

# BOOK REVIEWS

## Comparative Metric Semantics Of Programming Languages: Nondeterminism and Recursion

by Franck van Breugel

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This book is devoted to the comparison of the operational and the denotational approaches with the semantics of programming languages. The key feature of the study presented here is the use of the metric techniques, rather than the widely used ordered structures. The metric approach, introduced in the late seventies by Arnold and Nivat, and De Bakker and Zucker, comes with a very useful unique fixed-point proof principle which plays a crucial role in this book.

The book consists of **8 Chapters** and **one Appendix**. The **first two Chapters** (*1. Domain equations, and 2. Linear and branching domains*) introduce the metric structures as solutions of recursive domain equations, and study in some details two particular domains: the linear and the branching domains.

The **next 3 Chapters** (*3. Operational semantics, 4. Nondeterministic choice, and 5. Random assignment*) describe a general theory for comparing operational and denotational semantic models, and present two applications to programming languages with nondeterministic choice and random assignment, respectively.

In the **last 3 Chapters** (*6. Generalized finiteness conditions, 7. Dense choice, and 8. Second order communications*), an extension of the theory is presented to cope with the compactly branching metric labelled transition systems. This extension is used to study programming languages with dense choice (for real-time applications as in Baeten & Bergstra's language  $ACP_{rp}$ ) or with second order communications.

An Appendix on *Metric spaces* and a list with more than 170 references conclude the book.

The book is based on the author's Ph.D Thesis written at the Center of Mathematics and Computer Science, Amsterdam, under the supervision of Jaco de Bakker. It is an interesting and well-written advanced text useful for graduate students and researchers interested in the semantics of programming languages.

**Gheorghe Stefanescu**