**Assignment 1**

1. **Iterative deepening search:**

* The code for this search is present in the file ”ids.py”.
* The input file is ‘test/ids\_input.txt’
* Remove the astar\_input.txt file while running this as this takes a lot of time run.

**Input**:

Start state:

*--000--*

*--0X0--*

*00XXX00*

*000X000*

*000X000*

*--000--*

*--000--*

**Output**:

Moves made: [[9, 7], [23, 9], [10, 8], [7, 9], [4, 16]]

Number of nodes: 83

Memory utilized: 8300 bytes

Solution found at depth: 5

Time taken: 0.0260000228882 seconds

**Observations**

* This is an uninformed search and hence doesn’t use the knowledge of game’s goal state.
* The program took more time and space compared to informed searches like A \* search.

1. **A\* search**

* The code for this search is present in the file ”a\_star.py”.
* The input file is ‘test/astar\_input.txt’

**Input**:

Start state:

*--X0X--*

*--XXX--*

*0000XX0*

*0XX0XX0*

*0XX0000*

*--XXX--*

*--X0X--*

**Output**:

**A-Star search with heuristics 1**

Moves made: [[21, 7], [0, 8], [5, 3], [8, 6], [22, 8], [17, 5], [30, 22], [32, 24], [2, 10], [11, 9], [9, 7], [6, 8], [3, 15], [15, 27], [27, 29], [29, 17], [18, 16]]

Number of nodes: 99572

Memory utilized: 3584592 bytes

Time taken: 25.7889997959 seconds

**A-Star search with heuristics 2**

Moves made: [[0, 8], [32, 24], [11, 9], [2, 10], [21, 23], [30, 22], [14, 16], [9, 11], [11, 25], [17, 15], [28, 16], [25, 23], [23, 21], [8, 22], [21, 23], [23, 9], [4, 16]]

Number of nodes: 156

Memory utilized: 5616 bytes

Time taken: 0.0730001926422 seconds

**Observations:**

* Heuristics 1 is based on the number of pegs left on the board.
* Heuristics 2 is based on the distance of pegs from the center peg. This is more informed than Heuristics 1 as the final state just has a peg in the center.
* Memory utilized and time taken both are more in the case of Heuristics 1 and hence it is evident from the output that Heuristics 2 performs better than Heuristics 1.