Using Markov Decision Process for multi-agent Path Planning

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Markov Decision Process (MPD)

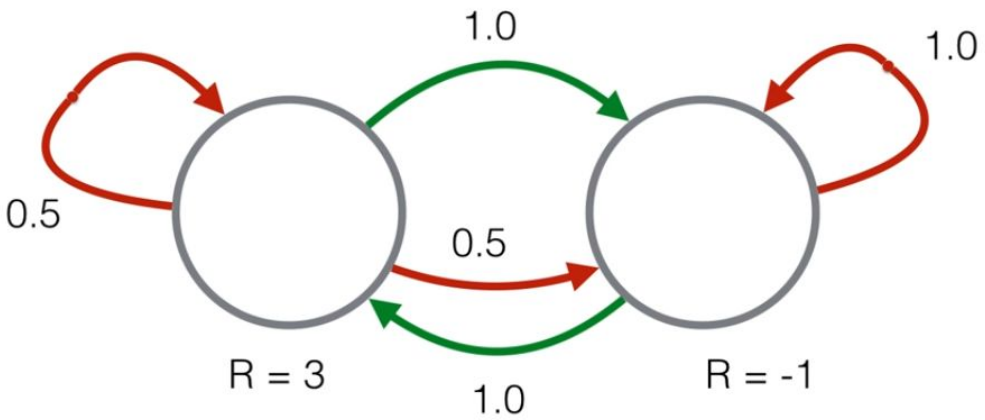


Image taken from Bert Huang on Youtube.
https://www.youtube.com/watch?v=KovN7WKI9Y0

MPD used for Path Planning

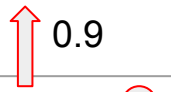
-1	-1	-1	-100	-1	-1
-1	-1	-1	100	-1	-1
-1	-1	100	-1	-1	-1
-1	100	-1	-1	-1	-1
-1	-1	-100	-1	-100	-1
-1	-1	-1	-1	-1	-1

MPD used for Path Planning

-1	-1	-1	-100	-1	-1
-1	-1	-1	100	-1	-1
-1	-1	100	-1	-1	-1
-1	100	-1	-1	-1	-1
-1	-1	-100	-1	-100	-1
-1 	-1	-1	-1	-1	-1

MPD used for Path Planning

-1	-1	-1	-100	-1	-1
-1	-1	-1	100	-1	-1
-1	-1	100	-1	-1	-1
-1	100	-1	-1	-1	-1
-1	-1	-100	-1	-100	-1
-1	-1	-1	-1	-1	-1



MPD used for Path Planning

-1	-1	-1	-100	-1	-1
-1	-1	-1	100	-1	-1
-1	-1	100	-1	-1	-1
-1	100	-1	-1	-1	-1 
-1	-1	-100	-1	-100	-1
-1 	-1	-1	-1	-1	-1 

Bellman Equation

$$U_{i+1}(s) \leftarrow R(s) + \gamma \max_{a \in A(s)} \sum_{s'} P(s'|s,a) U_i(s')$$

$$U(s) = R(s) + \gamma \max_{a \in A(s)} \sum_{s'} P(s'|s,a) U(s')$$

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Utility Calculations

-1 -10.1	-1 -2.111	-1 -1.111	-100 -90	-1 -0.111	-1 -1.01
-1 -10.1	-1 -0.100	-1 9.00	100 100	-1 9.00	-1 -1.111
-1 -0.100	-1 9.00	100 100	-1 9.00	-1 -2.1	-1 -1.110
-1 9.000	100 100	-1 9.00	-1 -0.100	-1 -10.0	-1 -1.111
-1 -0.100	-1 9.000	-100 -99	-1 -1.000	-100 -100.1	-1 -1.111
-1 -1.111	-1 -1.111	-1 -1.111	-1 -1.111	-1 -1.111	-1 -1.111

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-1 -10.1	-1 -2.111	-1 -1.111	-100 -90	-1 -0.111	-1 -1.01
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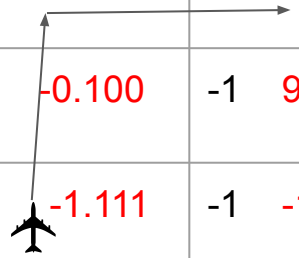
-1 -0.100	-1 9.00	100 100	-1 9.00	-1 -2.1	-1 -1.110
-1 9.000	100 100	-1 9.00	-1 -0.100	-1 -10.0	-1 -1.111
-1 -0.100	-1 9.000	-100 -99	-1 -1.000	-100 -100.1	-1 -1.111
-1 -1.111	-1 -1.111	-1 -1.111	-1 -1.111	-1 -1.111	-1 -1.111



Demo