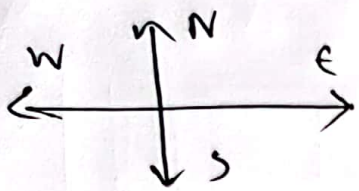
Tanvir Ahmed | 8H-172-021

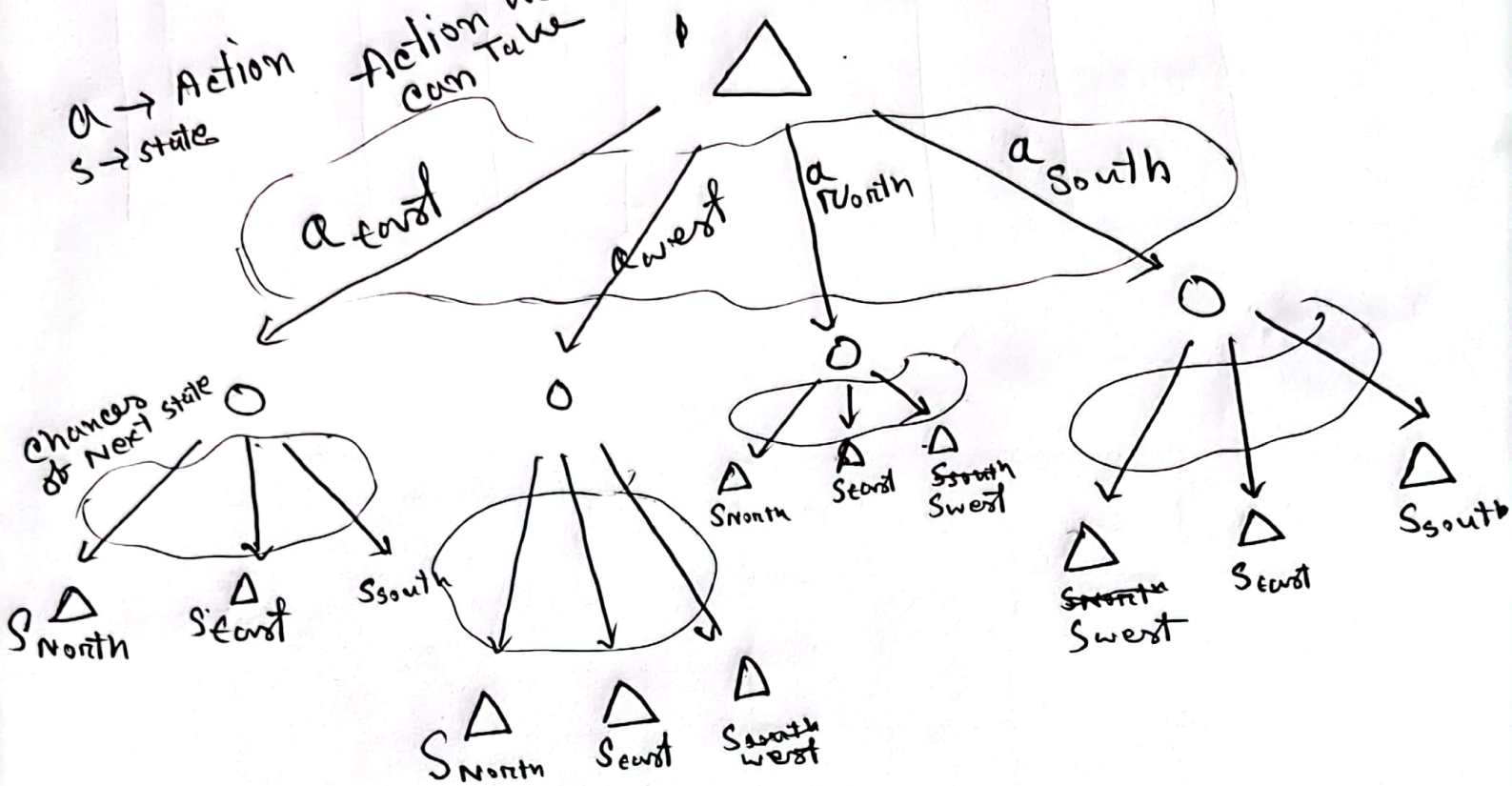
For Any Position On grid

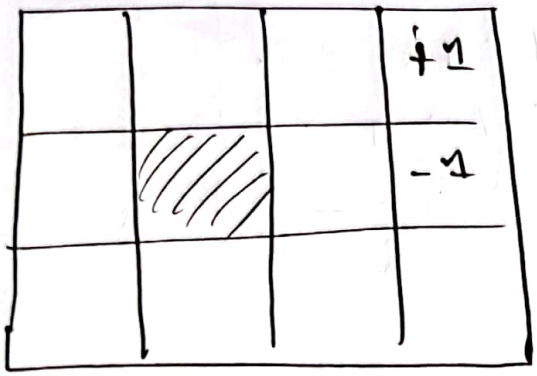


Noise = 0.2
$\gamma = 0.9$

a → Action
s → state

Action we can Take





$a \in A$

$A = [\text{East}, \text{West}, \text{North}, \text{South}]$

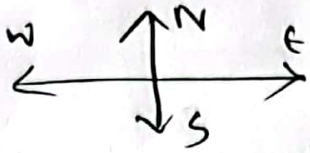
$$V_{i+1}(s) = \max_{a \in A} \sum_{s' \in S} P(s'|s,a)\left[R(s,a,s') + \gamma V_i(s')\right]$$

V_0

0	0	0	0
0		0	0
0	0	0	0

V_1

0	0	0	+1
0		0	-1
0	0	0	0



V_1

0	0	0	+1
0		0	-1
0	0	0	0

V_2

3	0	0	0.72	+1
2	0		0	-1
1	0	0	0	0
	1	2	3	4

$V_2(3,3) \longrightarrow$ ~~best action~~

$$\max \begin{cases} a_{east} = 0.8(0+0.9\times1)+0.1(0+0.9\times0)+0.1(0+0.9\times0) = 0.72 \\ a_{west} = 0.8(0+0.9\times0)+0.1(0+0.9\times0)+0.1(0+0.9\times0) = 0 \\ a_{North} = 0.8(0+0.9\times0)+0.1(0+0.9\times0)+0.1(0+0.9\times1) = 0.09 \\ a_{south} = 0.8(0+0.9\times0)+0.1\times(0+0.9\times0)+0.1(0+0.9\times1) = 0.09 \end{cases}$$

$= 0.72$

$V_2(2,3)$

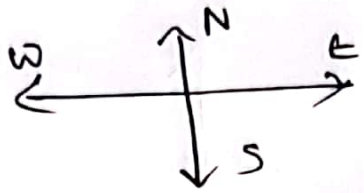
$$\max \begin{cases} a_{east} = 0 \\ a_{west} = 0 \\ a_{north} = 0 \\ a_{south} = 0 \end{cases}$$

