

REVIEW

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2 STÉPHANE DEMRI, VALENTIN GORANKO, and MARTIN LANGE, *Temporal Logics in Computer*
3 *Science: Finite-state Systems*. Cambridge Tracts in Theoretical Computer Science, vol. 58,
4 Cambridge University Press, Cambridge, 2016, viii + 744 pp.

5 There are four books and one article which I will refer to below: Blackburn, de Rijke and
6 Venema’s 500-page *Modal Logic* (2001), BSL VIII 299; Gabbay, Hodkinson, Reynolds and
7 Finger’s two volumes of over 1200 pages, on *Temporal Logic: Mathematical Foundations and*
8 *Computational Aspects* (1994, 2000); Stirling’s 200-page *Modal and Temporal Properties of*
9 *Processes* (2001); Huth and Ryan’s 400-page *Logic in Computer Science* (2nd edition, 2010);
10 the article is 100 pages on *Automata: From Logics to Algorithms* by Vardi and Wilke in
11 the book *Logic and Automata: History and Perspectives* edited by Flum, Grädel, and Wilke
12 (2008).

13 Like the first book, the book under review looks at the subject from different aspects: here
14 it is tableaux, automata, and games, detailed in Chapters 13, 14, and 15 respectively. They
15 are all computational in nature, and not as varied as the perspectives from frames, algebras
16 and complexity offered in the book by Blackburn et al, which interface to mathematics. Also
17 covered very lightly are the connections of temporal logics to first-order and monadic second-
18 order logics on linear orders and trees, which play a central role in the books by Gabbay et
19 al. Would leaving out modal logic and bisimulation, and concentrating on temporal logics,
20 have led to difficulties?

21 Chapters 5, 6, and 7 make an attempt at introducing and collecting older results on modal
22 and temporal logics. The details are often left to exercises or forwarded to the later chapters.
23 While the focus here is on the more popular linear and branching logics, many variants and
24 extensions appear in the text giving the book an encyclopaedic feel. Chapter 9 introduces
25 alternating temporal logic, it does not feature later. Focussing on a tableau procedure for this
26 logic could have served as a model for Chapter 13.

27 In a one-term graduate course, I lectured from this book on the connection between
28 temporal logic and the μ -calculus on the one hand, and automata and games on the other,
29 using Chapters 14, 8, 15, and 11. From Chapter 14 I connected temporal logics to alternating
30 automata, which my students were seeing for the first time, as well as to nondeterministic
31 ones, which they knew from earlier. The book under review gives all details, although at times
32 I found the article by Vardi and Wilke more crisp. Then using Chapters 8 and 15 I connected
33 alternating automata to μ -calculus and parity games. Here I preferred the slower treatment
34 in this book, and the slower one in Stirling’s monograph, to that of Vardi and Wilke. A short
35 section on linear-time μ -calculus could have made the treatment more uniform. (I hope
36 another edition will cover the new quasipolynomial time algorithm of Calude et al, *Proc. 49th*
37 *STOC* (2017), which the students were excited to hear about.) Finally I used Chapter 11, with
38 material by van Emde Boas, *Proc. Complexity, Logic, and Recursion Theory* (1997), and by
39 Carayol and Meyer, *LMCS*, vol. 2, 2 (2006), as an introduction to tilings, their connection
40 to space requirements and their use in proving lower bounds for logics.

41 I was able to follow easily the material from the book in a different order from that
42 presented, which was very pleasant. I found the examples in the book very useful, since
43 students often go through algorithms without bothering to try them out on actual examples.
44 I also handed out exercises from the book as homework and could see that working them
45 out helped in understanding.

46 The book under review could be used as a reference and as a teaching resource. It is
47 not as beginner-friendly as Huth and Ryan’s book is, I do think a basic background in
48 logic and computation is required to tackle the book on one’s own. It works very well for a

1 reader who wants a quick reminder of what is known, before being brought up to speed on
2 modern aspects which are not found in any other book. The authors have worked and taught
3 courses on temporal logics for infinite-state systems. A second volume would be nice to look
4 forward to.

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