

Preface

The Artificial Evolution conference was originally conceived as a forum for the French-speaking Evolutionary Computation community, but has of late been acquiring an European audience, with several papers from Germany, Austria, Italy, Spain... However, AE remains as intended a small and friendly gathering, which will continue to be held every two years.

Previous AE meets were held in Toulouse, Brest, and Nîmes. This year, the hosting was done by the LIL (Laboratoire d'Informatique du Littoral) in the not-so-cold city of Dunkerque.

The invited talk on “Fitness Landscapes and Evolutionary Algorithms” was delivered by Colin Reeves of Coventry University

This volume contains a selection of the papers presented at the conference. Twenty-seven papers were presented orally at the conference, selected from over 40 papers refereed by the program committee. After the conference, each presentation was reviewed and 20 papers were retained and revised for publication in this volume.

The papers in this volume have been grouped into the following five sections which more or less reflect the organization of the oral presentations.

1. **Invited Paper:** C. Reeves brightly describes the state of the art in Fitness Landscapes.
2. **Genetic Operators and Theoretical Models:** Devising new genetic operators and understanding the behavior of genetic operators is a popular research topic in evolutionary computation. Jens Gottlieb presents new initialization routines and several repair and optimization methods for the multidimensional knapsack problem. Jens Gottlieb and Günther Raidl characterize locality by analyzing the relation between genotypes and phenotypes. Mike Rosenman provides a solution to the problem of adaptation in case-based design. Aniko Ekart introduces a special mutation operator in order to moderate code growth in genetic programming.
In the only theoretical contribution, Anton Eremeev proposes a mathematical model of a simplified GA and obtains upper and lower bounds on the expected proportion of individuals above a given threshold.
3. **Applications:** This section demonstrates the successful applicability of EAs in a broad range of problems. Monmarché *et al.* generate style sheets for web sites based on artistic preferences with the help of a GA; Alain Ratle maximizes the absorbing properties of a composite material using an EA to find out the optimal distribution of two or more types of sound absorbing material elements; Laurence Moreau-Giraud and Pascal Lafon present their hybrid evolution strategy for mixed discrete continuous constrained problems; Anne Spalanzani proposes an evolutionary solution for speech recognition problems; Jean Louchet proposes a new swarm-based algorithm

for fast 3D image analysis; Yu Li and Youcef Bouchebaba solve the optimal communication spanning tree problem by means of evolutionary techniques.

4. **Agents - Cooperation:** Alternative evolutionary paradigms are introduced in this section. Philippe Mathieu *et al.* present a classification of ecological evolution by studying the classical iterated prisoner's dilemma. A.J. Bagnall and G.D. Smith describe an autonomous agent model of the UK market in electricity. Samuel Delepoulle *et al.* study the evolution of social behaviors within a behavioral framework, and David Griffiths and Anargyros Serafopoulos present some animated sequences of simulated agent colonies.
5. **Heuristics - Outlooks:** This section collects studies reflecting the general experience of the authors regarding evolutionary computation. Olivier Roux *et al.* use the ant colony paradigm to solve the quadratic assignment problem. Meriema Belaidouni and Jin-Kao Hao use the fitness landscape paradigm in order to study the difficulty of a combinatorial problem. Philippe Collard *et al.* introduce the notion of synthetic neutrality, an original paradigm for describing a problem difficulty. Sana Ben Hamida *et al.* compare the plain parametric approach to the GP parse-tree representation for the design of a 2-dimensional profile of an optical lens in order to control focal-plane irradiance of some laser beam. Denis Robilliard and Cyril Fonlupt use a repellent-attractor strategy to guide evolutionary computation.

At this point, we would like to mention Denis Robilliard, Philippe Preux, Olivier Roux, and Eric Ramat at the LIL in Calais, and thank them for their invaluable assistance with the nuts and bolts of organizing AE'99. Finally, we would like to thank the AE'99 program committee members for the service they rendered to the community by ensuring the high scientific content of the papers presented. The names of these very busy people, who still found time or made time to do the refereeing, are listed on the following pages.

April 2000

Cyril Fonlupt,
Jin-Kao Hao,
Evelyne Lutton,
Edmund Ronald,
and Marc Schoenauer.

Artificial Evolution 99 - EA'99

November 3-5, 1999

LIL, Université du Littoral, Dunkerque, France

AE'99 is the fourth conference on Evolutionary Computation organized in France. Following EA'94 in Toulouse, EA'95 in Brest, and EA'97 in Nîmes, the conference was held in Dunkerque.

AE'99 was hosted by the LIL, Laboratoire d'Informatique du Littoral.

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Highlights

An invited talk by Colin Reeves (Coventry University)

27 paper presentations

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