$= 0$

$V_2(3,2)$

$$\max \begin{cases} a_{east} = 0.8(0+0.9\times-1)+0+0 = -0.72 \\ a_{west} = 0 \\ a_{north} = 0.8(0+0.9\times0)+0.1(0+0.9\times0)+0.1(0+0.9\times-1) = -0.09 \\ a_{south} = 0.8(0+0.9\times0)+0.1(0+0.9\times0)+0.1(0+0.9\times-1) = -0.09 \end{cases}$$

$= 0$



V_2

0	0	0.72	+1
0		0	-1
0	0	0	0

V_3

3	0	0.52	0.78	+1
2	0		0.43	-1
1	0	0	0	0
	1	2	3	4

$V_3(3,3)$

$= \max \begin{cases} a_{North} = 0.8(0+0.9\times0.72) + 0 + 0.1(0+0.9\times1) = 0.64 \\ a_{South} = 0+0+0.1(0+0.9\times1) = 0.09 \\ a_{East} = 0.1(0+0.9\times0.72)+0+0.8(0+0.9\times1) = 0.78 \\ a_{West} = 0+0+0.1(0+0.9\times0.72) = 0.0648 \end{cases}$

$= 0.78$

$V_3(2,3)$

$= \max \begin{cases} a_{North} = 0.1(0+0.9\times0.72)+0+0 = 0.07 \\ a_{West} = 0 = 0 \\ a_{South} = 0+0+0.1(0+0.9\times0.72) = 0.07 \\ a_{East} = 0.8(0+0.9\times0.72) = 0.52 \end{cases}$

$= 0.52$

$V_3(3,2)$

$= \max \begin{cases} a_{North} = 0.8(0+0.9\times0.72)+0.1(0+0.9\times-1)+0 = 0.43 \\ a_{South} = 0+0+0.1(0+0.9\times-1) = -0.09 \\ a_{East} = 0.1(0+0.72\times0.9)+0.8(0+0.9\times-1)+0 = -0.65 \\ a_{West} = 0+0+0.1(0+0.72\times0.9) = 0.0648 \end{cases}$

