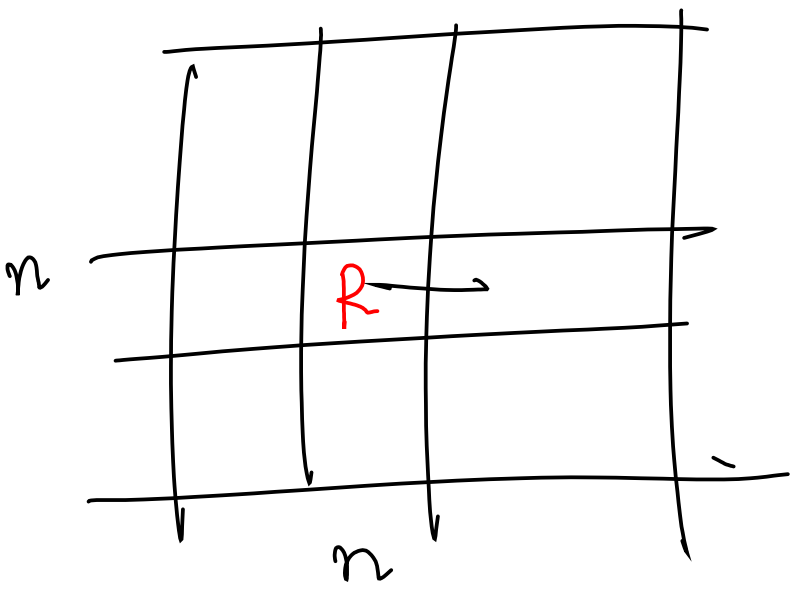
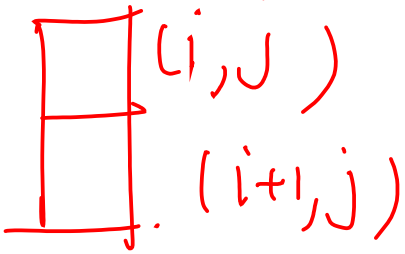
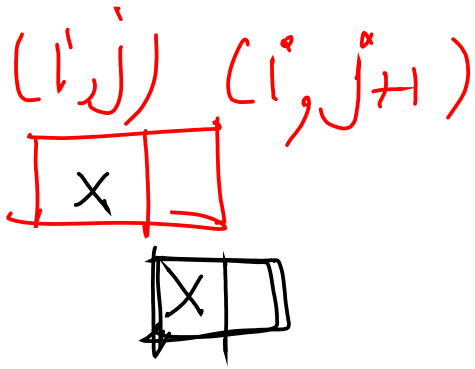
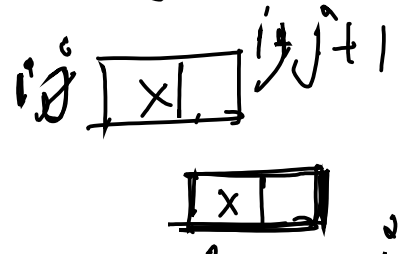


① Move
② positions
③ Writing and"
④



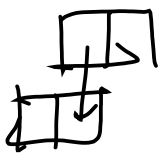


H2 right

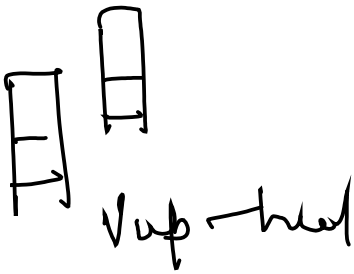


tail

left



head



Vu-tail

Vup-head

(3,5) ✓

(4,5) ✓

(3,3) ✓

(3,4) ✓

(2,3) ✓

(3,3) ✓

(2,2) ✓

(2,3) ✓

(2,4) ✓

(i*, j°)

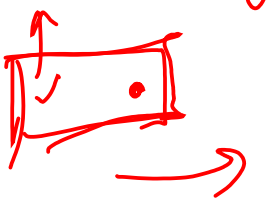
$m_{ijt} = 1$.

m_{351}

m_{452}

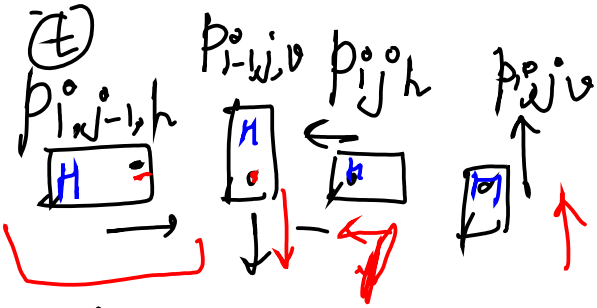
m_{333} ! ! ! ✓

$m_{ijt} \wedge p_{i,j-1,h}$



Boolean

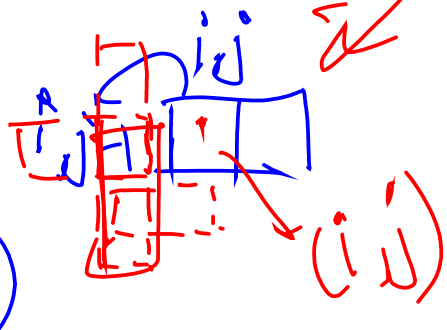
1) Moves m_{ijt}

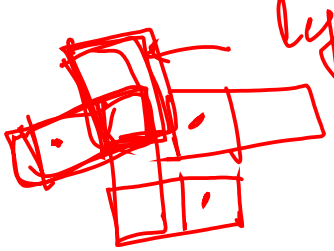


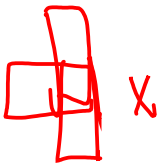
2) pos. p_{ijh} p_{ijv} ℓ_{ij} X_{ij}

3) if move done $(m_{ijt} \wedge p_{ijh}) \rightarrow (\sim p_{ijh} \wedge p_{i,j-1,h})$

Check (?)







① Move | Car orientation | Checks

m_{ijt} ~ p_{ijh} ^ ~x_{ij-1} ^ ~$p_{i,j-2,h}$ ^ ~$p_{i-1,j-1,h}$ ^ ~$p_{i,j-1,v}$

$\sim p_{ijh}$ $\quad p_{i,j-1,h}$

0 $\quad$ 1

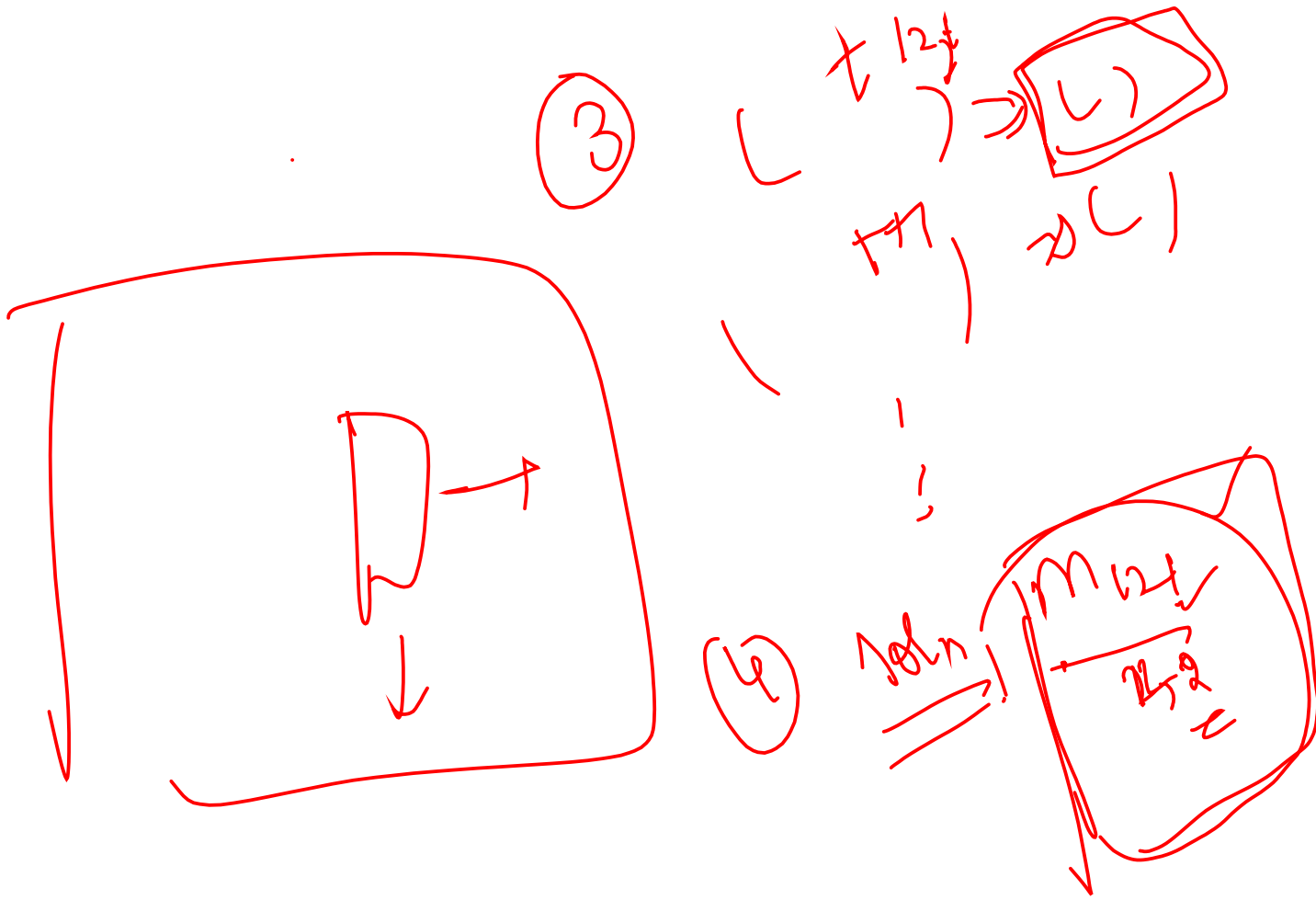
② only one move

m_{13} $\quad m_{121}$ $\quad m_{11}$

$x=1$ $\quad m_{ijt}=1$

unique

$\sum p_i = 1$ $\quad s_i$ $\quad$ (?)



