CS-GY 6613 HW1

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Q1. (a) False

(b) True

(c) True

(d) False

Q2. (a) The state space are 4 locations with or without dirt.

So the size of state space is $4 \times 2^4 = 64$

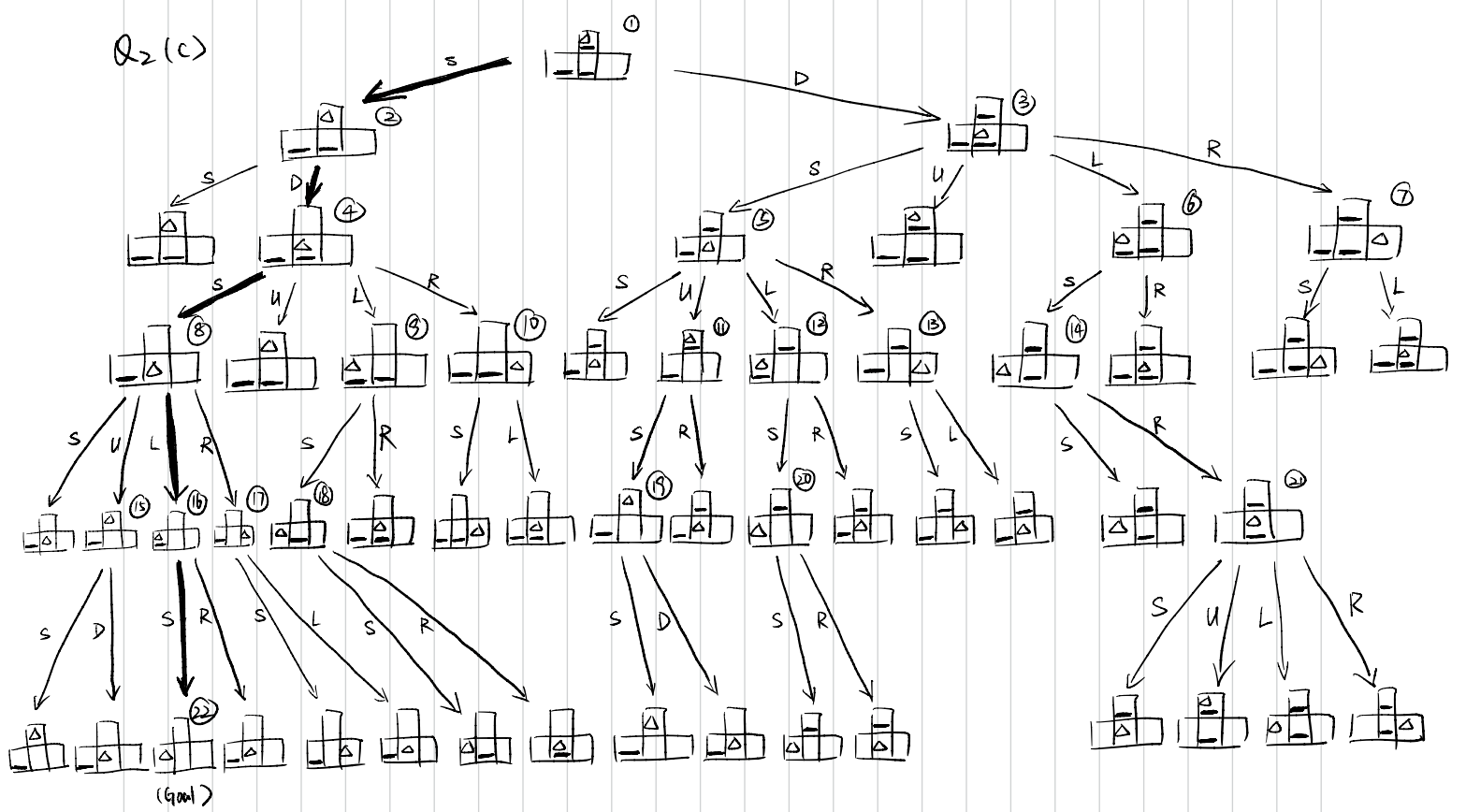
(b) 32 reachable states

(c) I draw the search tree in the next page.

In the tree, we define the actions as {left(L), right(R), up(U), down(D), suck(S)}

(d) Yes, because depth-first search with graph search doesn't allow repeated states.

Depth-first search is complete for finite state spaces.


Q2(c)
(Goal)

Q3 (a) Let L_i (R_i, U_i, D_i) be moving the i-th tile to the left (right, up, down). $i \in [1, 14]$.

So the set of action is:

$\{L_1, R_1, U_1, D_1,$

$L_2, R_2, U_2, D_2,$

...

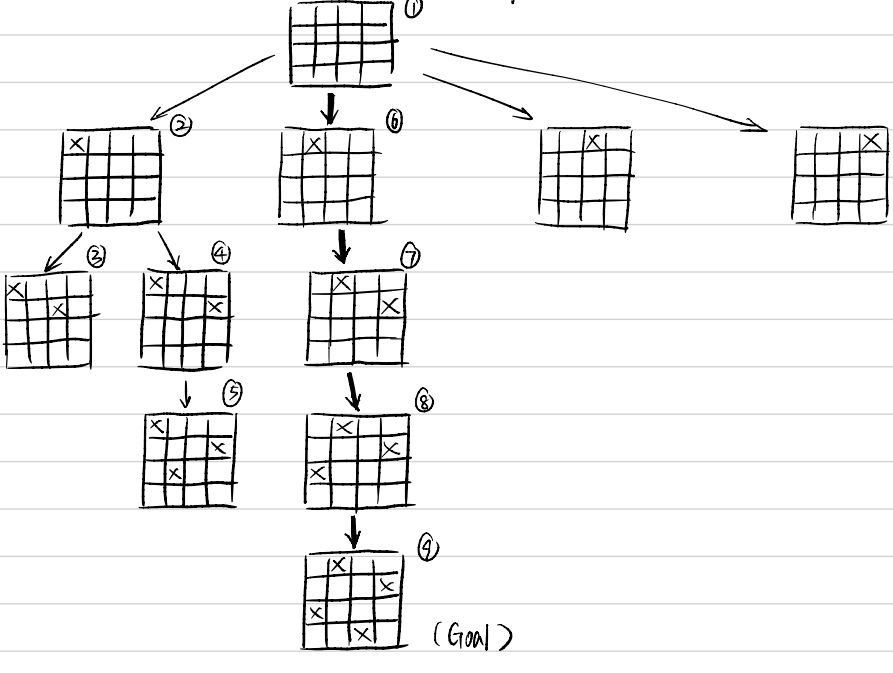
$L_{14}, R_{14}, U_{14}, D_{14}\}$

(b) If two blank positions are different, the size of state space is $16!$

However, we need to remove repeated states because two blank positions are same. The size of repeated state space is: $\frac{1}{2} \times 16 \times 15 \times \cdots \times 1 = \frac{1}{2} \times 16!$

As a result, the size of state space is: $(16!) - \frac{1}{2} \times (16!) = \frac{1}{2} \times (16!)$

Q4. Let "x" be a queen on a chessboard of size 4x4. The search tree is:



Q5 The search tree is: