ---> [Pitesti] ---> [Bucharest]

The Distance between source and destination is 418.0

**[Iterative Lengthening Search]**

Source city: Arad

Destination city: Bucharest

Cost of optimal path: 500.0

For cost limit: 0.0

No Path Found

For cost limit: 0.0

No Path Found

For cost limit: 75.0

No Path Found

For cost limit: 118.0

No Path Found

For cost limit: 140.0

No Path Found

For cost limit: 146.0

No Path Found

For cost limit: 220.0

No Path Found

For cost limit: 229.0

No Path Found

For cost limit: 239.0

No Path Found

For cost limit: 299.0

No Path Found

For cost limit: 317.0

No Path Found

For cost limit: 366.0

No Path Found

For cost limit: 374.0

No Path Found

For cost limit: 418.0

Path Taken:

[Arad] -> [Shibiu] -> [Rimnicu-Vilcea] -> [Pitesti] -> [Bucharest]

1. **Discussion and Comparison**

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| --- | --- |
| **Uniform Cost Search** | **Iterative Lengthening Search** |
| In UCS, all nodes are put into priority queue and then searched for. Thus, a lot of memory is used. | In ILS, the repeatedly with therefore for each iteration it has to explore already explored graph, which leads to greater execution time of the algorithm. |