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**Book Review: Grammatical Evolution: Evolutionary Automatic Programming in an Arbitrary Language**

**Published by:** Kluwer Academic Publishers, 2003, 160 pp; Book Series: GENETIC PROGRAMMING: Volume 4, ISBN 1-4020-7444-1.

**Authors:** Michael O'Neill and Conor Ryan

This is the first book written on grammatical evolution, a new technique that is receiving increasing attention and use. Therefore, the book fulfills an important role and occupies a currently empty niche. This branch of evolutionary algorithms has been described previously only in published papers, where space limitations have reduced clarity and the understanding of the readers. Therefore, the book should be received with the utmost interest and attention by specialists.

The book contains a good description of grammatical evolution, which makes it possible for people with knowledge of evolutionary algorithms to understand, use and even improve the techniques suggested. The abundance of examples and applications should convince the reader that grammatical evolution is quite general and applicable to multiple fields.

This book has evolved from a doctoral thesis, and this shows in a few places where the reader would like to find further explanations, rather than having to proceed to the references to fill in the gaps. E.g., this happens in chapter 2 (a survey of previous works on the field) and in pages 45 and 106 (on the use of competent GAs). On the other hand, because it includes all the information needed to follow their work in detail, the book is clearly useful in preference to the papers previously published by its authors.

Most of "Grammatical Evolution" is clear and well organized, although there are a few places (e.g. pages 45-46) where the presentation is confuse. Chapter 7 (on crossover) would be more complete with a more detailed explanation of different crossover procedures. Also some of the figures in chapter 7 are difficult to interpret because too much information has been clustered in a small space. A more complete index would also have been desirable.

A good feature is the new classification proposed for the old field of genetic programming. This introduces in its stead a new field (evolutionary automatic programming), itself subdivided into two areas: tree-based genetic programming (which comprises most of the previous genetic programming field) and string-based genetic programming, which includes grammatical evolution.

"Grammatical Evolution" should be useful for specialists and Ph.D. students in the fields of grammatical evolution and genetic programming, and people working in artificial intelligence and genetic algorithms in general. We would advise it as a good resource for university libraries. A reader without previous knowledge of genetic algorithms could have some difficulty to in following the comparison of grammatical evolution with other methods, but even so should be capable of using the algorithms described in the book for practical applications.

**Manuel Alfonseca, Alfonso Ortega**