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Descrizione fisica	1 online resource (344 p.)
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Nota di bibliografia	Includes bibliography (p. 309-324) and index.
Nota di contenuto	Preface; Contents; 1. Introduction; 1.1 Historical remarks: Different origins, different names; 1.2 DAE analysis; 1.2.1 Indices; 1.2.2 Dynamics and singularities; 1.2.3 Numerical aspects; 1.3 State vs. semistate modeling; 1.4 Formulations; 1.4.1 Input-output descriptions; 1.4.2 Leading terms; 1.4.3 Semiexplicit, semilinear and quasilinear DAEs; 1.4.3.1 Semiexplicit and semilinear DAEs; 1.4.3.2 Hessenberg DAEs; 1.4.3.3 Quasilinear DAEs; 1.5 Contents and structure of the book; Analytical aspects of DAEs; 2. Linear DAEs and projector-based methods; 2.1 Linear time-invariant DAEs 2.1.1 Matrix pencils and the Kronecker canonical form 2.1.2 Solving linear time-invariant DAEs via the KCF; 2.1.3 A glance at projector-based techniques; 2.1.3.1 Index one characterization via projectors; 2.1.3.2 Decoupling of linear time-invariant index one DAEs; 2.1.3.3 Geometrical remarks; 2.1.3.4 Higher index problems; 2.1.3.5 Some auxiliary properties of the projectors $P_i$ and $Q_i$ ; 2.2 Properly stated linear time-varying DAEs; 2.2.1 On standard form index one problems; 2.2.2 Properly stated leading terms; 2.2.3 P-projectors: Matrix chain

and the tractability index; 2.2.3.1 Matrix chain  
2.2.3.2 The tractability index of regular linear DAEs 2.2.4 The - framework; 2.2.4.1 Alternative chain construction; 2.2.4.2 Equivalence of the P- and -chains; 2.2.4.3 Some properties of the projectors  $i$  and  $M_i$ ; 2.2.5 Decoupling; 2.2.6 A tutorial example; 2.2.6.1 Index one; 2.2.6.2 Index two; 2.2.6.3 Index three; 2.2.7 Regular points; 2.3 Standard form linear DAEs; 2.3.1 The tractability index of standard form DAEs; 2.3.2 Decoupling; 2.3.3 Time-invariant problems revisited; 2.4 Other approaches for linear DAEs: Reduction techniques; 3. Nonlinear DAEs and reduction methods  
3.1 Semiexplicit index one DAEs 3.2 Hessenberg systems; 3.3 Some notions from differential geometry; 3.4 Quasilinear DAEs: The geometric index; 3.4.1 The framework of Rabier and Rheinboldt; 3.4.2 Index zero and index one points; 3.4.2.1 Index zero points; 3.4.2.2 Index one points; 3.4.3 Higher index points; 3.4.3.1 Index two points; 3.4.3.2 Index points; 3.4.4 Manifold sequences and locally regular DAEs; 3.4.4.1 Regular manifold, solution manifold, and locally regular DAEs; 3.4.4.2 Manifold sequences within different reduction approaches; 3.4.5 Local equivalence  
3.4.5.1 The index: Independence of reduction pairs and invariance  
3.4.5.2 C-conjugacy of state space descriptions; 3.4.5.3 On the link between local equivalence and reduction operators; 3.4.6 Examples; 3.4.6.1 Semiexplicit index one DAEs; 3.4.6.2 Hessenberg DAEs; 3.4.6.3 A locally regular DAE with different indices; 3.4.7 Nonautonomous problems; 3.4.7.1 Geometric index and reduction in the nonautonomous context; 3.4.7.2 Semiexplicit index one DAEs; 3.4.7.3 Nonautonomous Hessenberg DAEs; 3.4.7.4 Schur reduction and semiexplicit DAEs; 3.5 Dynamical aspects  
3.6 Reduction methods for fully nonlinear DAEs

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#### Sommario/riassunto

Differential-algebraic equations (DAEs) provide an essential tool for system modeling and analysis within different fields of applied sciences and engineering. This book addresses modeling issues and analytical properties of DAEs, together with some applications in electrical circuit theory. Beginning with elementary aspects, the author succeeds in providing a self-contained and comprehensive presentation of several advanced topics in DAE theory, such as the full characterization of linear time-varying equations via projector methods or the geometric reduction of nonlinear systems. Recent resul

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