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Recent progress on the attracting edge problem

Reinforcement is observed frequently in nature and society, where beneficial interactions tend to be repeated. An edge reinforced random walker on a graph remembers the number of times each edge was traversed in the past, and decides to make the next random step with probabilities favouring places visited before. Using martingale techniques and comparison with the generalized Urn scheme, it can be shown that the edge reinforced random walker on a graph of bounded degree, with the *reinforcement weight function* $W(k) = k^\rho$, $\rho > 1$, traverses a random *attracting* edge at all large times, with probability 1. A remarkably short argument of Sellke (1994) shows that attracting edge exists if and only if

$$\sum_k \frac{1}{W(k)} < \infty,$$

whenever the underlying graph has no odd cycle. The conjecture that the above summability condition implies existence of attracting edge when the underlying graph is a *triangle* is still open. Progress has been made recently towards better understanding of attracting edge property for a large class of weights W satisfying the above condition.