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AI Assignment #3 on 8 puzzle problem

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**Assignment #3**

Create a complete state space representation for 8-puzzle problem, given the initial and goal state is as follows. Formalize the problem (formally).

|  |  |  |
| --- | --- | --- |
| 2 | 8 | 3 |
| 1 | 6 | 4 |
| 7 |  | 5 |

|  |  |  |
| --- | --- | --- |
| 1 | 2 | 3 |
| 8 |  | 4 |
| 7 | 6 | 5 |

**Initial state** **Goal state**

**Action/operation**

By moving the blank spaces up, dawn, left or right until the goal is reached.

**Solution**

Using a method called **"Heuristic" search** which usesan evaluatingfunction to ranksuccessor nodes and picks the best.

It uses selecting criteria for a node by adding distance from start plus number of tiles out of place.

While moving the blank spaces we have to avoid explored nodes.

Formally it looks like as follows nodes with their corresponding lists and costs(sum of number of tiles out of spaces and distance from the start)

**exp. node OPEN list**

node 1 { node 2(6) , node 3(4), node 4(6) }

node 3 { node 5(5),node 8(5),node 9(6) }

node 5,node 8 { node 6(6),node 7(7),node 10(5),node11(7) }

node 10 { node 12(5) }

node 12 {node 13(5),node 14(7) }

node 13 { }

hence node 13 becomes the goal.

Graphically the heuristic search is as follows.

Node 1

|  |  |  |
| --- | --- | --- |
| 2 | 8 | 3 |
| 1 | 6 | 4 |
| 7 |  | 5 |

Start node

Node 2

Node 3

Node 4

|  |  |  |
| --- | --- | --- |
| 2 | 8 | 3 |
| 1 | 6 | 4 |
| - | 7 | 5 |

|  |  |  |
| --- | --- | --- |
| 2 | 8 | 3 |
| 1 | 6 | 4 |
| 7 | 5 | - |

|  |  |  |
| --- | --- | --- |
| 2 | 8 | 3 |
| 1 | - | 4 |
| 7 | 6 | 3 |

Node 9

Node 5

|  |  |  |
| --- | --- | --- |
| 2 | 8 | 3 |
| 1 | 4 | - |
| 7 | 5 | - |

Node 8

|  |  |  |
| --- | --- | --- |
| 2 | - | 3 |
| 1 | 8 | 4 |
| 7 | 6 | 5 |

|  |  |  |
| --- | --- | --- |
| 2 | 8 | 3 |
| - | 1 | 4 |
| 7 | 6 | 5 |

Node 6

Node 7

|  |  |  |
| --- | --- | --- |
| - | 8 | 3 |
| 2 | 1 | 4  Node 10 |
| 7 | 6 | 5  Node 11 |

|  |  |  |
| --- | --- | --- |
| 2 | 8 | 3 |
| 7 | 1 | 4 |
| - | 6 | 5 |

|  |  |  |
| --- | --- | --- |
| - | 2 | 3 |
| 1 | 8 | 4 |
| 7 | 6 | 5 |

|  |  |  |
| --- | --- | --- |
| 2 | 3 | - |
| 1 | 8 | 4 |
| 7 | 6 | 5 |

Node 12

|  |  |  |
| --- | --- | --- |
| 1 | 2 | 3 |
| - | 8 | 4 |
| 7 | 6 | 5 |

|  |  |  |
| --- | --- | --- |
| 1 | 2 | 3 |
| 7 | 8 | 4 |
| - | 6 | 5 |

|  |  |  |
| --- | --- | --- |
| 1 | 2 | 3 |
| 8 |  | 4 |
| 7 | 6 | 5 |

Node 14

Node 13

Goal node