#

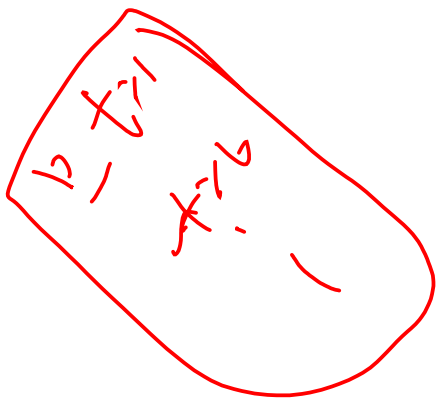
m_{ij}^ pivot_t ⇒ pivot_{(t+1)}

#

n²

n⁴ . x

m_{ij}



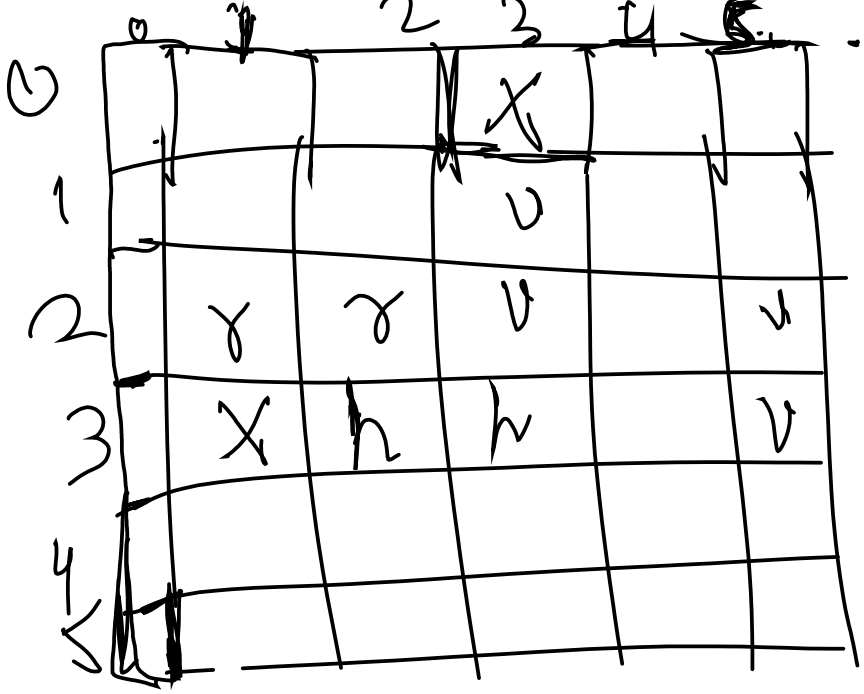
(i,j) n² x n x

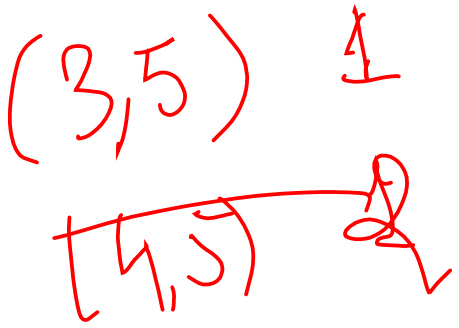
λ = ~100

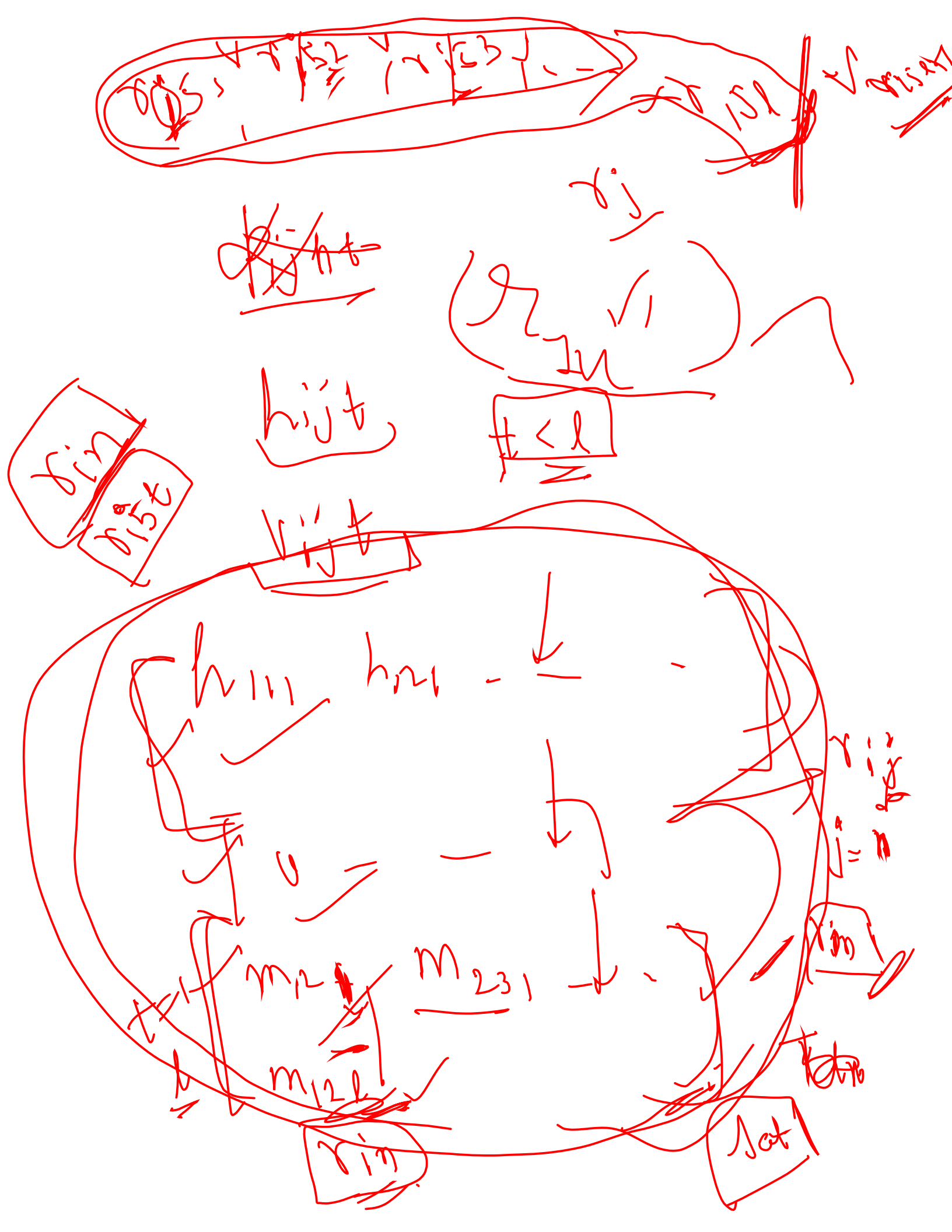
= 10² x 10 x 100

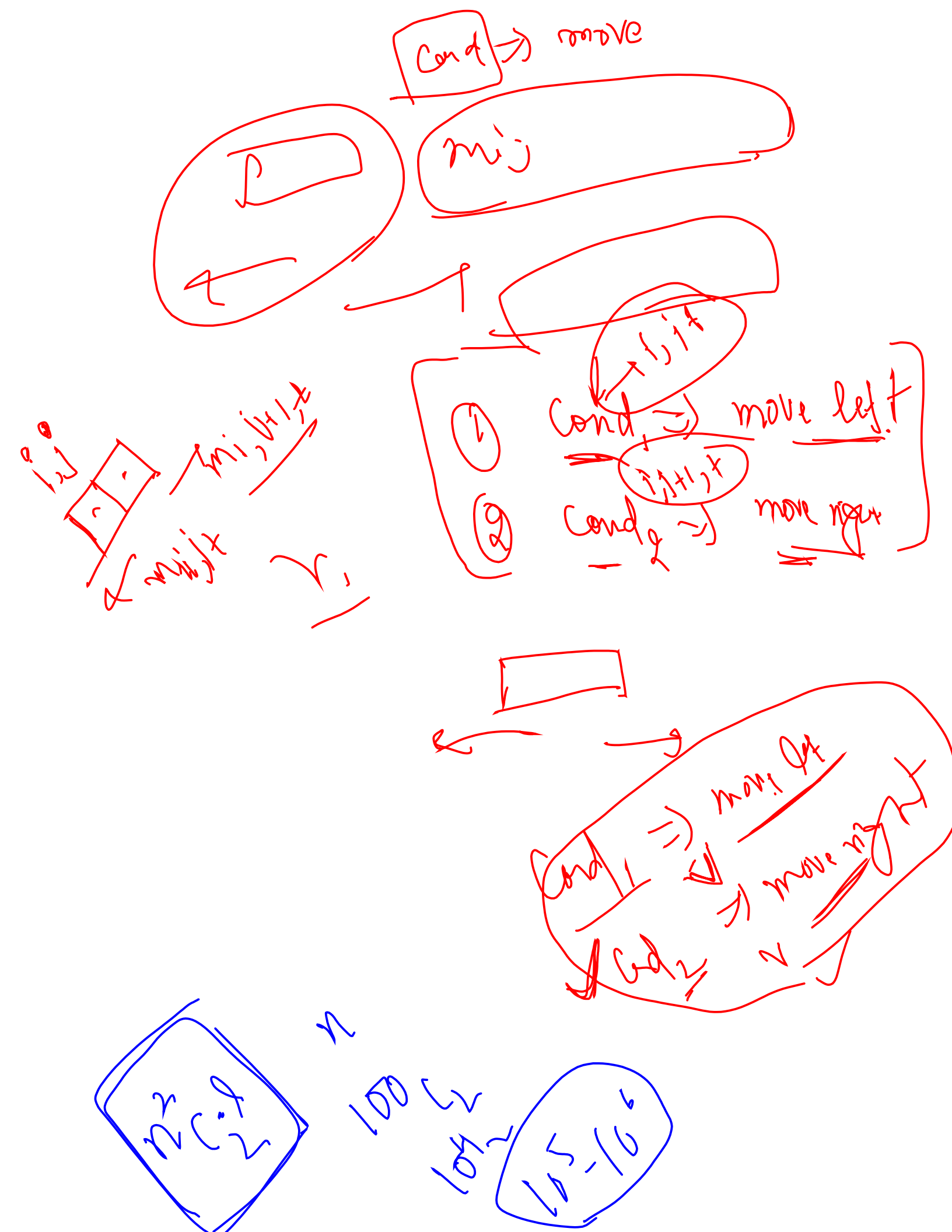
= 10^{5-6}

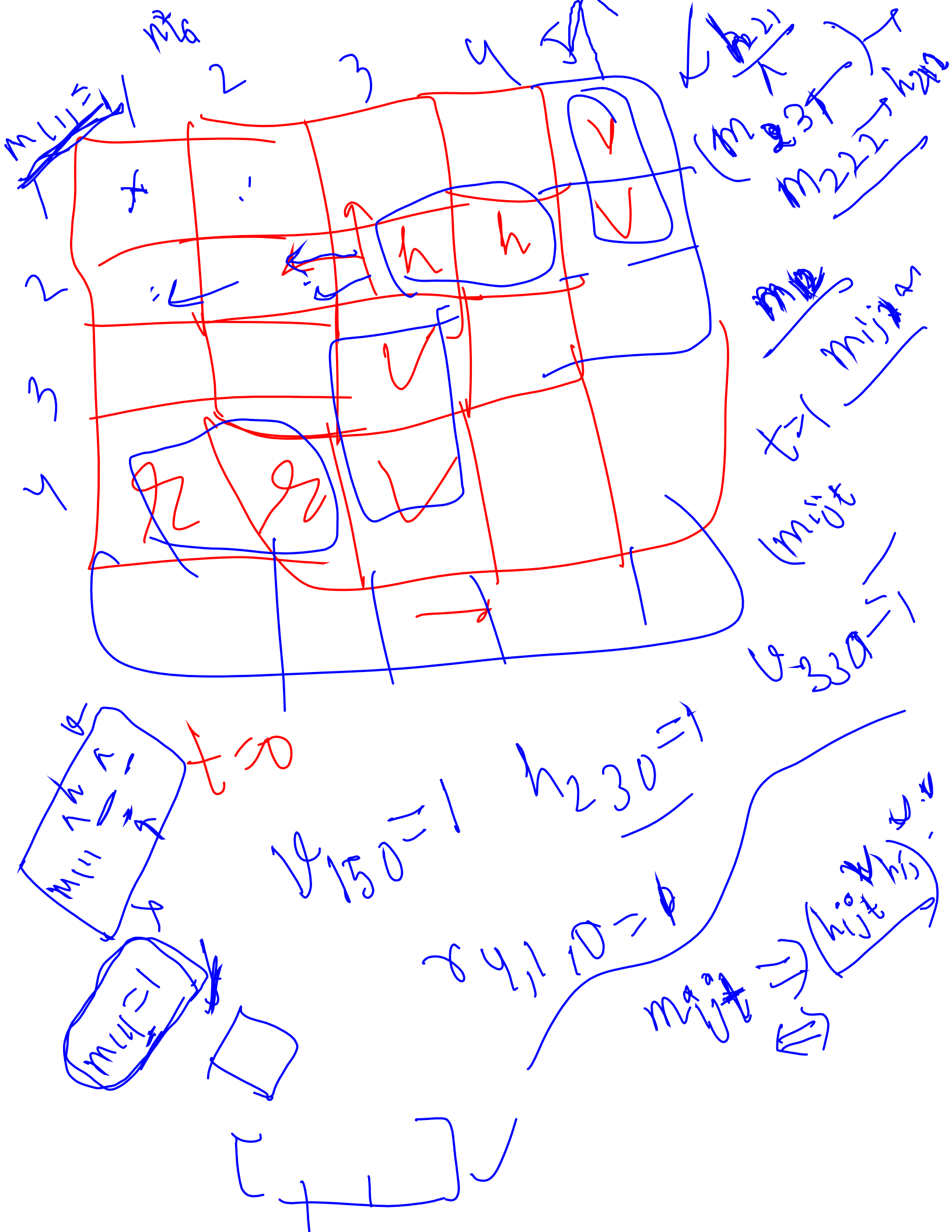

m
p1
p2
p3
dstack
dl-1
dl
dl=0
dl+2
Cap
m
dl
dl
dl
dl
dl
dy
dstack(dl) = m.size();

