Editorial Introduction

Welcome to the fourth issue of volume four of *Evolutionary Computation*! In addition to being the final issue of volume 4, this issue marks the end of my four-year term as editor-in-chief. Needless to say, it has been quite an experience serving as the first editor-in-chief of a new journal! I wouldn't have survived it without the support of the ECJ community and the excellent staff at MIT Press. However, it's now time for me to focus on other activities, and it's important for a new journal to have a continual infusion of new ideas and new leadership. I'm happy to announce that the editorial board has elected Darrell Whitley to serve as editor-in-chief for the next four-year term. I hope you will support him as much as you have done so for me in terms of subscriptions, submissions, and reviewing.

The first paper in this issue, by Hordijk, extends existing work involving an operator-oriented analysis of fitness landscapes. Using existing techniques from time series analysis, Hordijk is able to characterize the correlation structure of fitness landscapes induced by underlying search operators (crossover, mutation, etc.) used by an evolutionary algorithm (EA). In addition, the stochastic models that result from this analysis can be used to make predictions about performance.

The second paper, by Blickle and Thiele, extends and summarizes current work on analyzing selection schemes on the basis of how they affect the distribution of fitness values represented in a population. Standard selection methods, such as ranking, tournament, and truncation selection, are characterized in terms of expected fitness, fitness variance, selection intensity, and loss of diversity. This provides a systematic means for comparing and contrasting selection schemes and provides considerable insight into the implications of choosing a particular selection scheme for a particular EA.

The third paper in this issue, by Vose, extends earlier work on the use of Markov chains as an analysis tool for simple genetic algorithms (GAs). One of the difficulties with this approach is that many of the traditional notions of convergence associated with Markov chains, such as convergence to a steady-state transition probability distribution or convergence to a uniform population, are not particularly interesting when trying to characterize the behavior of GAs. Vose proposes a PAC-like characterization of population convergence using his expected value model $\mathcal{G}(x)$ and is able to show (with some additional assumptions) that the time required for a GA population with high probability to get within a prespecified distance δ of a fixed point is logarithmic in δ.

In order to get optimization-oriented proofs of convergence for EAs, simplifying assumptions are frequently made that on the surface seem quite plausible, but can lead to serious misconceptions. The final paper in this issue, by Salomon, points out a classic example of this, involving assumptions about the invariance of EA behavior with respect to rotations of the underlying function to be optimized. Salomon shows both theoretically and empirically that EAs that use a mutation operator that modifies on the average one parameter per individual are highly sensitive to rotations in the sense that they typically exhibit excellent ($n \log n$) convergence rates on problems involving a relatively few number of parameter interactions, but exhibit extremely poor behavior (n^n) when such functions are rotated to produce significantly more complex parameter interaction. He notes that our current test suites are quite weak in the sense that they do not include problems that have strong nonlin-

ear parameter interactions, and hence do not serve either as a source of counterexamples for erroneous assumptions about rotational invariance or as a test of the abilities of particular EAs to handle nonlinear interactions.

Volume 5 is already taking shape with a variety of interesting papers and a special issue on program induction. We'll post things on the journal web page as the details become available.

Enjoy!

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