

7_avg_exp.py

1. For all bots which are currently at a node & idle

Update:

- true idleness of all nodes in graph (true) = $+\Delta t$
- Store all the true idleness values at this time stamp
- Expected idleness of nodes at which bots are currently present is calculated as the avg of true idleness while going through a particular edge (now, expected idleness is function of edge not node)

Calculate: here, learning rate (α) = 0.1, discount factor (γ) = 0.95

- Value function all edges where bots are present (Q) =

$$Q^{new}(s_t, a_t) \leftarrow \underbrace{Q(s_t, a_t)}_{\text{old value}} + \underbrace{\alpha}_{\text{learning rate}} \cdot \underbrace{\left(\underbrace{r_t}_{\text{reward}} + \underbrace{\gamma}_{\text{discount factor}} \cdot \underbrace{\max_a Q(s_{t+1}, a)}_{\text{estimate of optimal future value}} - \underbrace{Q(s_t, a_t)}_{\text{old value}} \right)}_{\text{new value (temporal difference target)}}$$

temporal difference

- Reward (r_t) = $\log(|\text{expect} - \text{true}|)$ and

$$r_t = 0 \text{ if } [\text{expect} = \text{true}]$$

- Softmax of Value function = value_exp =
$$\frac{e^{Q_i * \text{expect}[i]}}{\sum_{j=i}^k e^{Q_j * \text{expect}[j]}}$$

(summation over all edges)

Set:

- True idleness of nodes where bots are present = 0

OBSERVATION model: bot will calculate the expected idleness as an average of all the past true idleness it has seen when it last visited the node while travelling **along that particular edge**.

The name 7_avg_exp indicates => avg = averaging true idleness to get expected idleness (OBSERVATION model)

exp = including the expected idleness into the softmax calculation

2. For a bot deciding the next node to visit

Set:

- True idleness of the node where the bot is present = 0

Decision Making: here, we chose $\varepsilon=0.1$

- With $(1 - \varepsilon)$ probability, check all neighbours and visit the one with highest value of = $[value_exp]$
- With ε probability, go to a random node

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DRAWBACK:

- Even when $|expect_true| = 1$, reward = 0.