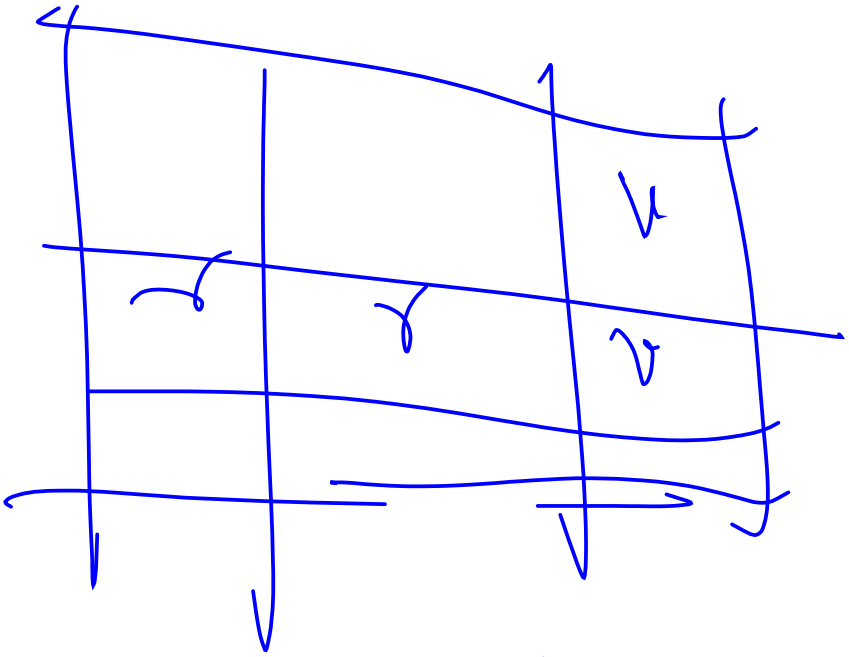

0
1
2
3
4
5
X
v
γ
γ
v
v
X
h
h
v

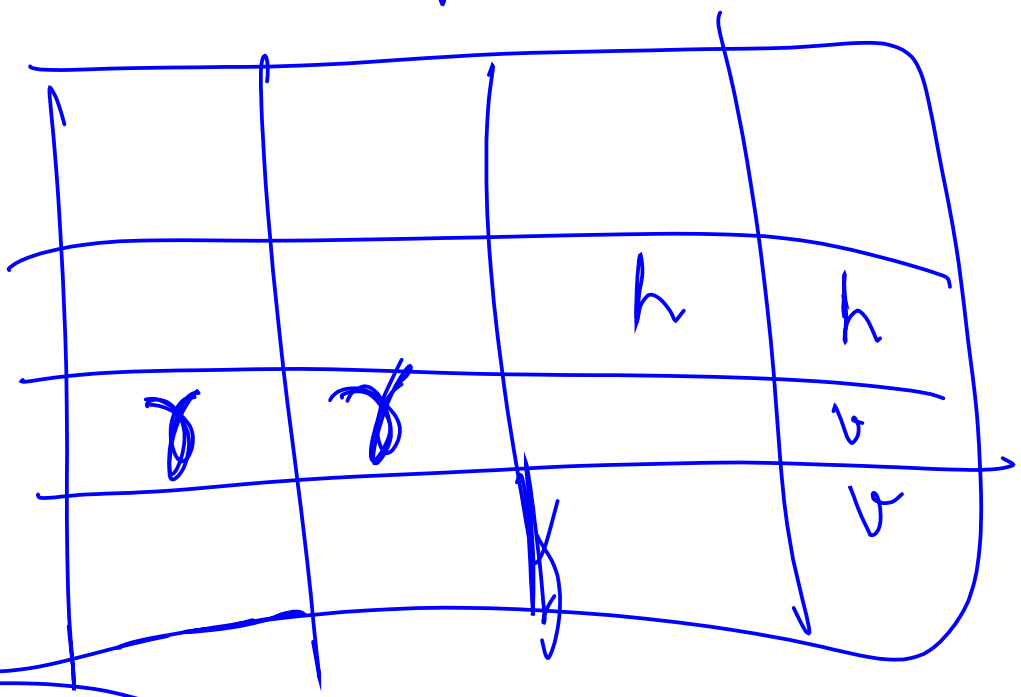

(3,5) 1
[4,5) 2




Cond → move
move left
move right







$l = 5$

$\forall i,j$

left $i-1,j-1$

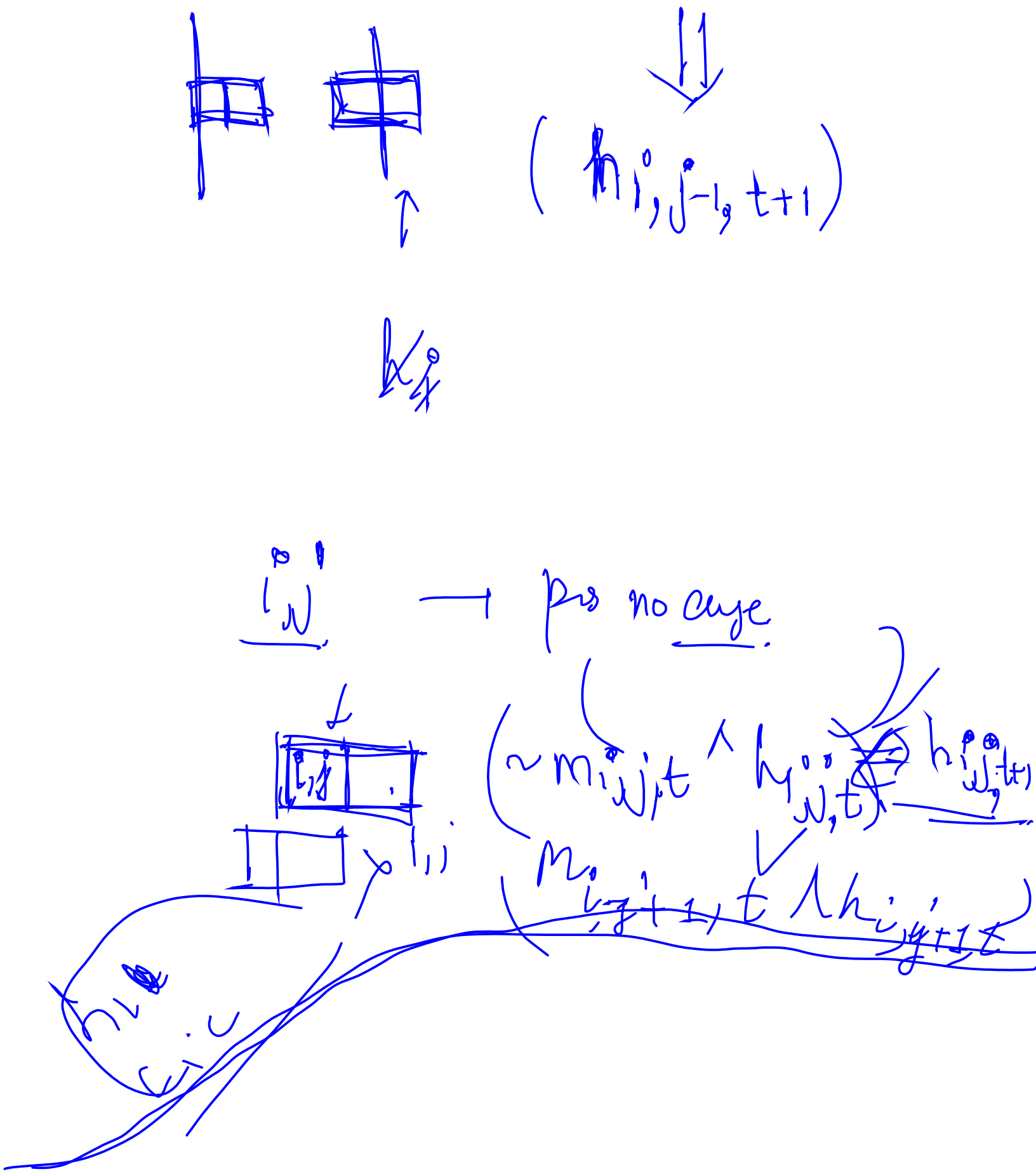
$i,j-1$

i,j

$i,j-2$

$i+1,j-1$

$$\left(m_{ijt} \wedge h_{ijt} \wedge h_{i,j-2,t} \wedge v_{i-1,j-1,t} \wedge v_{i,j-1,t} \right)$$



