Contents

Preface *page* vii

1 Motivation 1
- 1.1 Naturalness of Coalgebraic Representations 2
- 1.2 The Power of the Coinduction 6
- 1.3 Generality of Temporal Logic of Coalgebras 18
- 1.4 Abstractness of the Coalgebraic Notions 24

2 Coalgebras of Polynomial Functors 33
- 2.1 Constructions on Sets 33
- 2.2 Polynomial Functors and Their Coalgebras 48
- 2.3 Final Coalgebras 67
- 2.4 Algebras 78
- 2.5 Adjunctions, Cofree Coalgebras, Behaviour-Realisation 94

3 Bisimulations 114
- 3.1 Relation Lifting, Bisimulations and Congruences 115
- 3.2 Properties of Bisimulations 122
- 3.3 Bisimulations as Spans and Cospans 131
- 3.4 Bisimulations and the Coinduction Proof Principle 142
- 3.5 Process Semantics 149

4 Logic, Lifting and Finality 159
- 4.1 Multiset and Distribution Functors 160
- 4.2 Weak Pullbacks 169
- 4.3 Predicates and Relations 183
- 4.4 Relation Lifting, Categorically 202
- 4.5 Logical Bisimulations 212
- 4.6 Existence of Final Coalgebras 222
- 4.7 Polynomial and Analytical Functors 232

Downloaded from https://www.cambridge.org/core. Radboud University Nijmegen, on 31 Aug 2018 at 10:16:38, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/CBO9781316823187

5 Monads, Comonads and Distributive Laws 246
5.1 Monads and Comonads: Definition and Examples 247
5.2 Kleisli Categories and Distributive Laws 263
5.3 Trace Semantics via Finality in Kleisli Categories 280
5.4 Eilenberg–Moore Categories and Distributive Laws 296
5.5 Bialgebras and Operational Semantics 316

6 Invariants and Assertions 334
6.1 Predicate Lifting 335
6.2 Invariants 347
6.3 Greatest Invariants and Limits of Coalgebras 354
6.4 Temporal Logic for Coalgebras 363
6.5 Modal Logic for Coalgebras 377
6.6 Algebras and Terms 391
6.7 Algebras and Assertions 401
6.8 Coalgebras and Assertions 419
6.9 Coalgebraic Class Specifications 434

References 440
Definition and Symbol Index 466
Subject Index 469

Downloaded from https://www.cambridge.org/core. Radboud University Nijmegen, on 31 Aug 2018 at 10:16:38, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/CBO9781316823187