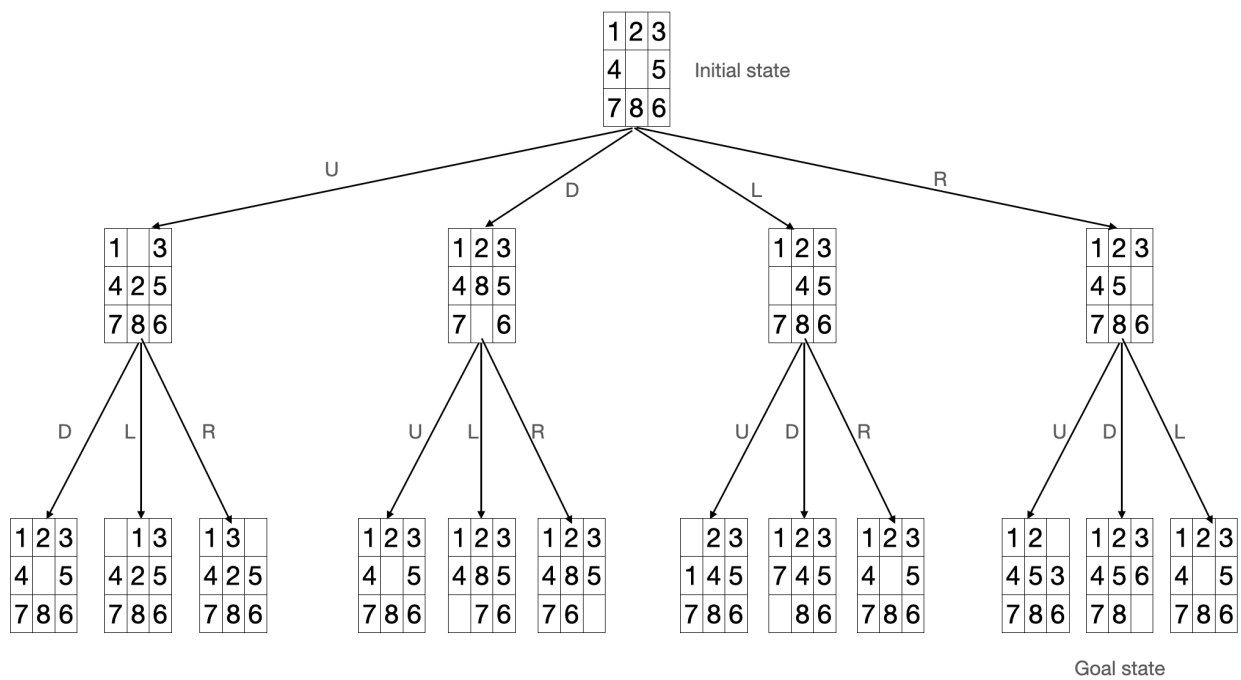cpt_s 540 Artificial Intelligence
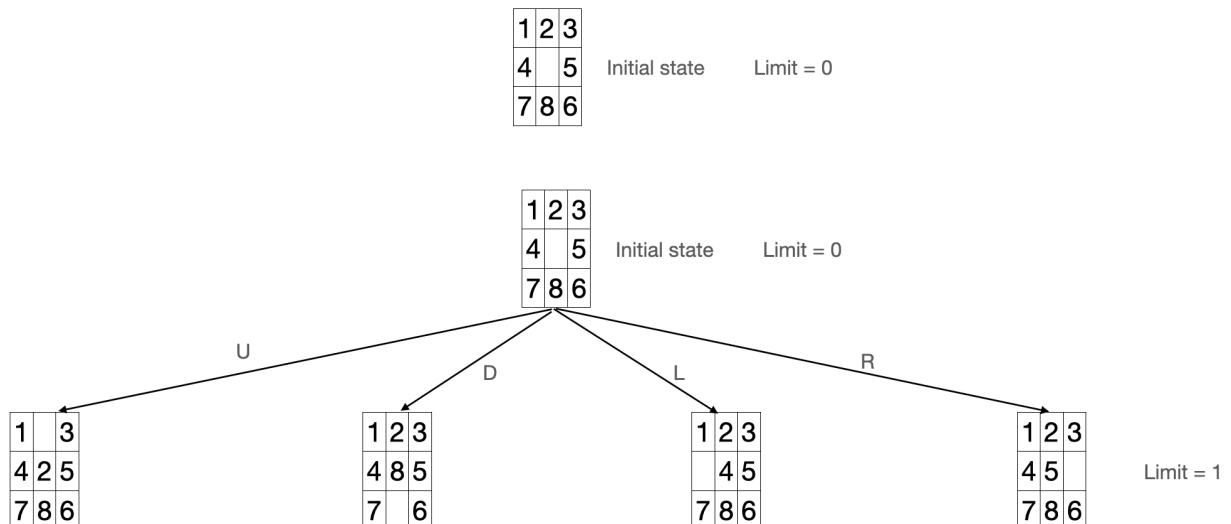
Homework 2
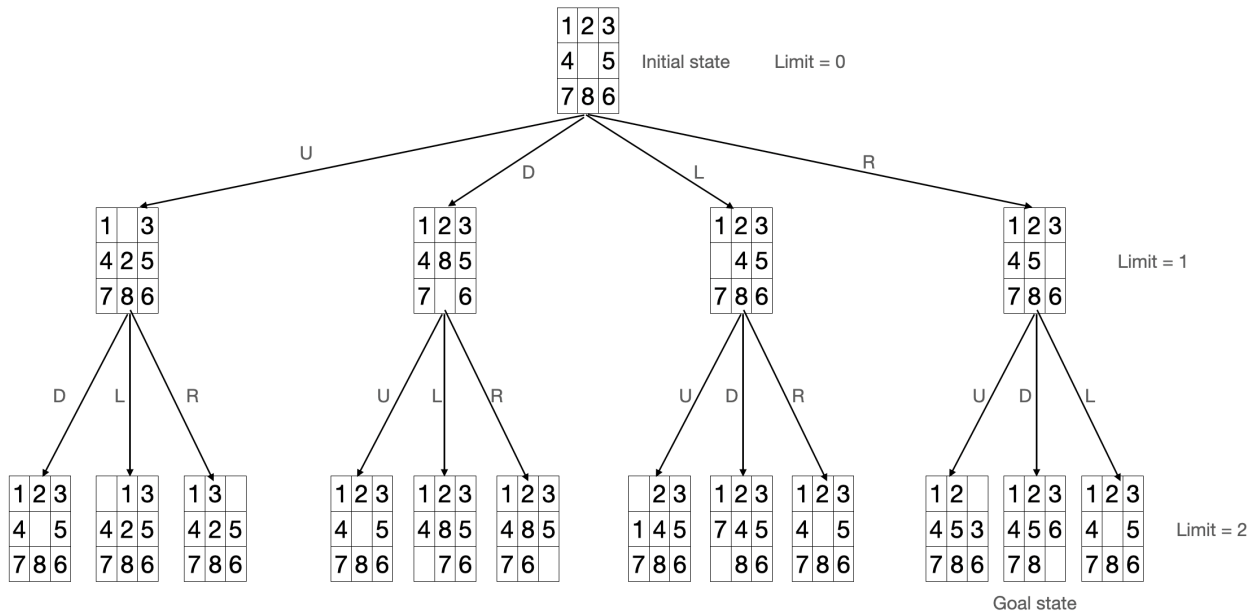
11641327 Yu-Chieh Wang