$h_{ijk} \rightarrow 3 \times 3$

$\checkmark \Leftrightarrow \checkmark$

Soln

$m_{231} = 1$

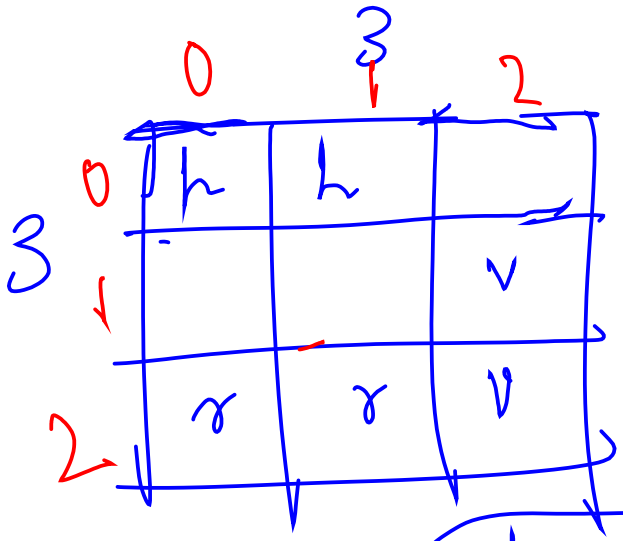
h_{111}

v_{131}

γ_{311}

m_{322}

γ_{322}



m_{ijk}

a	b	c
1	1	1
0	0	0/1

$a \Rightarrow b$

$a \wedge c \Rightarrow b$

2 moves

9.18

$h_{ijt} \wedge m_{ijt} \Leftrightarrow h_{i,j-1,t+1}$

m_{131}

m_{111} m_{121}

m_{211} m_{221} m_{231}

m_{311} m_{321} m_{331}

$m_{211} = 1$

$h_{ij,t+1}$

$\Rightarrow$

$m_{ij} \wedge$ $t-1$

m_{23}

v_{23}

True

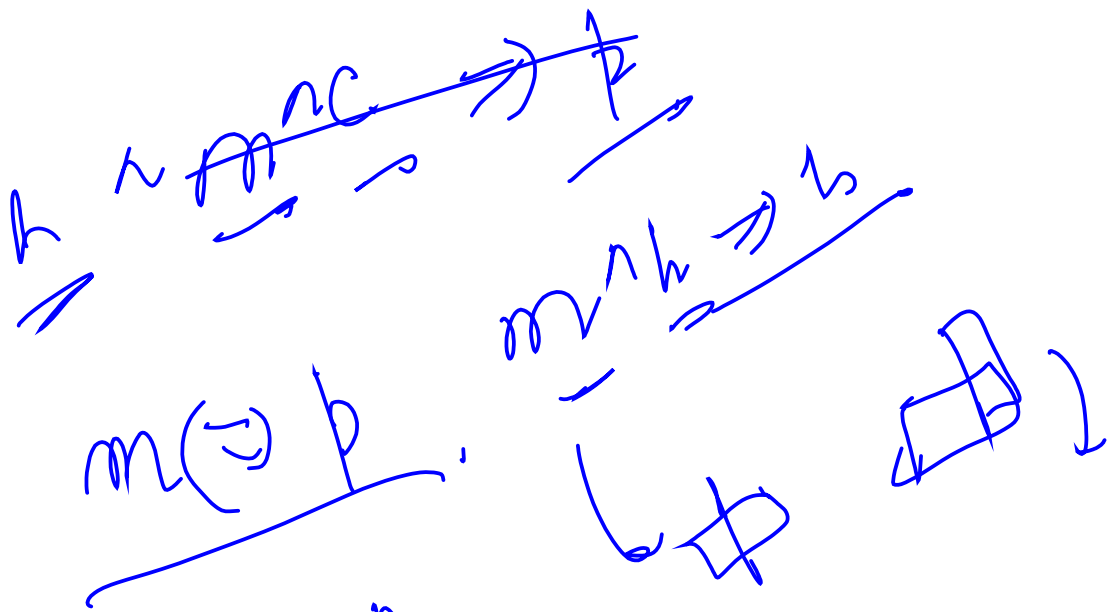
h_{110} v_{230} γ_{310}

m_{111} Wall x, m_{121},

m[i][j][t]

m i,j,t

m 121



m ⇒ c^n pos.

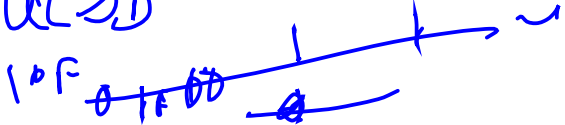
m ≥ 1

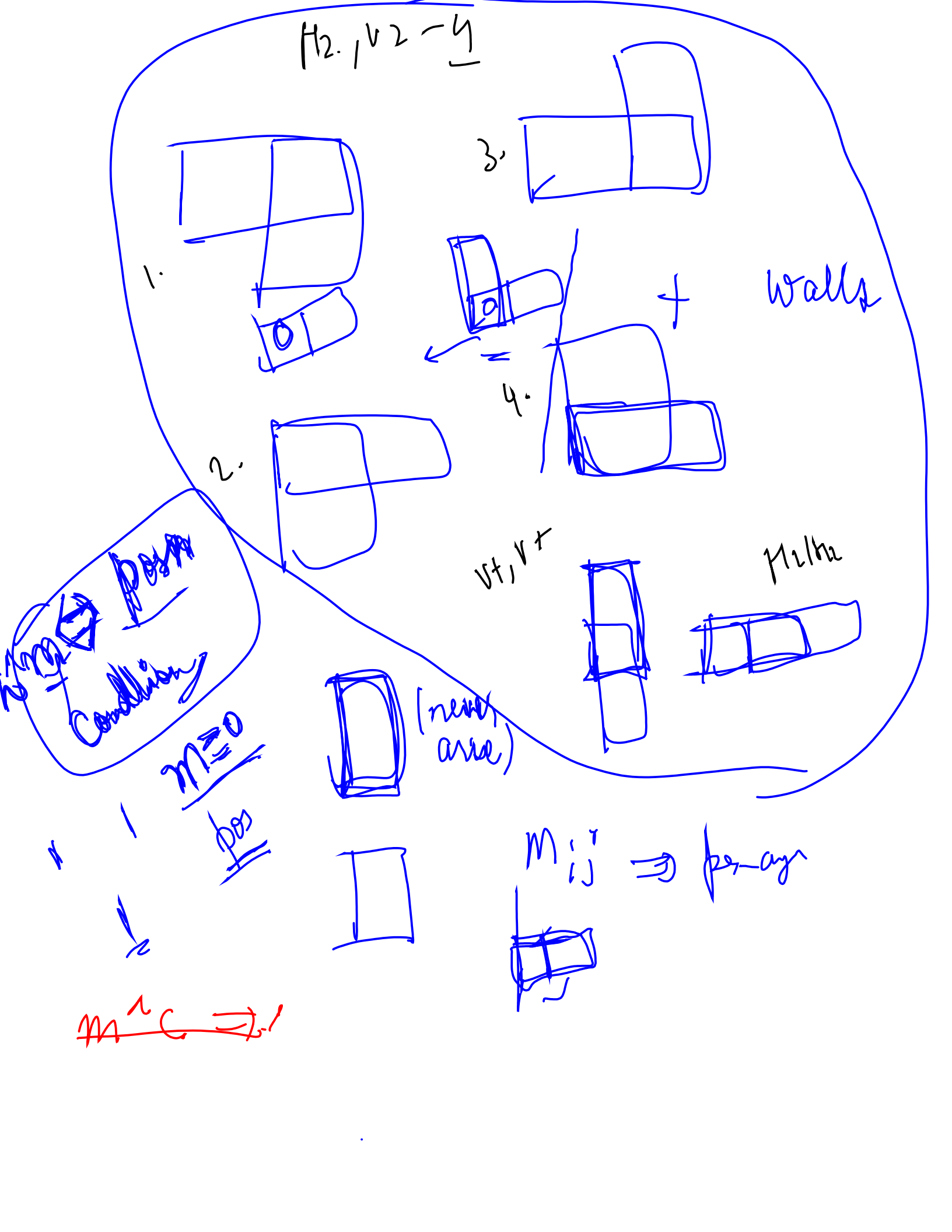
c ≥ 1 p = 1

m ≥ 0

pos =

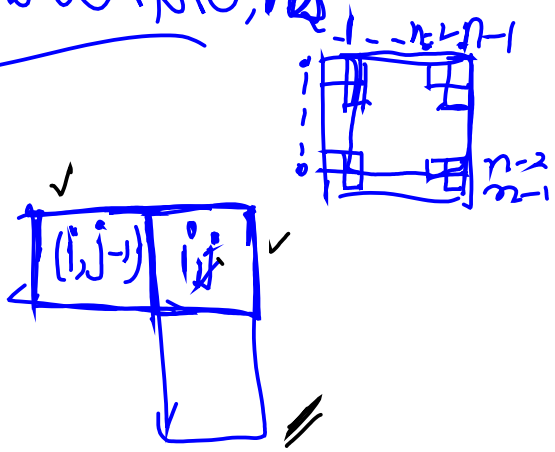
a ⇔ b (a ⇒ b) ∧ (b ⇒ a)

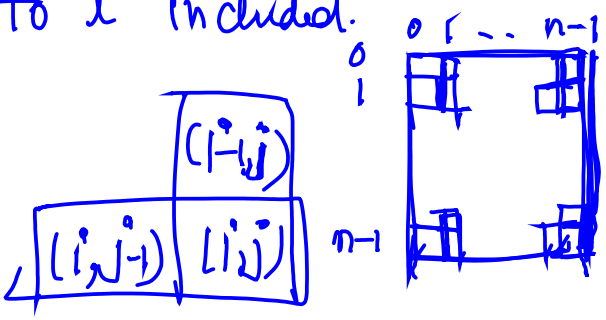



M2, V2 - 4
1.
2.
3.
4.
+ Walls
V1, V2
M1/M2
Pos
Collision
M=0
(new area)
Mij ⇒ pos_agv

Collisions

$t = 0$ to 1 included.



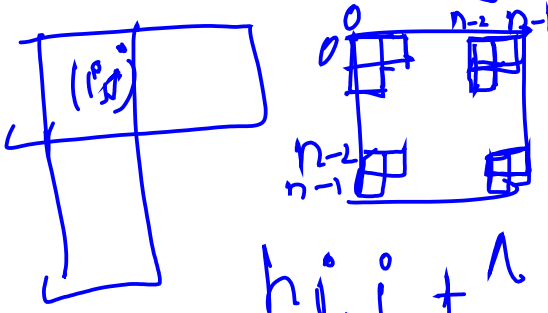


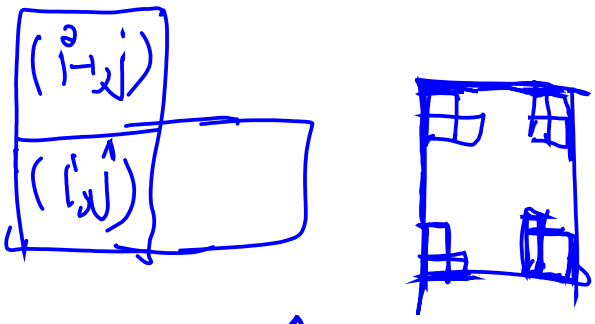
$h_{i,j-1,t} \wedge v_{i-1,j,t}$

$i = 1$ to $n-1$ $\quad j = 1$ to $n-1$

$h_{i,j-1,t} \wedge v_{i,j,t}$

$i = 0$ to $n-2$, $j = 1$ to $n-1$





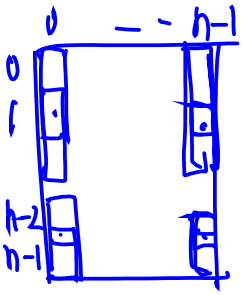
$h_{i,j,t} \wedge v_{i,j,t}$

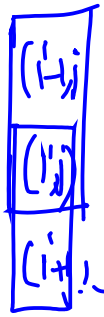
$\forall i = 0$ to $n-2$, $j = 0$ to $n-2$

