FOREWORD

One of my motivations for working on the *Handbook of Genetic Algorithms* in 1990 was to demonstrate the real-world power of evolutionary algorithms. We have certainly come a long way since then. Now that evolutionary algorithms are well-known as optimization techniques, I believe that what is important is to communicate the range of problems to which they can be applied. This volume displays the power of evolutionary algorithms when combined with fuzzy logic. These are exciting times in the fields of fuzzy logic and evolutionary algorithms, and this book will add to the excitement, because it is the first volume to focus on the growing connections between the fields of evolutionary algorithms and fuzzy logic. These two fields have been maturing for a long time, and both have had impressive real-world impact. The ability of fuzzy logic systems to capture the spirit of human rules and to express the sort of gradual predicates that we humans often work with has led to a variety of expert systems and industrial control systems that are easily formulated and understood, and that produce marvelously humanlike behavior. The ability of evolutionary algorithms across a variety of domains to produce better solutions than those we find using mathematical or heuristic techniques is similarly surprising and marvelous.

What is at the heart of this volume is a fact that is not so well known. Evolutionary algorithms can be used to create, modify, improve, and update fuzzy logic systems. The papers in this volume show how these two techniques can be combined — perhaps with humans generating the initial fuzzy logic rules or predicates and with evolutionary algorithms working to evolve rule sets, modify the set membership parameters, or update the fuzzy logic systems as the domain changes. When these techniques are combined in this way, the results can be better than if either is applied to the problem alone.

Although fuzzy logic and evolutionary algorithms have been profitably combined and applied to real-world problems, these approaches are not guaranteed to provide viable solutions. Experience and an understanding of the mechanics of each discipline are required in order to determine whether they should be applied to a specific problem and, if so, where they should be applied and how. This book will be a valuable aid to anyone considering the application of fuzzy logic and evolutionary algorithms to real problems, because it contains a number of detailed accounts of such applications written by authors in several countries. By making these accounts available in one place, the editors of this book have made it much easier for us to benefit from the authors' experience, and have done us a great service.

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