

TEAM 25 REPORT

MEMBERS:

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PART-1: (Matrices with Utilities till convergence)

Iteration No 1:

0.000000	0.000000	25.000000	0.000000
-1.250000	-1.250000	18.750000	-1.250000
-1.250000	-25.000000	0.000000	-1.250000
-1.250000	-1.250000	-1.250000	-1.250000

Iteration No 2:

0.000000	0.000000	25.000000	0.000000
-2.500000	11.125000	18.500000	13.500000
-2.500000	-25.000000	0.000000	-2.500000
-2.500000	-2.500000	-2.500000	-2.500000

Iteration No 3:

0.000000	0.000000	25.000000	0.000000
7.150000	12.162500	21.212500	14.650000
-3.750000	-25.000000	0.000000	9.050000
-3.750000	-3.750000	-3.750000	-3.750000

Iteration No 4:

0.000000 0.000000 25.000000 0.000000
8.820001 14.436250 21.431250 18.090000
1.595000 -25.000000 0.000000 12.280000
-5.000000 -5.000000 -5.000000 5.240000

Iteration No 5:

0.000000 0.000000 25.000000 0.000000
11.340500 14.838625 22.002625 18.931999
3.465501 -25.000000 0.000000 15.678000
-0.974000 -6.250000 1.942000 8.598000

Iteration No 6:

0.000000 0.000000 25.000000 0.000000
12.101500 15.335962 22.127062 19.813099
5.668950 -25.000000 0.000000 17.031200
0.800000 -2.821400 6.016800 12.346400

Iteration No 7:

0.000000 0.000000 25.000000 0.000000
12.795815 15.485246 22.264906 20.136080
6.498095 -25.000000 0.000000 18.006720
3.083020 0.781300 9.830481 14.211281

Iteration No 8:

0.000000 0.000000 25.000000 0.000000
13.067588 15.610449 22.312132 20.376205
7.136461 -25.000000 0.000000 18.460207
4.334908 4.192514 12.085121 15.559552

Iteration No 9:

0.000000 0.000000 25.000000 0.000000
13.258764 15.660750 22.348665 20.483347
7.417717 -25.000000 0.000000 18.743006
5.311911 6.337348 13.614666 16.282633

Iteration No 10:

0.000000 0.000000 25.000000 0.000000
13.346249 15.695007 22.364410 20.551567
7.598783 -25.000000 0.000000 18.885279
5.849099 7.775468 14.499040 16.734135

Iteration No 11:

0.000000 0.000000 25.000000 0.000000
13.400509 15.711029 22.374657 20.585213
7.686877 -25.000000 0.000000 18.968309
6.315163 8.626779 15.037116 16.981541

The total number of iterations : 11

Final Utility Board:

0.000000 0.000000 25.000000 0.000000
13.400509 15.711029 22.374657 20.585213
7.686877 -25.000000 0.000000 18.968309
6.315163 8.626779 15.037116 16.981541

Part-2: (Final Expected Utility,Optimal Path,Policy)

The final expected utility from the Value Iteration Algorithm is got as follows:

The Final Expected Utility is nothing but the utility of Start state which is nothing but 6.315163.

Maximum expected utility from VI : 6.315163

Maximum expected utility from LP : 8.214805

Ratio MEU(LP)/MEU(VI) = $8.214805/6.315163 = 1.3008$

The Optimal Policy :

N – North , S – South , W – West , E – East

X – Policy is not applicable I.e wall or Terminal state.

	0	1	2	3
0	['X']	['X']	['X']	['X']
1	['E']	['E']	['N']	['W']
2	['N']	['X']	['X']	['N']
3	['E']	['E']	['E']	['N']

This is the optimal policy got from both VI and LP Algorithms.

The Optimal Path:

The optimal path obtained is $(3,0) \Rightarrow (3,1) \Rightarrow (3,2) \Rightarrow (3,3) \Rightarrow (2,3) \Rightarrow (1,3) \Rightarrow (1,2) \Rightarrow (0,2)$

This is obtained by starting from the start state and selecting the neighbour of highest utility till we reach the final state.

PART-3: (Value of X and Expected Utility from LP)

We have 12 states and 42 state action pairs.

Our convention is as follows:

1->North

2->South - - S12 -

3->West S8 S9 S10 S11

4->East S5 S6 - S7

5->Noop S1 S2 S3 S4

In the following table we have the state action pairs and corresponding X values obtained from the linear programming solution and we generate the policy from the X values.

(State,Action) Pair	X value
(1,1)	0
(1,2)	0
(1,3)	0
(1,4)	1.11111111111111
(2,1)	0
(2,2)	0
(2,3)	0
(2,4)	0.987654320987654
(3,1)	0
(3,2)	0
(3,3)	0
(3,4)	1.11111111111111
(4,1)	0.987654320987654
(4,2)	0

(4,3)	0
(4,4)	0
(5,1)	0.136986301369863
(5,2)	0
(5,3)	0
(5,4)	0
(6,5)	0.135297429161193
(7,1)	1.12799983319781
(7,2)	0
(7,3)	0
(7,4)	0
(8,1)	0
(8,2)	0
(8,3)	0
(8,4)	0.121765601217656
(9,1)	0
(9,2)	0
(9,3)	0
(9,4)	0.228333669254417
(10,1)	1.08087821354851
(10,2)	0
(10,3)	0
(10,4)	0
(11,1)	0
(11,2)	0
(11,3)	1.12276409768122
(11,4)	0
(12,5)	0.864702570838806

**The value of expected utility obtained from LP IS
8.214805316.**