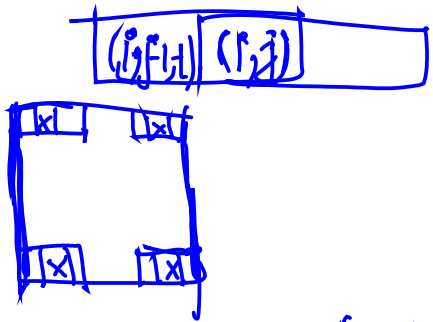
$h_{i,j,t} \wedge v_{i+1,j,t}$

$i = 1$ to $n-1$

$j = 0$ to $n-2$







$v_{i,j,t} \wedge v_{i+1,j,t}$

$i = 1$ to $n-2$

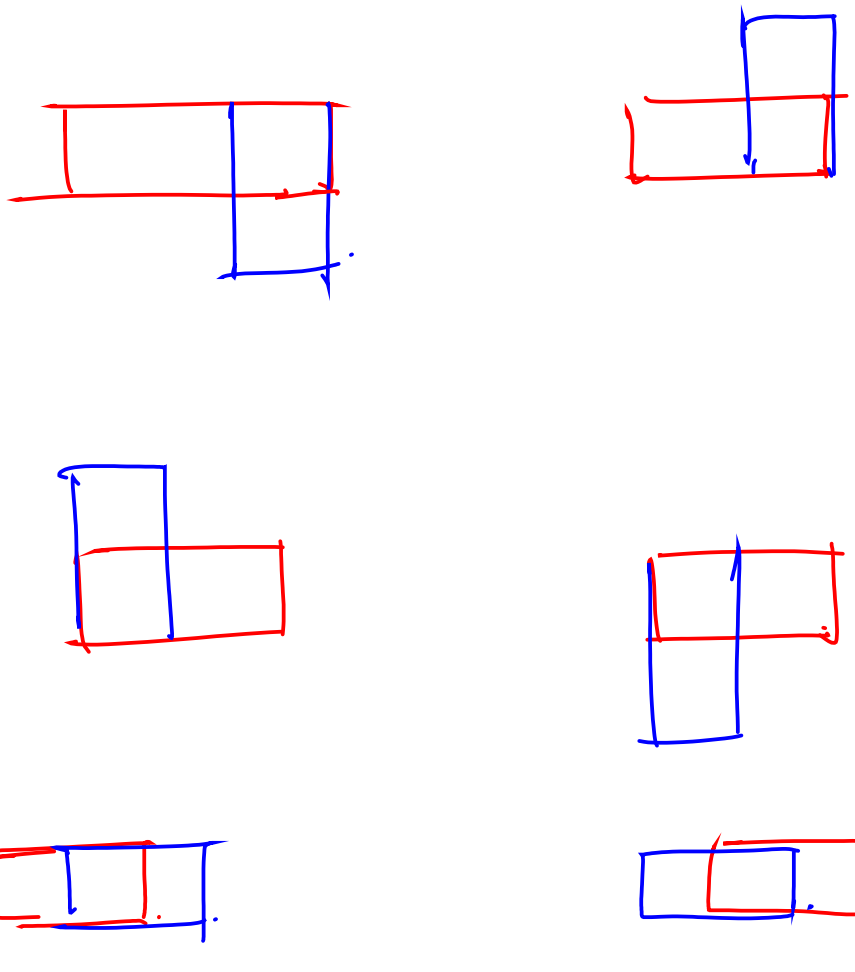
$j = 0$ to $n-1$

$h_{i,j-1,t} \wedge h_{i,j,t}$

$j = 1$ to $n-2$

$i = 0$ to $n-1$

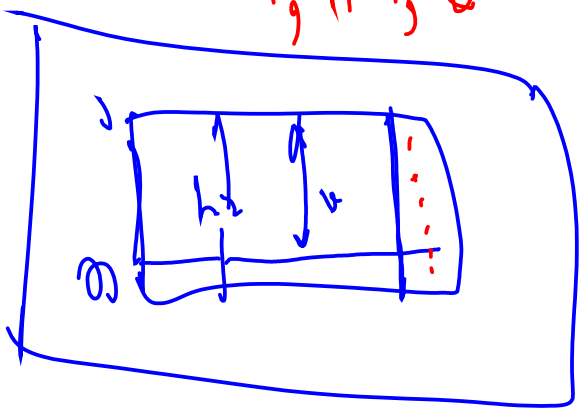
Red collisions



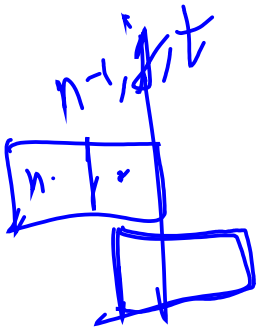
* Just put $h = r$ above!*

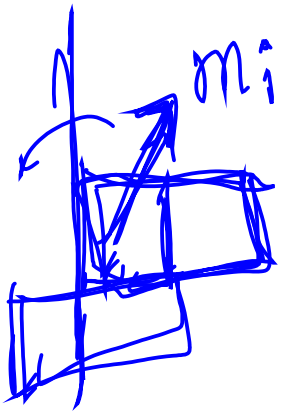
forbidden position $\Rightarrow$ $h_{i,n-1,t}$ $v_{n-1,j,t}$

Walls:



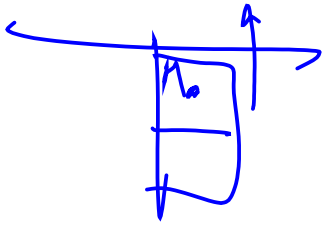
forbidden moves $\rightarrow$ $m_{i0t} \wedge h_{i,0,t-1}$

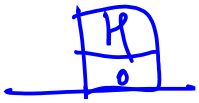




~~$m_{(n)jt} \wedge m$~~

$m_{i,n-1,t} \wedge h_{i,n-2,t-1}$

0  $m_{0,j,t} \wedge v_{0,j,t-1}$

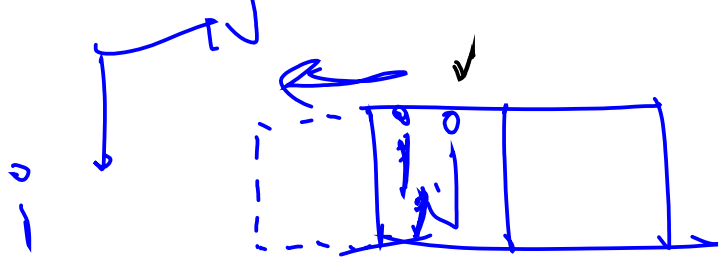
 $m_{n-1,j,t} \wedge v_{n-2,j,t-1}$

Move

$m \wedge h \Leftrightarrow h_{t+1}$

left

$\sim m \wedge L$



$\sim m \Rightarrow (h_t \Leftrightarrow h_{t+1})$

$(m_{i,j,t} \wedge h_{i,j,t-1})$

$(\sim h_{i,j+1,t}) \wedge h_{i,j-1,t} \wedge \sim h_{i,j,t}$

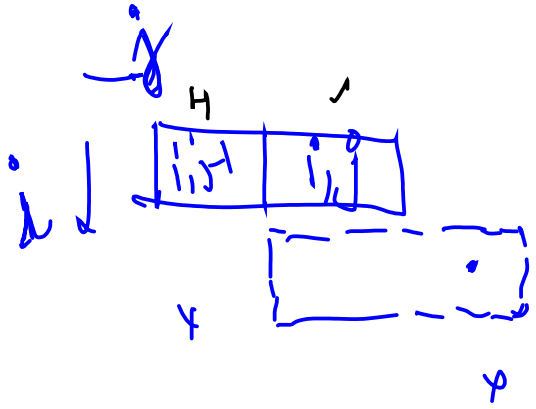
drop $j = 0$ clause

$j = 1$ to $n-2$

$i = 0$ to $n-1$

Right move

$m_{i,j,t} \wedge h_{i,j-1,t-1}$



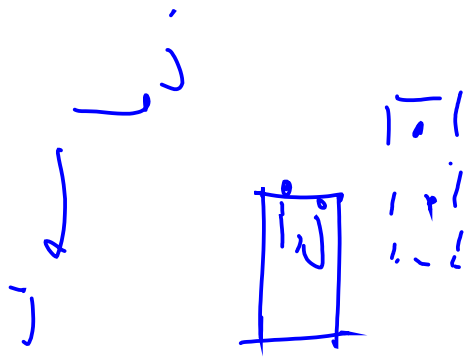
$\Downarrow$

$\Rightarrow h_{i,j-1,t} \wedge h_{i,j,t} \wedge h_{i,j+1,t}$

$\forall j = 1$ to $n-2$

$i = 0$ to $n-1$

up



$m_{i,j,t} \wedge v_{i,j,t-1}$

$\Downarrow$

$v_{i-1,j,t} \wedge \sim V_{i,j,t} \wedge \sim V_{i+1,j,t}$

$\forall i = 1$ to $n-2$ $\quad \forall j = 0$ to $n-1$

down

$$m_{i,\emptyset,t} \wedge v_{i-1,j,t-1}$$

$$\Downarrow$$

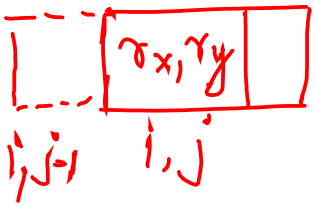
$$v_{i,j,t} \wedge \sim v_{i-1,j,t} \wedge \sim v_{H,x,t}$$

$$i \in 1 \text{ to } n-2$$

$$j \in 0 \text{ to } n-1$$

Red car movement

left



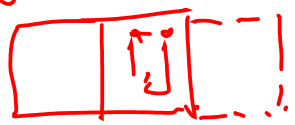
$M[i][j][t] \wedge r_{i,j,t-1}$

$\Downarrow$

$\sim r_{i,j,t} \wedge r_{i,j-1,t} \wedge \sim r_{i,j+1,t}$

for all else $r_{ijt} = 0$.

Right



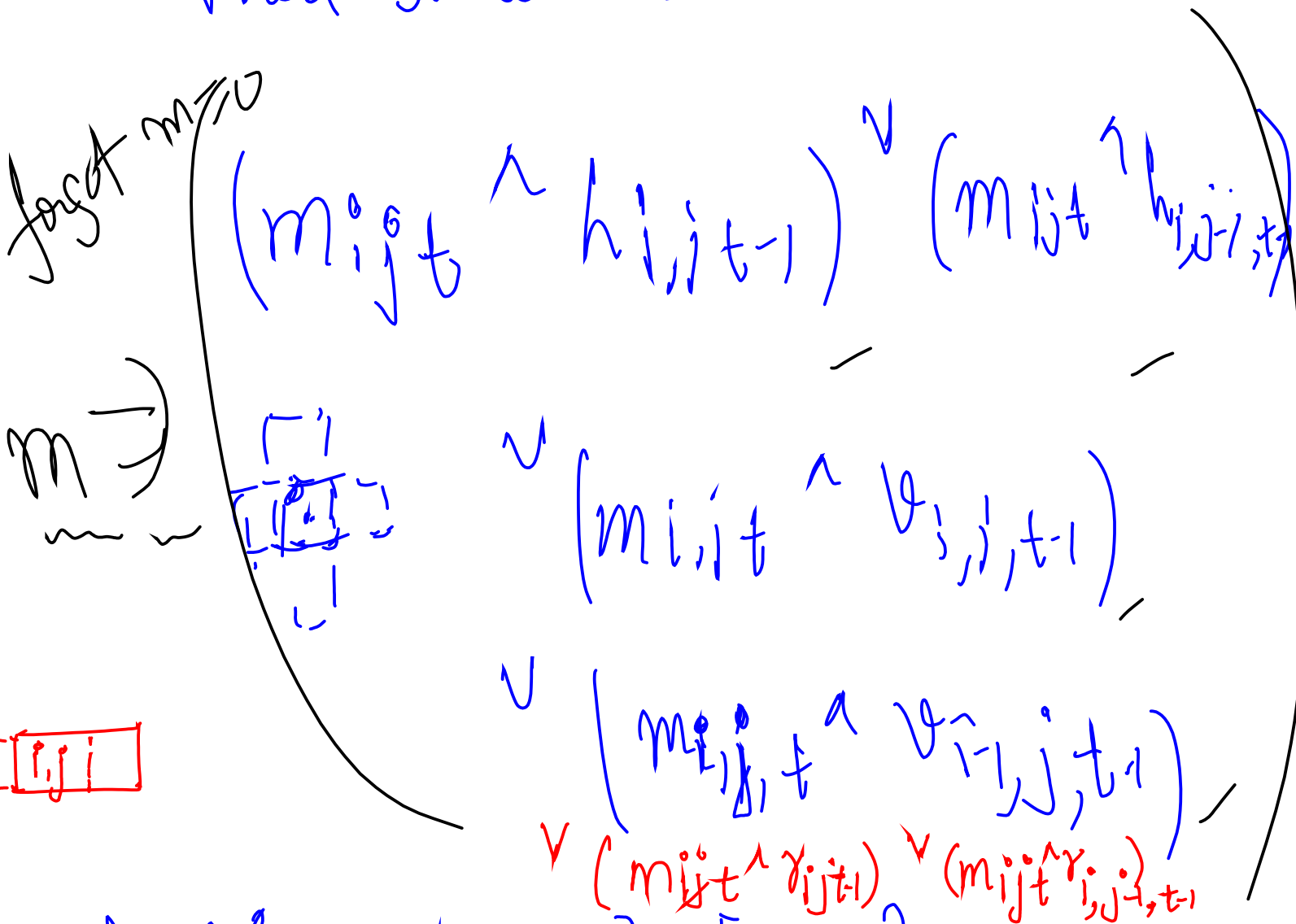
for all else $r_{ijt} = 0$.

