

Consider

Initial state

Goal state

Part 1 Formalization $(\Sigma, S_0, A, \text{Succ}, G, C)$ 

1	2	*
3	4	5
6	7	8

*	1	2
3	4	5
6	7	8

$\Sigma \Rightarrow$  States  $\Rightarrow$  Each of the eight tiles and the '\*' in any of the nine squares

(This will be a total of  $9!$  possible states)

$S_0 \Rightarrow$  Initial state  $\Rightarrow$  Any of the states in  $\Sigma$  can be designated as initial state.

(for eg:  $[1, 2, *, 3, 4, 5, 6, 7, 8] = S_0$ )

Actions (A)  $\Rightarrow$  Depending on where the '\*' (blank) is the actions could be

Up  $\Rightarrow$  swap the indices

or subtract 3 from the index value of '\*' and add 3 to the index value of the tile being swapped with '\*'

Down  $\Rightarrow$  Add 3 to the index value of '\*'

and subtract 3 from the index value of the tile being swapped with '\*'

Right  $\Rightarrow$  Add 1 to the index of '\*'

and subtract 1 from the index of the tile being swapped with '\*'

Left  $\rightarrow$  Subtract 1 from the index of '\*'

and add 1 to the index of the tile being swapped with '\*'

Transition Model  $\Rightarrow$  (Successor state) (Succ)

This is the state resulting from a given state after an action

for eg: given  $S_0 = [1, 2, *, 3, 4, 5, 6, 7, 8]$

and action Left

then the successor state would be

$[*, 1, 2, 3, 4, 5, 6, 7, 8]$

(G)

Goal test: This is a test of checking whether the state matches the goal configuration

for eg: if the current state is 'S' & the Goal state is 'G', then Is  $S = G$ ? is the goal test

(C)

Path cost: If the cost of each step is 1 then it is simply the number of steps in a path.