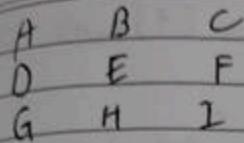


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States: (A, B, C, D, E, F, G, H, I)

Actions: UP DOWN LEFT RIGHT

Policy: 0.25 or $\frac{1}{4}$

Discount: $\gamma = 1$

Reward: $R = -1$

Step 1

$$1. V_{k+1}(A) = \frac{1}{4} [(-1 + v(K)) + (-1 + v(B)) + (-1 + v(D)) + (-1 + v(A))] \\ = \frac{1}{4} [-1 + (-1) + (-1) + (-1)]$$

$$V_{k+1}(A) = -1$$

$$2. V_{k+1}(B) = \frac{1}{4} [(-1 + v(A)) + (-1 + v(C)) + (-1 + v(E)) + (-1 + v(B))] \\ = \frac{1}{4} [(-1) + (-1) + (-1) + (-1)]$$

$$V_{k+1}(B) = -1$$

$$3. V_{k+1}(D) = \frac{1}{4} [(-1 + v(D)) + (-1 + v(E)) + (-1 + v(G)) + (-1 + v(A))] \\ = \frac{1}{4} [-1 + (-1) + (-1) + (-1)]$$

$$V_{k+1}(D) = -1$$

$$4. V_{k+1}(E) = \frac{1}{4} [(-1 + v(D)) + (-1 + v(F)) + (-1 + v(H)) + (-1 + v(B))] \\ = \frac{1}{4} [-1 + (-1) + (-1) + (-1)]$$

$$V_{k+1}(E) = -1$$

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$$5. V_{K+1}(F) = '|_1 [(-1 + V(E)) \uparrow (-1 + V(F)) + (-1 + V(I)) + (-1 + V(C))] \\ = '|_1 [-1 + (-1) + (-1) \uparrow (-1)]$$

$$V_{K+1}(E) = -1$$

$$6. V_{K+1}(H) = '|_1 [(-1 + V(G)) + (-1 + V(I)) + (-1 + V(H)) + (-1 + V(E))] \\ = '|_1 [-1 + (-1) + (-1) + (-1)]$$

$$V_{K+1}(H) = -1$$

? ~~V_{K+1}~~

-1	-1	0
-1	-1	-1
0	-1	0

Step 2

$$8. q_{K+1}(A, Left) = -1 + V(A) \\ = -1 + (-1) = -2$$

$$9. q_{K+1}(A, Right) = -1 + V(B) \\ = -1 + (-1) = -2$$

$$10. q_{K+1}(A, Up) = -1 + V(A) \\ = -1 + (-1) = -2$$

$$11. q_{K+1}(A, Down) = -1 + V(D) \\ = -1 + (-1) = -2$$

12. ~~q_{K+1}(A)~~ E Left, Right, Up, Down
semimore

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$$13. q_{K+1}(B, \text{Left}) = -1 + v(A)$$
$$= -1 + (-1) = -2$$

$$14. q_{K+1}(B, \text{Right}) = -1 + v(C)$$
$$= -1 + 0 = -1$$

$$15. q_{K+1}(B, \text{Up}) = -1 + v(B)$$
$$= -1 + (-1) = -2$$

$$16. q_{K+1}(D, \text{Down}) = -1 + v(D) = -1 + v(E)$$
$$= -1 + (-1) = -2$$

$$17. \pi_{K+1}(B) = \{\text{Right}\}$$

$$18. q_{K+1}(D) = -1 + v(D)$$
$$= -1 + (-1) = -2$$

$$19. q_{K+1}(D, \text{Right}) = -1 + v(E)$$
$$= -1 + (-1) = -2$$

$$20. q_{K+1}(D, \text{Up}) = -1 + v(A)$$
$$= -1 + (-1) = -2$$

$$21. q_{K+1}(D, \text{Down}) = -1 + v(G)$$
$$= -1 + 0 = -1$$

$$22. \pi_{K+1}(D) = \{\text{Down}\}$$

$$23. q_{K+1}(E, \text{Left}) = -1 + v(D)$$
$$= -1 + (-1) = -2$$

$$24. q_{K+1}(E, \text{Right}) = -1 + v(F)$$
$$= -1 + (-1) = -2$$

$$25. q_{K+1}(E, \text{Up}) = -1 + v(B)$$
$$= -1 + (-1) = -2$$

$$26. q_{K+1}(E, \text{Down}) = -1 + v(H)$$
$$= -1 + (-1) = -2$$

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$$27. \pi_{K+1}(E) = \{Left, Right, Up, Down\}$$