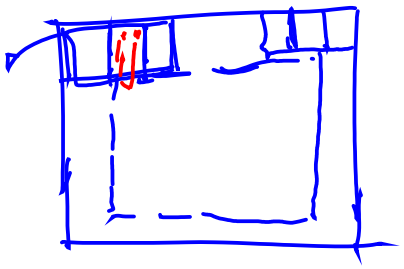
$m_{ijt} \wedge r_{i,j-1,t-1}$

$\Downarrow$

$r_{ijt} \wedge \sim r_{i,j-1,t} \wedge \sim r_{i,j+1,t}$

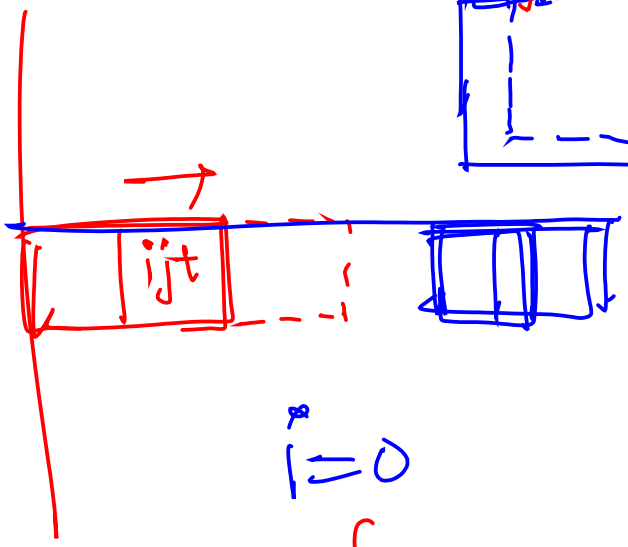
ensure that move is legal only when there is a car





$i = 0, n-1$

$j = 0, n-1$



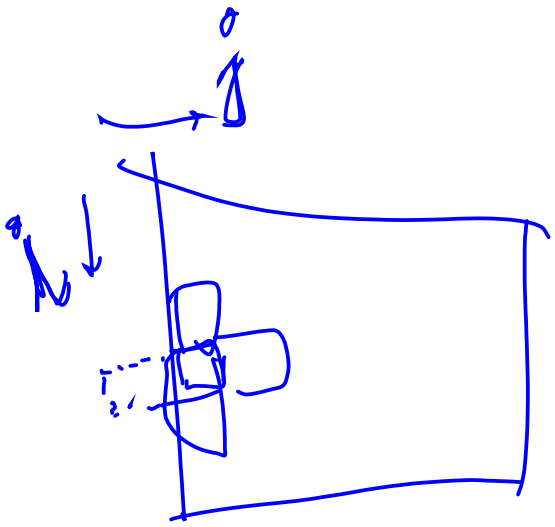
$i = 0$

right

$j = 0$

$m \Rightarrow \{ m_{ijt} \wedge$

for near wall case



$(m_{ijt} \wedge h_{i,j,t-1}) \vee (m_{ijt} \wedge h_{i,j-1,t})$

$m \Rightarrow$  $\vee (m_{i,j,t} \wedge \theta_{i,j,t-1})$

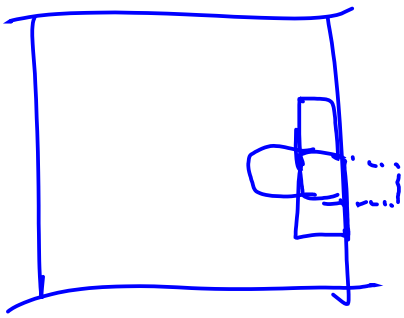
$\vee (m_{i,j,t} \wedge \theta_{i-1,j,t-1})$

$\vee (m_{ijt} \wedge \gamma_{ijt-1})$

$j = 0$

$i = 1$ to $n-2$, $n-1$ too

$t = 1$ to l



forget m

$(m_{ijt} \wedge h_{i,j,t-1}) \vee (m_{ijt} \wedge h_{i,j-1,t})$

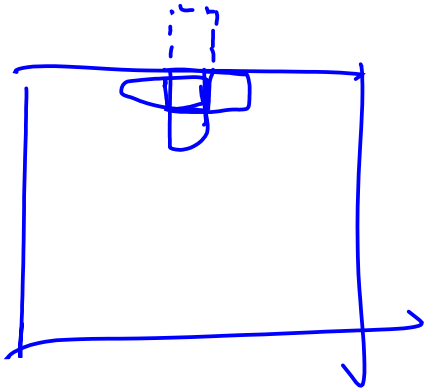
$m \Rightarrow$ 

$\vee (m_{i,j,t} \wedge \theta_{i,j,t-1})$

$\vee (m_{i,j,t} \wedge \theta_{i-1,j,t-1})$ γ won

$j = n-1$, $i = 1$ to $n-2$

(to $n-1$)



$m_{ijt} \wedge h_{i,j,t-1}$

$\vee (m_{ijt} \wedge h_{i,j-1,t-1})$

$m \rightarrow$ 

$\vee (m_{ijt} \wedge v_{i,j,t-1})$

$\vee (m_{ijt} \wedge v_{i-1,j,t-1})$

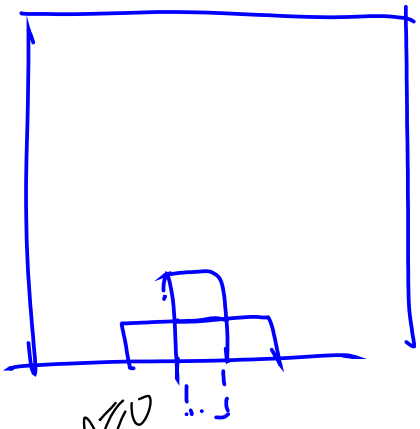
$\vee (m_{ijt} \wedge r_{ij,t-1})$

$\vee (m_{ijt} \wedge r_{i,j-1,t-1})$

$i = 0$

$j = 1$ to $n-2$

$+(n-1)$



$i = n-1$

$j = 1$ to $n-2$

$+(n-1)$

$m_{ijt} \wedge h_{i,j,t-1}$

$\vee (m_{ijt} \wedge h_{i,j-1,t-1})$

$m \rightarrow$ 

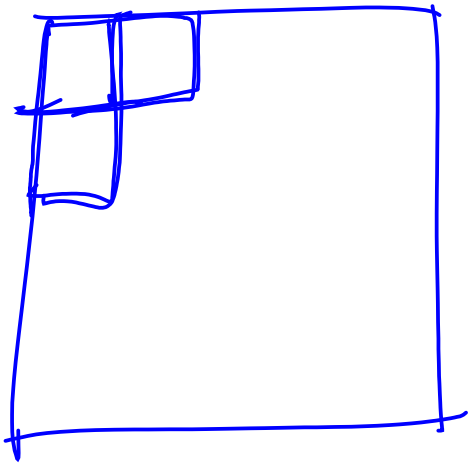
$\vee (m_{ijt} \wedge v_{i,j,t-1})$

$\vee (m_{ijt} \wedge v_{i-1,j,t-1})$

$\vee (m_{ijt} \wedge r_{ij,t-1})$

$\vee (m_{ijt} \wedge r_{i,j-1,t-1})$

(0,0) 出发



forget $m=0$

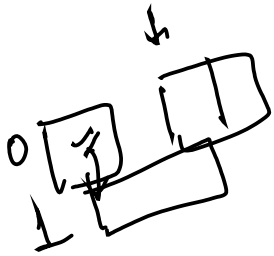
$m \Rightarrow$

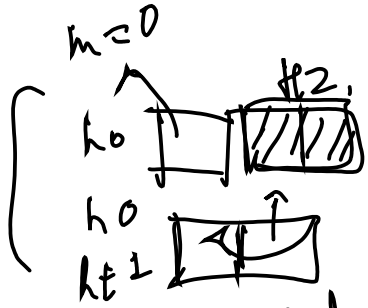
$$(m_{ijt} \wedge h_{i,j,t-1}) \vee (m_{ijt} \wedge \cancel{h_{i-1,j,t-1}})$$

$$\vee (m_{i,j,t} \wedge v_{i,j,t-1})$$

$$\vee (\cancel{m_{i,j,t} \wedge v_{i-1,j,t-1}})$$

$$\vee (m_{ijt} \wedge r_{ij,t-1})$$





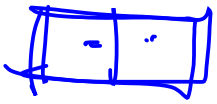
$\times$

$m \Rightarrow$ (▭ $\wedge$ unchanged)

