

Contents

1. Introduction	1
1.1 Singularly Perturbed and Weakly Coupled Bilinear Systems	4
1.2 Book Organization	10
2. Continuous-Time Singularly Perturbed Bilinear Systems	13
2.1 Introduction	13
2.2 An Overview of Existing Results	15
2.3 Open-Loop Control of Singularly Perturbed Bilinear Systems	18
2.4 "Closed-Loop" Control of Singularly Perturbed Bilinear Systems	27
2.4.1 Composite Control of Bilinear Singularly Perturbed Systems	29
2.5 Case Study: Induction Motor Drives	33
2.6 Near-Optimal Control of Singularly Perturbed Bilinear Systems	36
2.7 Conclusion	38
Appendix 2.1	40
Appendix 2.2	40
3. Continuous-Time Weakly Coupled Bilinear Systems	49
3.1 Introduction	49
3.2 Optimal Control of Weakly Coupled Bilinear Systems	50
3.2.1 Open-Loop Control of Weakly Coupled Bilinear Systems	51
3.2.2 "Closed-Loop" Control of Weakly Coupled Bilinear Systems	57
3.3 Case Study: A Paper Making Machine	61
3.4 Conclusion	62
Appendix 3.1	70
Appendix 3.2	72
4. The Successive Approximation Procedure	77
4.1 Introduction	77
4.2 Steady State Bilinear-Quadratic Control Problem	79
4.3 Successive Approximations Approach	82
4.3.1 Proof of Convergence	89
4.4 Examples	91
4.4.1 A General Bilinear System	91
4.4.2 Case Study: A paper Making machine	94
4.5 Finite-Time Optimal Control of Bilinear Systems	96
4.5.1 Proof of Convergence	100

4.6 Case Study: Chemical Reactor	104
4.7 Conclusion	105
Appendix 4.1	107
Appendix 4.2	110
5. Concluding Remarks	113
References	117
Index	131