$$28. q_{K+1}(F, Left) = -1 + v(F)$$
$$= -1 + (-1) = -2$$

$$29. q_{K+1}(F, Right) = -1 + v(F)$$
$$= -1 + (-1) = -2$$

$$30. q_{K+1}(F, Up) = -1 + v(C)$$
$$= -1 + 0 = -1$$

$$31. q_{K+1}(F, Down) = -1 + v(I)$$
$$= -1 + 0 = -1$$

$$32. \pi_{K+1}(F) = \{Up, Down\}$$

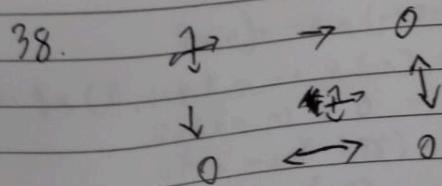
$$33. q_{K+1}(H, Left) = -1 + v(G)$$
$$= -1 + 0 = -1$$

$$34. q_{K+1}(H, Right) = -1 + v(I)$$
$$= -1 + 0 = -1$$

$$35. q_{K+1}(H, Up) = -1 + v(E)$$
$$= -1 + (-1) = -2$$

$$36. q_{K+1}(H, Down) = -1 + v(H)$$
$$= -1 + (-1) = -2$$

$$37. \pi_{K+1}(H) = \cancel{\{Left, Right, Up, Down\}} \quad \{Left, Right\}$$



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$$K = 2$$

$$\text{V}_{\text{L}}(A) = \frac{1}{4} [(-1 + V(A)) + (-1 + V(B)) + (-1 + V(A)) + (-1 + V(D))]$$

$$= \frac{1}{4} (-2 + (-2) + (-2) + (-2))$$

$$\text{V}_{\text{L}}(A) = -2$$

$$10. \quad \text{V}_{\text{L}}(B) = \frac{1}{4} (-2 + (-1) + (-2) + (-2)) \\ = -1.75$$

$$11. \quad \text{V}_{\text{L}}(D) = \frac{1}{4} (-2 + (-2) + (-2) + (-1)) \\ = -1.75$$

$$12. \quad \text{V}_{\text{L}}(E) = \frac{1}{4} (-2 + (-2) + (-2) + (-2)) \\ = -2$$

$$13. \quad \text{V}_{\text{L}}(F) = \frac{1}{4} (-2 + (-2) + (-1) + (-1)) \\ = -1.5$$

$$14. \quad \text{V}_{\text{L}}(H) = \frac{1}{4} (-1 + (-1) + (-2) + (-2)) \\ = -1.5$$

$$15. \quad \text{V}_{\text{R}}(A, \text{Left}) = -1 + (-2) = -3$$

Right = $-1 + \cancel{0} + (-1.75) = -2.75$

$$V_P = -1 + (-2) = -3$$
$$\text{Down} = -1 + (-1.75) = -2.75$$

$$16. \quad \text{V}_{\text{R}}(B, \text{Left}) = -1 + (-2) = -3$$

Right = $-1 + 0 = -1$

$$V_P = -1 + (-1.75) = -2.75$$
$$\text{Down} = -1 + (-2) = -3$$

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77. $g^*(D)$, left = $-1 + (-2) = -3$
Right = $-1 + (-2) = -3$
Up = $-1 + (-2) = -3$
Down) = $-1 + 0 = -1$

78. $g^*(E)$, left = $-1 + (-1.75) = -2.75$
Right = $-1 + (-1.5) = -2.5$
Up Down) = $-1 + (-1.75) = -2.75$
Down) = $-1 + (-1.5) = -2.5$

79. $g^*(F)$, left = $-1 + (-2) = -3$
Right = $-1 + (-1.5) = -2.5$
Up = $-1 + 0 = -1$
Down) = $-1 + 0 = -1$

80. $g^*(H)$, left = $-1 + 0 = -1$
Right = $-1 + 0 = -1$
Up = $-1 + (-2) = -3$
Down) = $-1 + (-1.5) = -2.5$

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$$51. \pi_A = \{ \text{Right, Down} \}$$

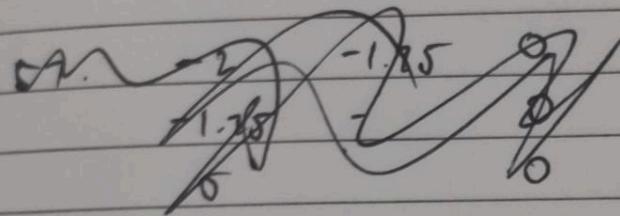
$$52. \pi_B = \{ \text{Right} \}$$

$$53. \pi_D = \{ \text{Down} \}$$

$$54. \pi_E = \{ \text{Right, Down} \}$$

$$55. \pi_F = \{ \text{Up, Down} \}$$

$$56. \pi_H = \{ \text{Left, Right} \}$$



$$57. \begin{matrix} -2 & -1.75 & 0 \end{matrix}$$

$$\begin{matrix} -1.75 & -2 & -1.5 \end{matrix}$$

$$\begin{matrix} 0 & -1.5 & 0 \end{matrix}$$

$$58. \begin{matrix} \rightarrow & \rightarrow & 0 \\ \downarrow & \leftrightarrow & \uparrow \\ 0 & \leftrightarrow & 0 \end{matrix}$$