$\checkmark \sim m \Rightarrow (h_{i,j,t-1} \Leftrightarrow h_{i,j,t})$ $\times$

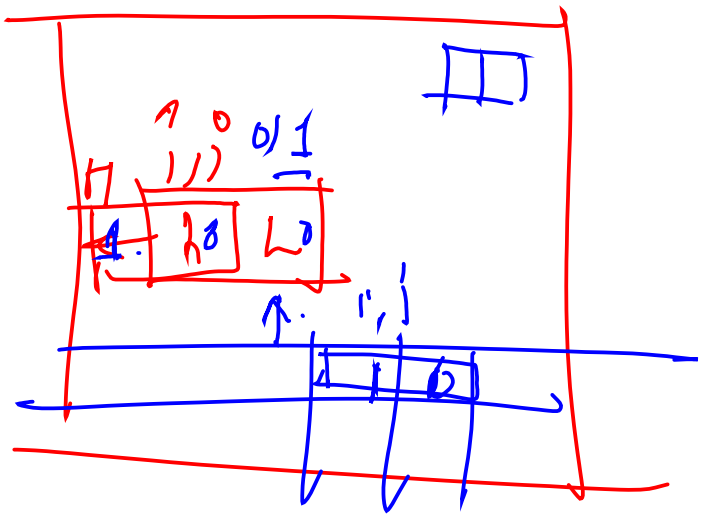
if no move, pos. remain same

$\sim m$

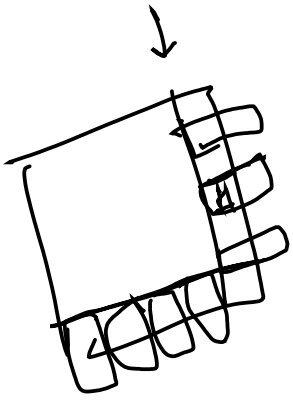


t $\sim m_{i,j,t}$ h $\Rightarrow$ h_i

t



v_1 H_1



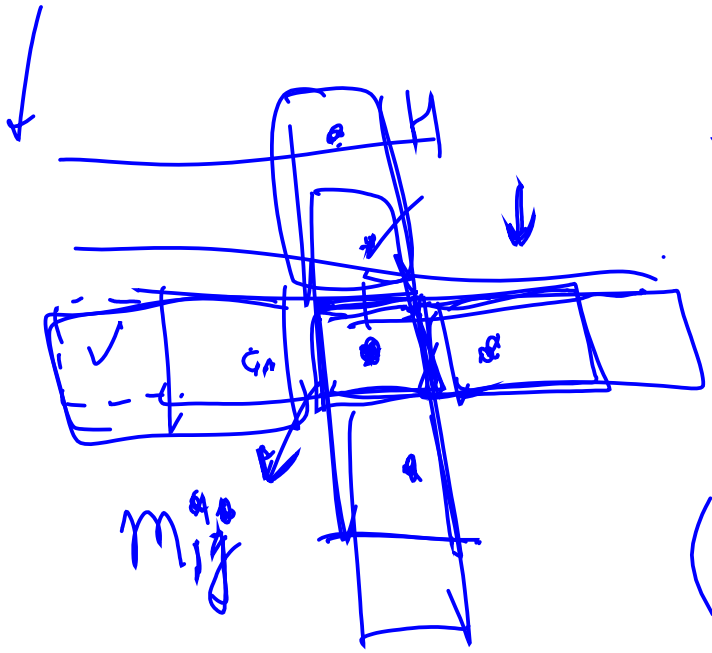
$t+1$

$\Rightarrow$

$h_{i,j,t+1} = 1 \sim$

$t = 1$ to k $m_{i,j,t}$ ( ) $\Rightarrow$ $h_{i,j,t+1}$

$\sim m_t \Rightarrow (h_{t-1} \Leftrightarrow k_t)$ $\forall i,j$ 0 to $n-1$



m_{ij}

$(\sim m_{ik} \sim m_{rk} \sim m_{nk})$

$\sim m_{ij}^{t} \wedge m_{i,j+1}^{t}$

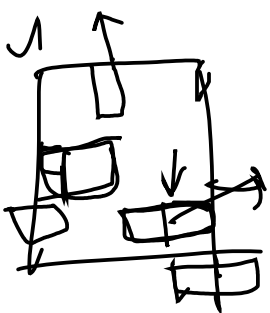
$\sim (m_{ik}^{t} \; m_{rk}^{t} \; m_{nk})$

$$\sim m_{ijt} \sim \left[\left(m_{i,j-1,t} \wedge h_{i,j-2,t-1} \right)^{\vee} \left(\quad \right) \right.$$

$$\left. \vee \left(\quad \right)^{\vee} \left(\quad \right) \right]$$

$\checkmark$

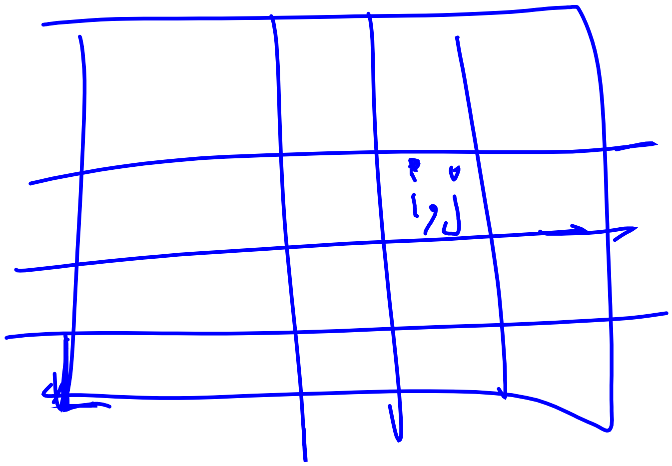
p_{ij} Change

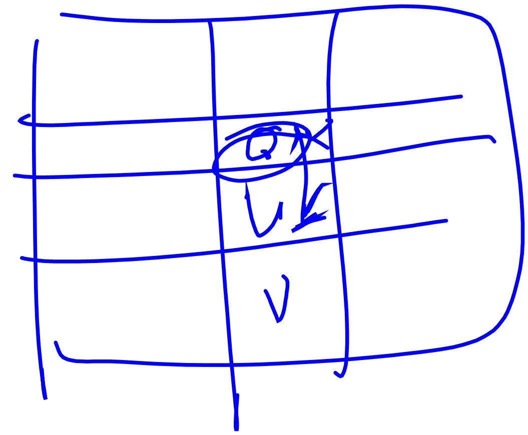


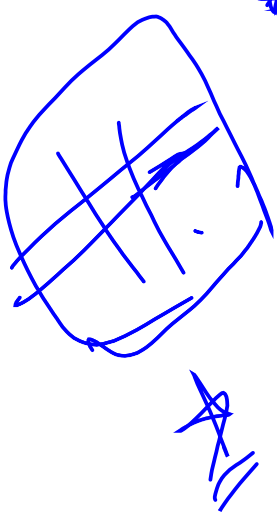
$(i, n-1, t$

$i, n-2, t-1)$

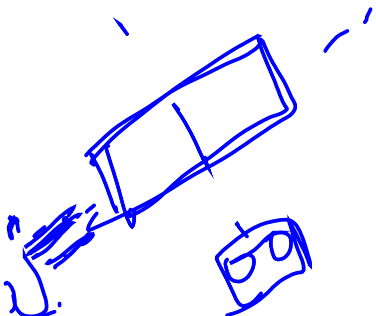
$\wedge m_{ijt} \sim [\quad] \Rightarrow$ Unchange

