Optimal Control of Mutation Rate in Genetic Algorithms

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Abstract. We consider genetic algorithms (GAs) as Markov chains, and then consider the optimal control problem of its parameters. We give several formulations of this problem depending on additional constraints, such as time horizon and information constraints. In particular, we shall look into the problem of optimal control of the mutation rate parameter. Using combinatorial result about the intersection of spheres in a Hamming space will allow us to derive closed-form solutions for some of these problems. We shall also discuss how these solutions can be applied to problems, where the objective function is only weakly monotonic relative to the Hamming metric. If time allows, we shall also discuss the recent discovery of the mutation rate control in bacteria.