



Theory and Practice of Logic Programming

Theory and Practice of Logic Programming May 2012 12 : pp 417-419
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Logic: A Brief Course by Daniele Mundici, Springer, 2012. Paperback, ISBN 978-88-470-2360-4, xi + 124 pp.
doi:10.1017/S1471068412000026

This is a short introduction to mathematical logic that covers basic material in 17 chapters that total less than 130 pages. The author takes a different route than the one commonly taken in standard introductory texts, which results in an attractive option for a first course on logic for computer science students.

The first non-standard decision is taken at the very beginning. Motivated by an example of the graph colouring problem discussed in Chapter 1, the book starts from Chapter 2 with the introduction of the first class of propositional formulas – those in conjunctive normal form (CNF). Full propositional logic appears only in Chapter 7. This decision has some pedagogical advantage as the not completely trivial proof of the Unique Reading Lemma does not need to be imposed upon the reader at the very beginning when she/he is barely introduced to a new formalism.

Chapters 2–6 focus on CNF formulas, gradually introducing their syntax and semantics (in Chapter 2), followed in Chapter 3 by the representation in the form of finite sets, the introduction of the (propositional) resolution method, and, somewhat surprisingly, the Davis–Putnam procedure (DPP). This makes it possible to completely drop the proof theory and focus instead on the procedural way of drawing conclusions by means of refutations.

In fact, there are no proof rules at all in this book, this being the other non-standard decision. Those who find the proof theory at the core of mathematical logic might not like this decision, but those who, like the logic programming community, view resolution as the realisation of a deduction process might instead favour it. Consequently, proofs are introduced as directed graphs whose vertices are clauses and edges depict the formation of resolvents. (In turn, axioms appear only in Chapter 15 that deals with the equality axioms.)

The customary proof-theoretic notation

$$\frac{\phi}{\psi}$$

is used only in exercises to introduce problems asking for determining whether ψ is a logical consequence of ϕ or can be deduced from ϕ by means of resolution or the DPP.

The exposition of the formulas in the CNF form deals with (in Chapter 4) the Completeness Theorem, which in this form is due to Alan Robinson, a short account of the Krom and Horn clauses (in Chapter 5) and the Compactness Theorem (in Chapter 6). Because of the restriction to formulas in CNF form, the proof of the latter theorem is self-contained and does not rely on any completeness result (or the ultrafilter construction).

Full propositional logic is finally considered in Chapters 7–9 that deal, respectively, with syntax, semantics and reductions to CNF and DNF forms.

The second part of the book deals with predicate (i.e. first-order) logic. In Chapter 11 the alphabet of predicate logic is introduced and quantifiers are discussed.

Book Review

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<http://www.springer.com/978-88-470-2360-4>

Logic: a Brief Course

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2012, XI, 130 p., Softcover

ISBN: 978-88-470-2360-4