

Cambridge Elements

Elements in Philosophy and Logic

edited by
Bradley Armour-Garb
SUNY Albany

Frederick Kroon
The University of Auckland

TEMPORAL LOGICS

Valentin Goranko
Stockholm University



CAMBRIDGE
UNIVERSITY PRESS

Cambridge University Press & Assessment
978-1-009-17010-9 — Temporal Logics
Valentin Goranko
Frontmatter
[More Information](#)



Shaftesbury Road, Cambridge CB2 8EA, United Kingdom
One Liberty Plaza, 20th Floor, New York, NY 10006, USA
477 Williamstown Road, Port Melbourne, VIC 3207, Australia
314–321, 3rd Floor, Plot 3, Splendor Forum, Jasola District Centre,
New Delhi – 110025, India
103 Penang Road, #05–06/07, Visioncrest Commercial, Singapore 238467

Cambridge University Press is part of Cambridge University Press & Assessment,
a department of the University of Cambridge.

We share the University's mission to contribute to society through the pursuit of
education, learning and research at the highest international levels of excellence.

www.cambridge.org
Information on this title: www.cambridge.org/9781009170109

DOI: 10.1017/9781009170093

© Valentin Goranko 2023

This publication is in copyright. Subject to statutory exception and to the provisions
of relevant collective licensing agreements, no reproduction of any part may take
place without the written permission of Cambridge University Press & Assessment.

First published 2023

A catalogue record for this publication is available from the British Library.

ISBN 978-1-009-17010-9 Paperback
ISSN 2516-418X (online)
ISSN 2516-4171 (print)

Cambridge University Press & Assessment has no responsibility for the persistence
or accuracy of URLs for external or third-party internet websites referred to in this
publication and does not guarantee that any content on such websites is, or will
remain, accurate or appropriate.

Temporal Logics

Elements in Philosophy and Logic

DOI: 10.1017/9781009170093
First published online: August 2023

Valentin Goranko
Stockholm University

Author for correspondence: Valentin Goranko,
valentin.goranko@philosophy.su.se

Abstract: Temporal logics are a rich variety of logical systems designed for formalising reasoning about time and about events and changes in the world over time. These systems differ by the ontological assumptions made about the nature of time in the associated models, by the logical languages involving various operators for composing temporalised expressions, and by the formal logical semantics adopted for capturing the precise intended meaning of these temporal operators. Temporal logics have found a wide range of applications as formal frameworks for temporal knowledge representation and reasoning in artificial intelligence, and as tools for formal specification, analysis, and verification of properties of computer programs and systems. This Element aims at providing both a panoramic view on the landscape of the variety of temporal logics and closer looks at some of their most interesting and important landmarks.

Keywords: logic, temporal, reasoning, linear time, branching time

© Valentin Goranko 2023

ISBNs: (HB), 9781009170109 (PB), 9781009170093 (OC)
ISSNs: 2516-418X (online), 2516-4171 (print)

Contents

Preface	1
1 Temporal Reasoning and Logics: Introduction and a Brief Historical Overview	2
2 The Variety of Models of Time	7
3 Prior's Basic Systems of Temporal Logic	13
4 Temporal Logics for Linear Time	24
5 Reasoning about Non-determinism: Models and Logics for Branching Time	32
6 The Peircean Branching Time Logic PBTl	39
7 The Ockhamist Branching Time Logic OBTL	47
8 First-Order Temporal Logics	59
9 Variations, Extensions, and Applications of Temporal Logics	76
Epilogue: Past, Present, and Future of Temporal Logics	89
References	90