Techniques for bounding the convergence rate of genetic algorithms

June 2, 2000

Yuri Rabinovich
Avi Wigderson

Abstract
The main purpose of the present paper is the study of computational aspects, and primarily the convergence rate, of Genetic Algorithms (GA's). Despite the fact that such algorithms are widely used in practice, little is known so far about their theoretical properties, and in particular about their long-term behaviour. This situation is perhaps not too surprising, given the inherent hardness of analyzing nonlinear dynamical systems, and the complexity of the problems to which GA's are usually applied.

In the present paper we concentrate on a number of very simple and natural systems of this sort, and show that at least for these systems the analysis can be property carried out. Various properties and tight quantitative bounds on the long-term behavior of such systems are established.

It is our hope that the techniques developed for analyzing these simple systems will prove to be applicable to a wider range of Genetic Algorithms, and contribute to the development of the mathematical foundations of this promising optimization method.