$= 0.43$

$$V_3(3,1) =$$

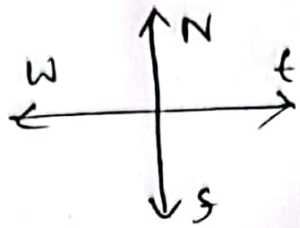
$$\max \begin{cases} a_{North} = 0+0+0 = 0 \\ a_{east} = 0+0+0 = 0 \\ a_{south} = 0+0+0 = 0 \\ a_{north} = 0+0+0 = 0 \end{cases}$$

$$= 0$$

$$V_3(4,1)$$

$$\geq \max \begin{cases} a_{North} = 0+0+0.8(0+0.0\times -1) = -0.72 \\ a_{south} = 0+0+0 = 0 \\ a_{east} = 0+0+0.1(0+0.9\times -1) = -0.09 \\ a_{west} = 0+0+0.1(0+0.9\times -1) = -0.09 \end{cases}$$

$$\geq 0$$



V_3

0	0.52	0.78	+1
0		0.43	-1
0	0	0	0

V_4

3	0.37	0.65	0.83	+1
2	0		0.51	-1
1	0	0	0.31	0
	1	2	3	4

$V_4(3,3)$

$= \max \begin{cases} a_{north} = 0.8\times0.9\times0.78 + 0.1\times0.9\times1 + 0.1\times0.9\times0.52 = 0.7 \\ a_{south} = 0.8\times0.9\times0.43 + 0.1\times0.9\times1 + 0.1\times0.9\times0.52 = 0.45 \\ a_{east} = 0.8\times0.9\times0.78 + 0.8\times0.9\times1 + 0.1\times0.9\times0.43 = 0.83 \\ a_{west} = 0.8\times0.9\times0.52 + 0.1\times0.9\times0.78 + 0.1\times0.9\times0.43 = 0.48 \end{cases}$

≥ 0.83

$V_4(2,3) = \max \begin{cases} a_{north} = 0.8\times0.9\times0.52 + 0.1\times0.9\times0.78 + 0 = 0.44 \\ a_{south} = \cancel{0.1\times0.9\times0.52 + 0.1\times0.9\times0.52} \quad 0.8\times0.9\times0.52 + 0.1\times0.9\times0.78 = 0.44 \\ a_{east} = \cancel{0.8\times0.9\times0.52} \quad 0.8\times0.9\times0.78 + 0.1\times0.9\times0.52 + 0.1\times0.9\times0.52 = 0.65 \\ a_{west} = 0 + 0.1\times0.9\times0.52 + 0.1\times0.9\times0.52 \end{cases}$

≥ 0.09

≥ 0.65

$V_4(1,3) = \max \begin{cases} a_{north} = 0.1\times0.9\times0.52 = 0.05 \\ a_{south} = 0.1\times0.9\times0.52 = 0.05 \\ a_{east} = 0.8\times0.9\times0.52 = 0.37 \\ a_{west} = 0 \end{cases}$

≥ 0.37

$V_4(3,2) =$

$$\max \begin{cases} a_{North} = 0.78 \times 0.9 \times 0.8 + 0.1 \times 0.9 \times 0.13 + 0.1 \times 0.9 \times -1 = 0.51 \\ a_{South} = -0.05 \\ a_{West} = 0.38 \\ a_{East} = -0.65 \end{cases}$$

$= 0.52$

$V_4(3,1) =$

$$\max \begin{cases} a_{North} = 0.2 \times 0.9 \times 0.13 = 0.31 \\ a_{South} = 0 \\ a_{East} = 0.1 \times 0.9 \times 0.13 = 0.04 \\ a_{West} = 0.04 \end{cases}$$

$= 0.31$

$V_4(2,1) =$

$$\max \begin{cases} a_{North} = 0 \\ a_{South} = 0 \\ a_{East} = 0 \\ a_{West} = 0 \end{cases}$$

$V_4(4,1) =$

$$\max \begin{cases} a_{North} = 0.8 \times 0.9 \times -1 = -0.72 \\ a_{South} = 0 \\ a_{left} = 0.1 \times 0.9 \times 1 = -0.09 \\ a_{East} = 0.1 \times 0.9 \times -1 = -0.09 \end{cases}$$

$= 0$