2020/9/17

1. 8-puzzle.

    a. BFS

    b. IDS

Initial state   Limit = 0

U   D   L   R

Limit = 1

D   L   R   U   L   R   U   D   R   U   D   L

Limit = 2

Goal state

c. A*

Initial state

h(n) = 2
g(n) = 0
f(n) = 2

U   D   L   R

h(n) = 3
g(n) = 1
f(n) = 4

h(n) = 3
g(n) = 1
f(n) = 4

h(n) = 3
g(n) = 1
f(n) = 4

h(n) = 1
g(n) = 1
f(n) = 2

U   D   L

h(n) = 2
g(n) = 2
f(n) = 4

h(n) = 0
g(n) = 2
f(n) = 2

h(n) = 2
g(n) = 2
f(n) = 4

Goal state

d. Hill-Climbing

Initial state:
```
1 2 3
4 _ 5
7 8 6
```
h(n) = 2, value = $\frac{1}{3}$

U:
```
1 _ 3
4 2 5
7 8 6
```
h(n) = 3, g(n) = 1, f(n) = 4

D:
```
1 2 3
4 8 5
7 _ 6
```
h(n) = 3, value = $\frac{1}{4}$

L:
```
1 2 3
_ 4 5
7 8 6
```
h(n) = 3, value = $\frac{1}{4}$

R:
```
1 2 3
4 5 _
7 8 6
```
h(n) = 1, value = $\frac{1}{2}$

