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Preface

All life is problem solving.

Karl R. Popper

These proceedings contain the written record of the International Conference on Evolutionary Computation – The Fourth International Conference on Parallel Problem Solving from Nature, held in Berlin, Germany, September 22 through 26, 1996.

The conference was jointly organized by the Technical University of Berlin and the Humboldt University at Berlin. It was a great pleasure for the organizers to bring this conference to the place where the evolution strategies were born some thirty years ago.

The unifying theme of the PPSN conference is natural computation, i.e., the design, the theoretical and empirical understanding, and the comparison of algorithms gleaned from nature together with their application to real-world problems in science and technology. Quite dominant is the subject called evolutionary computation, a synonym for evolutionary approaches to problem solving as evolution strategies, genetic algorithms, evolutionary programming, and genetic programming.

We have tried to arrange the papers in thematically coherent sections. The first section on basic concepts of evolutionary computation contains papers which emphasize such topics like hardware evolution, evolution of multiple agent systems, and speciation and symbiogenesis in evolutionary computation.

The second section describes new developments for the theoretical understanding of evolutionary computation. This concerns for example the asymptotic behavior and the statistical description of evolutionary algorithms, the connection between evolutionary algorithms and probabilistic data bases as well as between interactive evolutionary computation and stochastic automata.

The third section shows several extensions of evolutionary algorithms. This concerns problem representation issues and the design of genetic operators, the implications of adaptation, niching, and isolation in evolutionary computation and further modifications.

The next section contains comparative studies which are necessary to grasp the advantages and disadvantages of evolutionary approaches in diverse applications.

Evolutionary algorithms are not the only biological metaphor for computation and problem solving. Other sources of inspiration which are investigated in the fifth section are collective and cooperative behavior, pattern formation, and the immune system.

Evolutionary algorithms have been applied to many domains. The sixth section has been subdivided in applications in machine learning, neural networks, and fuzzy systems, in applications in electrical, electronics, and communications

engineering especially for VLSI design and testing, in applications in computer science and operations research, and finally, in applications in such distinct fields like mechanical, chemical, and optical engineering.

Just like during the former PPSN conferences, most of the emphasis is on poster presentations. This promotes active interaction between presenters and the interested people. Only few papers have been selected for oral presentation based on how well they could stimulate the following discussion. Again, this has been done to promote active participation of the attendees.

The papers of these proceedings have been carefully selected from more than 160 submitted papers based on a peer review process. Each paper has been rated independently by, in general, three leading researchers in the field. Each reviewer provided each author with recommendations for the improvement of her/his paper which led to high quality contributions. The effort of these volunteering reviewers is gratefully acknowledged.

We would like to personally thank all the volunteers from the Technical University of Berlin and the Humboldt University at Berlin who have spent many late hours and long weekends on organizing this conference.

Finally, we acknowledge the financial support of the several organizations and companies that made the conference possible.

July 1996

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Invited Speakers

We thank the invited speakers for their talks given at the conference.

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Manfred Eigen
Max-Planck-Institute for Biophysical Chemistry, Göttingen, Germany

Leonard A. Rastrigin
Technical University of Riga, Riga, Latvia

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