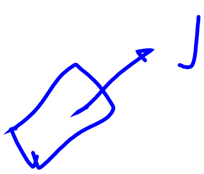


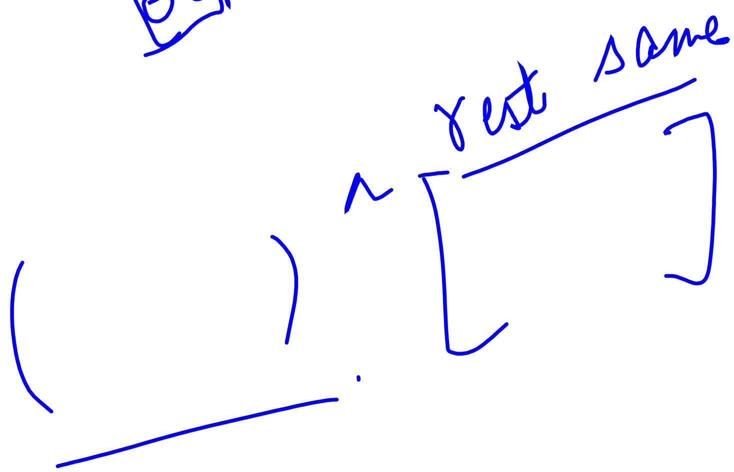




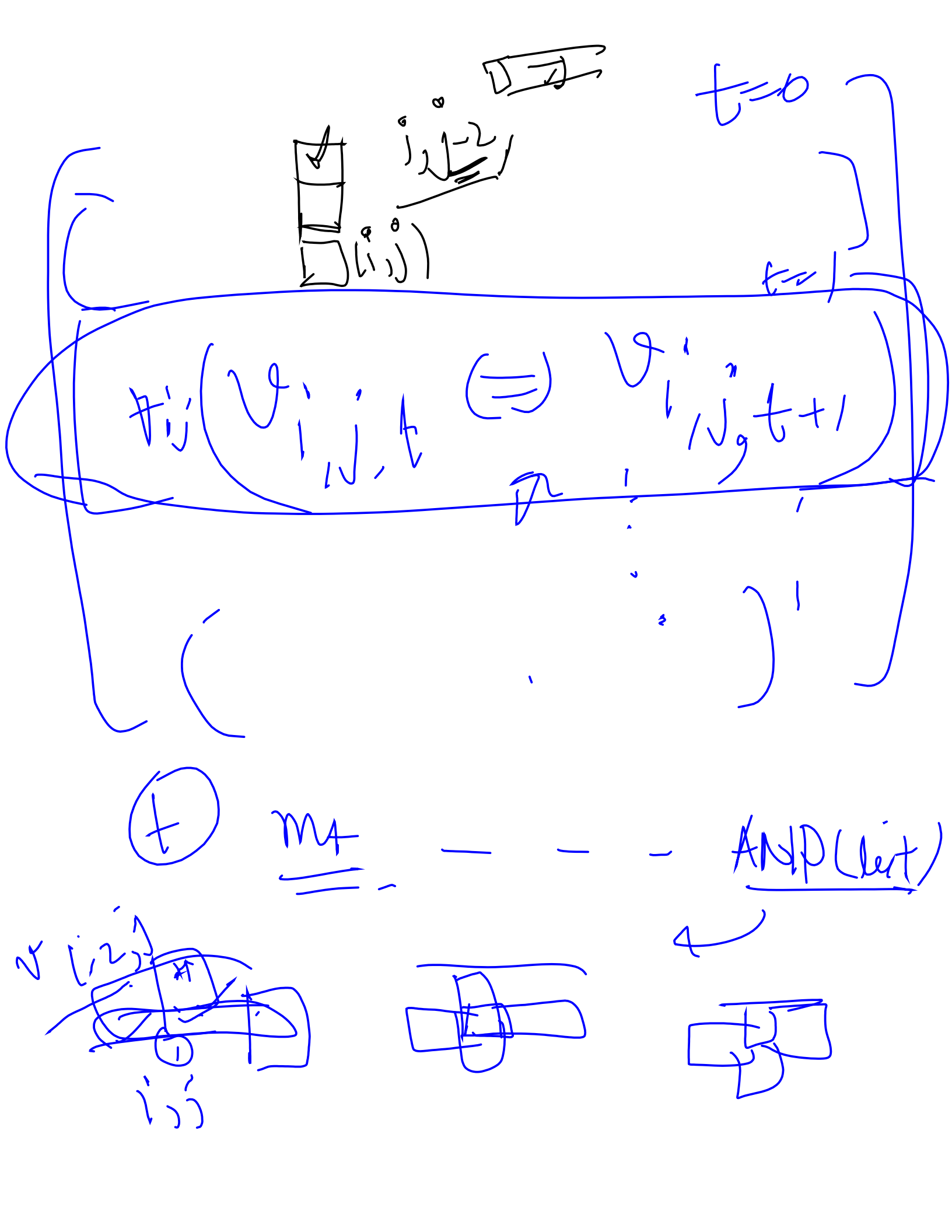
mij

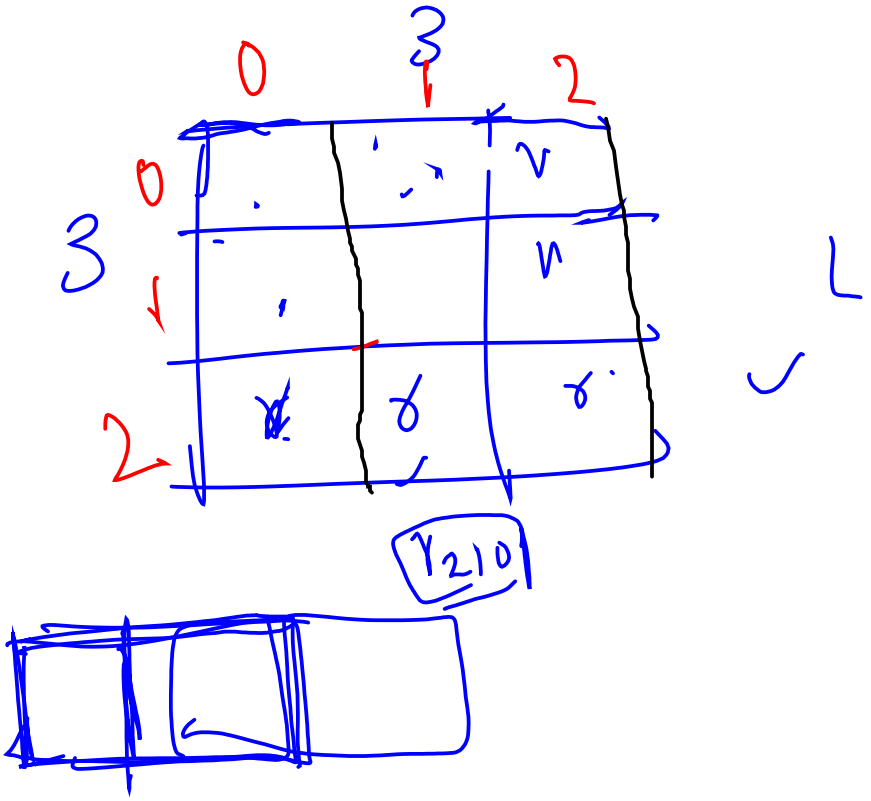






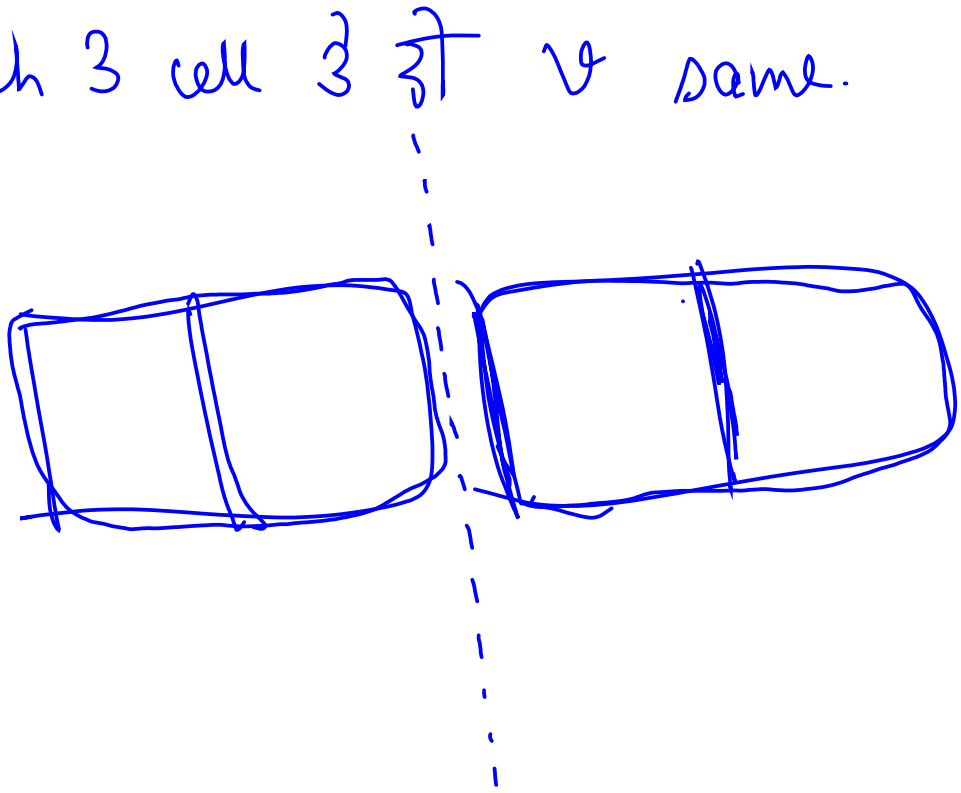
mij => (packege)^ (else remains same)

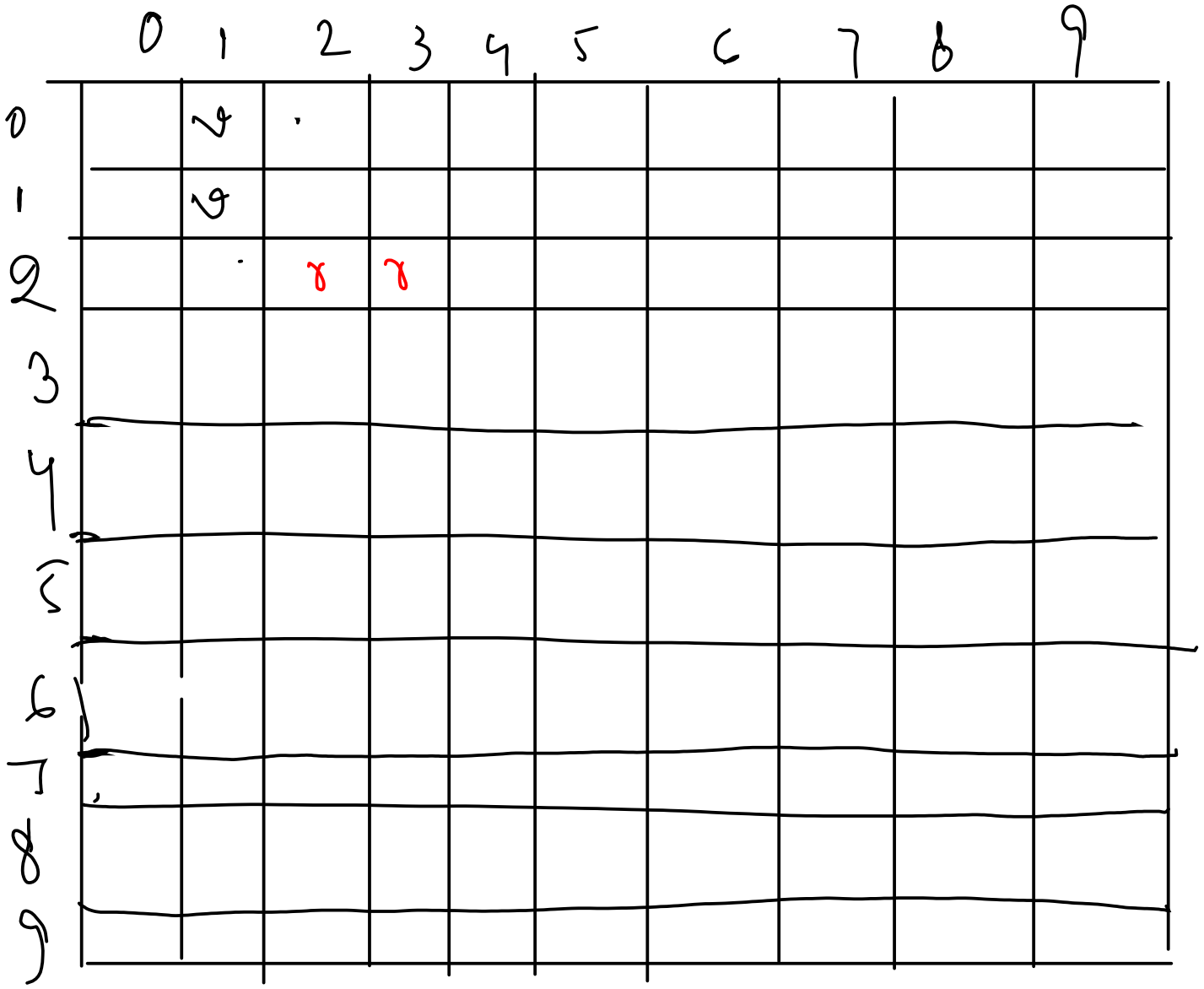

t=0
t=1
AND(left)

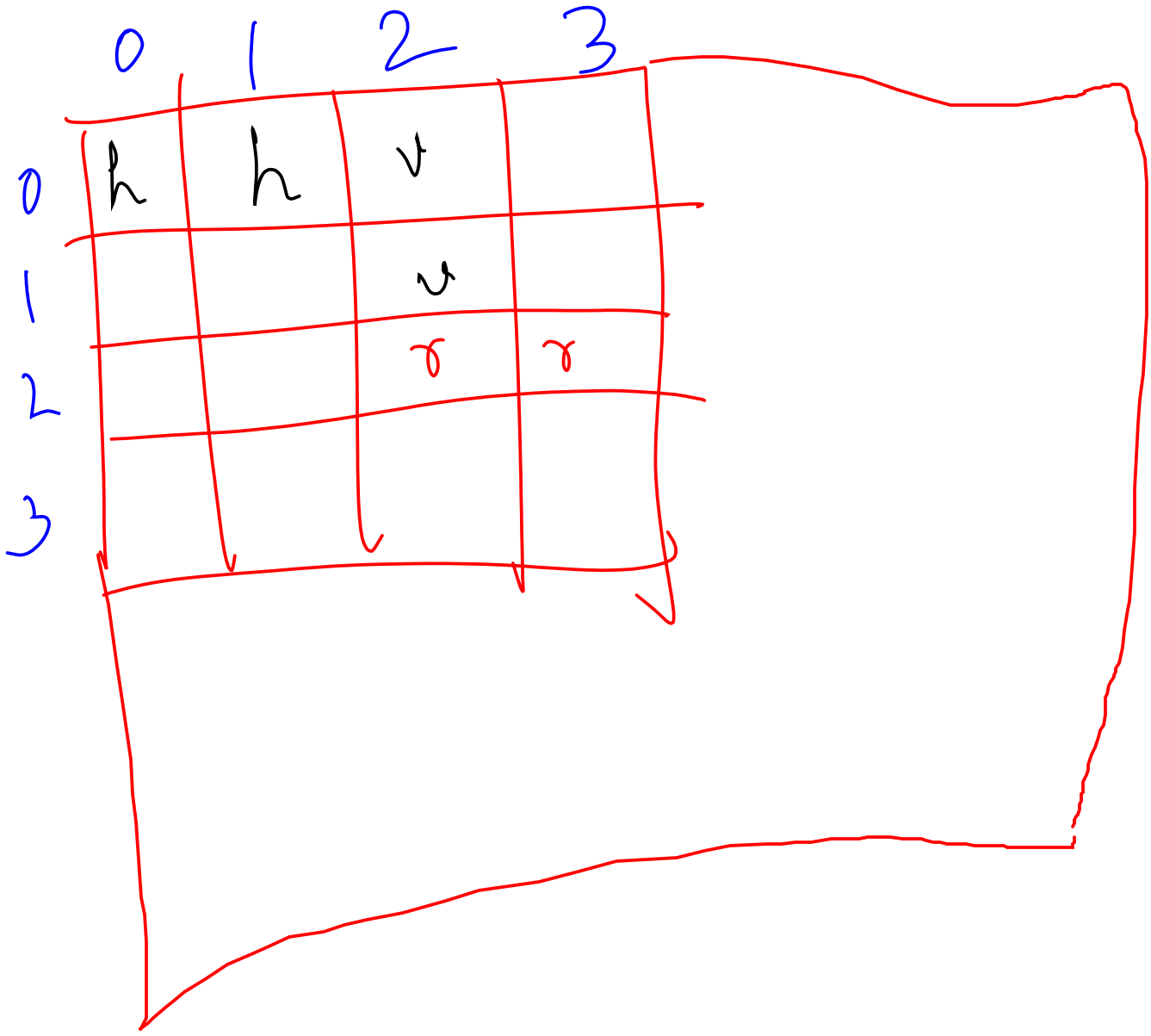


rest cell same h, v both

ch 3 cell 3 ⫪ v same.




0 1 2 3 4 5 6 7 8 9
0
1
2
3
4
5
6
7
8
9


0
1
2
3
0
1
2
3
h
h
v
v
r
r