Oblivious routing via random walks

Abstract:

We present novel oblivious routing algorithms for the splittable and the unsplittable multicommodity flow settings. Our algorithms for both models improve upon the state-of-the-art, in terms of running time and performance with respect to graphs that exhibit good expansion guarantees. As an intermediate step towards the unsplittable setting, we present a novel generalization of Valiant's classical load balancing scheme for packet-switched networks to arbitrary graphs, which is of independent interest. Our approach relies on diffusing traffic throughout the network and then regathering it to its destination, via iterative applications of the random walk operator. Consequently, the performance guarantees of our algorithms are derived from the convergence of the random walk operator to the stationary distribution and are expressed in terms of the spectral gap of the graph (which dominates the mixing time).