Analysis of random walks on a hypercube Alina Misnik¹

This work is devoted to the analysis of a random walk of a pair of particles on a hypercube, whose motion dynamics are described by a two-dimensional Markov chain. The transition probability matrix of this chain is constructed in such a way that both marginal distributions correspond to simple random walks on the hypercube. Moreover, the joint dynamics are chosen to minimize the expected distance between the particles at each step.

For this type of random walk, the distribution of the distance between the particles at each time moment is obtained using generating functions. We derive mathematical characteristics of the meeting time, establish its limit distribution, and estimate the probability of large deviations via the Chernoff bound. The analytical findings are complemented by a numerical experiment that illustrates the practical behavior of the meeting time.

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