

Assignment 2

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COMP 8700 Fall 2019 Assignment 2

Due: Nov. 25@ Bb, 11:59pm

4.1 Give the name of the algorithm that results from each of the following special cases:

a. Local beam search with $k = 1$.

Answer: Hill Climbing Search

c. Simulated annealing with $T = 0$ at all times (and omitting the termination test).

Answer: Hill Climbing Search

d. Simulated annealing with $T = \infty$ at all times.

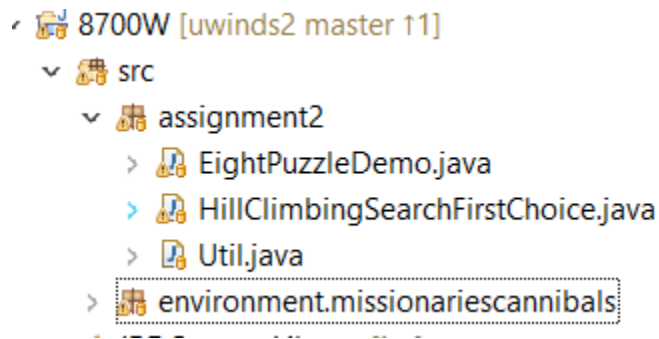
Answer: Random walk

e. Genetic algorithm with population size $N = 1$.

Answer: Local beam search

4.4 Generate a large number of 8-puzzle and 8-queens instances and solve them (where possible) by hill climbing (steepest-ascent and first-choice variants), hill climbing with random restart, and simulated annealing. Measure the search cost and percentage of solved problems and graph these against the optimal solution cost. Comment on your results.

Find source code here :



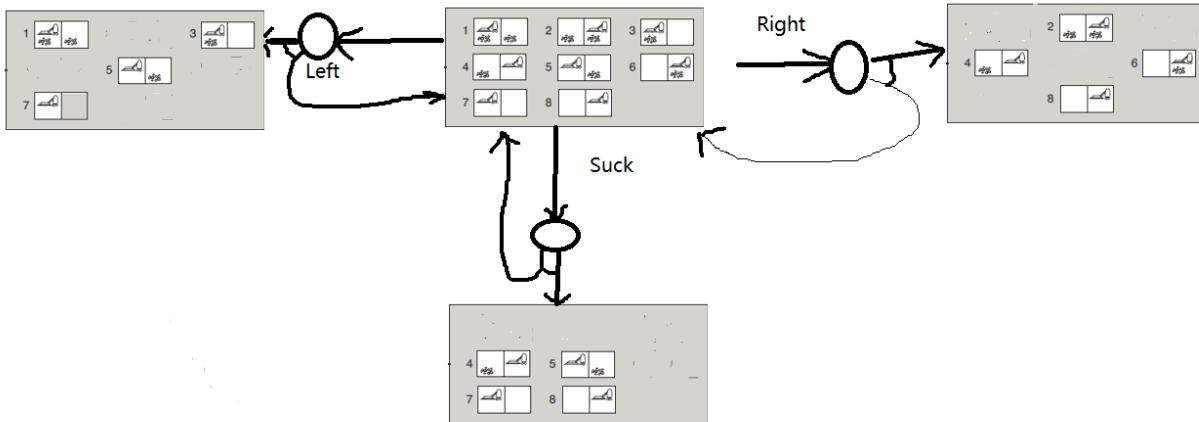
Testing result as below, we can see Hill Climbing variations like steepest ascent, First Choice and Random Restart

1. outperform in Search cost, but percentage of success are low

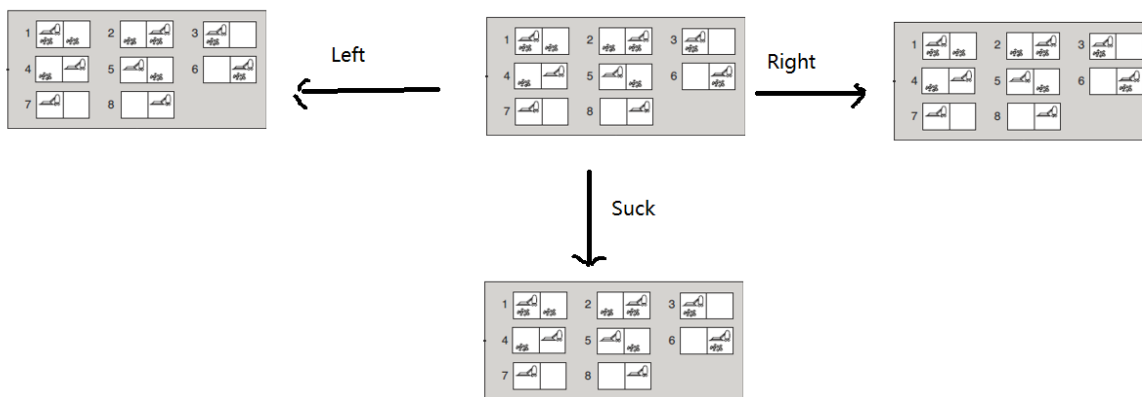
| Algorithm | Search cost | Solution cost | Percentage of success | Remark |
|-----------------------------------|--|--|-----------------------|---|
| Hill climbing steepest ascent | 14 nodes expanded | 12 | 1/1000 | Almost there can always be at least 1 success out of 1000 tries |
| Hill climbing first choice | 23 nodes expanded | 9 | 1/1000 | Almost there can always be at least 1 success out of 1000 tries |
| Hill climbing with random restart | ~ = 14 * 1000. About 14 nodes expanded for each with 1000 restarts. | 12. evaluated according to steepest ascent | 100% | According to steepest-ascent, 100% success for 1000 tries. |
| Simulated annealing | 100 | 68 | 4/1000 | |
| AStarSearch | 1369 | 23 | 100% | Optimal and complete |

4.10 Consider the sensorless version of the erratic vacuum world. Draw the belief-state space reachable from the initial belief state $\{1, 2, 3, 4, 5, 6, 7, 8\}$, and explain why the problem is unsolvable.

Answer: if it is deterministic, belief state is as below for the sensorless version.



Since it is erratic, belief state is as below after combine two belief-state spaces for each step:



From the belief-state space above we can see, any step from the initial belief-state space leads to the same belief state space, which is the initial belief-state itself, it cannot reach any goal state, so it's unresolvable.