U:
```
1 2 _
4 5 3
7 8 6
```
h(n) = 2, value = $\frac{1}{3}$

D:
```
1 2 3
4 5 6
7 8 _
```
h(n) = 0, value = 1
Goal state

L:
```
1 2 3
4 _ 5
7 8 6
```
h(n) = 2, value = $\frac{1}{3}$
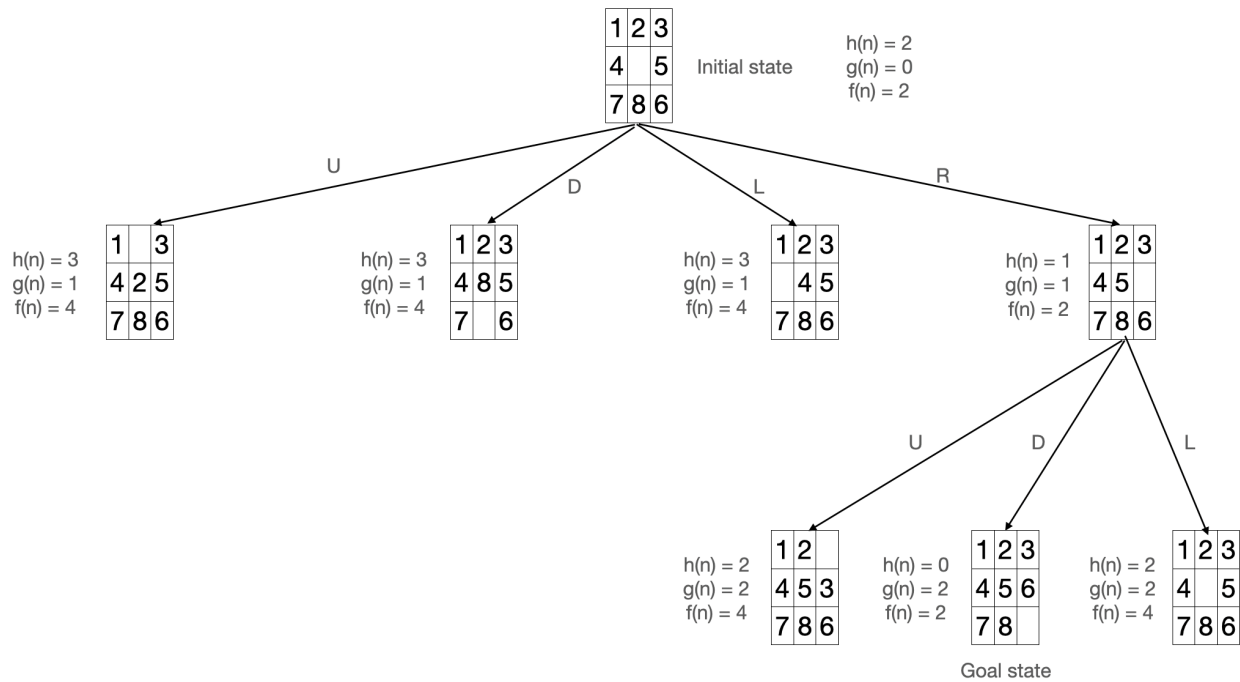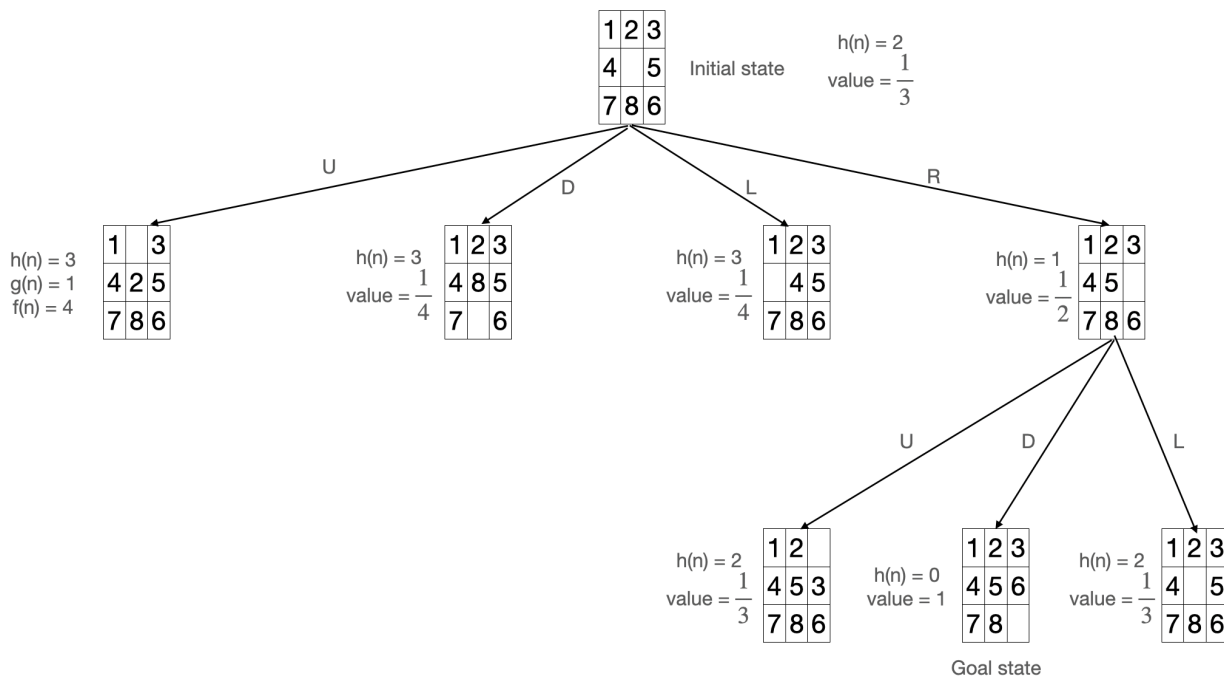
2. If new h(n) is admissible.

The answer is yes because although the h'(n) = h(n)/8. The h(n) is still depends on the number of city-block distance of each title. It is rationally when each h is divided by a fixed value.

3. A solution of 8-Puzzle is exactly 10 moves.

To mention about the optimal solution, the answer will be A* search definitely. In this case, I will run random states, then do A* search on these states. If any of their optimal solution is exactly 10 moves, the state will be my initial one.