Iterative deepening

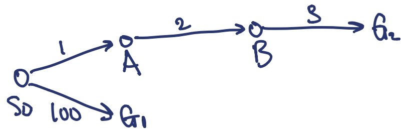
$$S = d + db + (d-1)b^2 + \cdots + b^d$$
$$bS = db + db^2 + (d-1)b^3 + \cdots + b \cdot b^d$$
$$bS - S = \boxed{\text{TODO}}$$

In general: edge cost $(s \to t) > 0$

$\boxed{\text{Uniform-Cost Search}}$

optimal goal G:

optimality: $\min_{\text{path}} \sum_{s \to t \text{ on path from } S_0 \text{ to } G} \text{Cost}(s \to t)$



optimal goal would be G_2, cost of 6 (pushing to PQ)

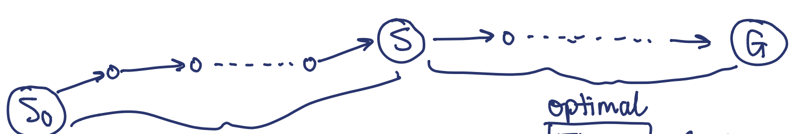
(Don't do goal check when generating new nodes

PQ:

~~$(S_0, 0)$~~
~~$(A, 1)$~~
$(G_1, 100)$
~~$(B, 3)$~~
~~$(G_2, 6)$~~

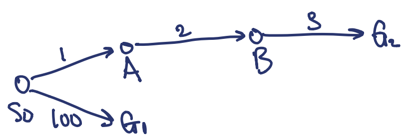
$(S_0, 0)$
$(A\ 1)$
$(B, 3)$
$(G_2, 6) \to$ found

A^* search



$\boxed{\sum \text{cost}} = g(s)$

optimal $\boxed{\sum \text{cost}} = h(s)$



$g(S_0) = 0$ $\quad g(A) = 1$
$h(S_0) = 6$ $\quad h(A) = 5$ $\quad \cdots$

$$\boxed{f(s) = g(s) + h(s)}$$

Heuristic on h(s)

8		3
6	7	5
2	4	1

S_0

$\Longrightarrow$

1	2	3
4	5	6
7	8	

example:

h(s) = # of tiles in "wrong" position

h(s) is hypothetical, heuristic

6	8	3
	7	5
2	4	1

S

$g(s) = 2$
$h(s) = 7$

$h(s) \le$ true heuristic $\leftarrow$ This is because for each wrong tile, you have to move it once

Another heuristic

$h(s) = \sum_{\text{tile } i} L_1 \text{distance}(\text{tile position}, \text{target position})$

$\downarrow$ manhattan position / tile position

This h(s) is also smaller than true heuristic

Another heuristic

$h(s) = 0$. Is this the lower bound of true heuristic? Yes, but trivial.

Use $f(t) := g(t) + h(t)$

$\downarrow$ heuristic

$\downarrow$ must be a lower bound (A^* search)

change to the uniform-cost search