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(continued after Index)

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Dry Clutch Control for Automotive Applications

 Springer

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Advances in Industrial Control

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Series Editors' Foreword

The series *Advances in Industrial Control* aims to report and encourage technology transfer in control engineering. The rapid development of control technology has an impact on all areas of the control discipline. New theory, new controllers, actuators, sensors, new industrial processes, computer methods, new applications, new philosophies, new challenges. Much of this development work resides in industrial reports, feasibility study papers and the reports of advanced collaborative projects. The series offers an opportunity for researchers to present an extended exposition of such new work in all aspects of industrial control for wider and rapid dissemination.

The *Advances in Industrial Control* series began in 1992, and since then has published only one volume from the field of vehicle control. Even that seminal work by P. Kachroo and K. Ozbay entitled *Feedback Control Theory for Dynamic Traffic Assignment* (ISBN 978-1-85233-059-0, 1998) was on traffic management rather than vehicle control *per se*. This seems quite an important omission from the series when the recent growth and influence of control-system techniques in many diverse aspects of automotive vehicle control is considered. A recent look at international control conferences identified a wide range of topics in this field including sessions and papers on:

- control of braking systems;
- engine control and engine-health management;
- ignition-system control and novel developments;
- control of gasoline and Diesel-fueled engines;
- control of electric automotive motors;
- electric-vehicle systems;
- hybrid-vehicle systems;
- *in-traffic* control systems;
- control systems for autonomous land vehicles;

- multi-vehicle control - simple configurations, *e.g.*, spacing;
- multi-vehicle control - complex configurations, *e.g.*, co-operative maneuvering.

Clearly, there is much control systems research activity in the field, and the Series Editors are pleased to introduce this first *Advances in Industrial Control* series monograph on automotive vehicle control. This sharply focused volume entitled Dry Clutch Control for Automotive Applications by P.J. Dolcini, C. Canudas de Wit and H. Béchart, presents some new ideas for enhancing powertrain driving comfort during a standing-start or in gear-shifting maneuvers using the clutch element of the drivetrain. The monograph opens by describing the range of practical and aesthetic constraints that limit control engineering design freedom.

Powertrain packaging constraints, such as the necessary preservation of interior car capacity, and the spatial constraints emerging from front collision robustness requirements, are given. Other practical constraints are:

- minimum required ground clearance;
- wheel steering movement volume limitations;
- pedestrian collision test requirements;
- style requirements for the vehicle front design.

Within the context of these constraints, the authors pose this key question: what can be done with clutch design and control to enhance powertrain drive comfort? Some answers are presented in the six succinct chapters of the monograph. These are arranged in two parts. Part I covers the mechanical description and mathematical modeling of the drivetrain and Part II pursues several aspects of the control solution for clutch design. Included are a chapter on a synchronized clutch- assist system and a chapter presenting experimental results from a Renault Clio prototype vehicle. A chapter on 'Conclusions and Open Questions' ends the book.

The monograph will be of obvious interest to both automotive engineers and control engineers, and also to researchers and academics with an interest in automotive vehicle control problems. Those interested in demanding real-world control applications may also find this monograph provides a suitably challenging set of problems for new design techniques.

Fortunately, the depth of modeling presented will enable a wide range of readers, be they researchers, academic or students, to try their skills on the clutch control problems described. As was stated at the beginning of this Foreword, there is significant international research activity evident at the interfaces between many aspects of automotive engineering, and control system design. Consequently, because the series editors are always seeking new monographs

to create a corpus of contributions to important and active fields and in anticipation of two new volumes on automotive vehicle control expected to appear in the series soon, it is pleasing to initiate the *Advances in Industrial Control* series contribution to this field with this excellent text from P. J. Dolcini, C. Canudas de Wit and H. Béchart.

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2009

M.J. Grimble
M.A. Johnson

Contents

1	Introduction	1
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Part I Mechanical System and Comfort Requirements

2	Powertrain	7
2.1	Brief Mechanical Description	7
2.1.1	Elements of the Engine Block	7
2.1.2	Engine	8
2.1.3	Flywheel and Dual-mass Flywheel	11
2.1.4	Dry Clutch	13
2.1.5	Driveline	18
2.2	Models	20
2.2.1	Simulation Model	20
2.2.2	Control Model	26
2.2.3	Driver Model	30
3	Clutch Comfort	33
3.1	Detailed Analysis of the Clutch Use	33
3.1.1	When the Clutch Is Used	33
3.1.2	Standing-start Analysis	34
3.1.3	Upward Gearshift Analysis	36
3.1.4	Clutch Torque at Synchronization	37
3.1.5	Clutch-related Driving Comfort	38

3.2	Influence of the Driveline Parameters	39
3.3	State-of-the-art	40
3.3.1	Manual Transmission	40
3.3.2	Automated Manual Transmission	40
3.3.3	Clutchless Gearshifting	41
3.4	Motivation and Methodology	42
3.4.1	A Manual Transmission in Troubled Waters	42
3.4.2	Passive Means of Increasing the Clutch Comfort	42
3.4.3	Conclusion on the Passive Means of Improvement	46

Part II Dry Clutch Engagement Control

4	Synchronization Assistance	49
4.1	Principle	49
4.2	Synchronization Assistance Assuring the <i>GV No-lurch Condition</i>	51
4.2.1	Control Law	51
4.2.2	Feedback Effects and Engine Torque Control	52
4.3	GV No-lurch Condition Limitations	55
4.4	Synchronization Assistance with Ideal Engagement Conditions	57
4.4.1	Principle	57
4.4.2	Cost Function	57
4.4.3	Optimal Problem Formulation	58
4.4.4	Linear Quadratic Optimal Control	59
4.4.5	Optimal Control by Differential Analysis	59
4.4.6	Optimal Control by Quadratic Programming	68
5	Optimal Standing-start	71
5.1	Principle	71
5.2	Exact Dynamic Replanning	72
5.2.1	Model Predictive Control	72
5.2.2	Optimization Horizon Update	72
5.2.3	<i>Model Predictive Control</i> Control Structure	74
5.2.4	Results	75

5.3	Simplified Dynamic Replanning	77
5.3.1	Segment-approximated Model Predictive Control	77
5.3.2	State Vector Reduction	79
5.3.3	Results.....	80
6	Clutch Friction and Torque Observer	83
6.1	Principle	83
6.2	Friction-coefficient Observer	84
6.2.1	Motivation	84
6.2.2	Driveline Models	85
6.2.3	MIMO-LTV Observer	85
6.2.4	Sampled-data Observer	88
6.3	Clutch-torque Observer for AMT	89
6.3.1	Principle	89
6.3.2	Unknown-input Observer	89
6.3.3	Estimation Error Analysis	90
6.3.4	Performance Comparison	93
6.4	Clutch-torque Observer for Manual Transmission	94
6.4.1	Motivation	94
6.4.2	Observer Structure	94
6.4.3	Continuous Unknown-input Observer	95
6.4.4	Non-uniform Sampling	96
6.4.5	Results.....	100
6.5	Conclusions	100
7	Experimental Results and Control Evaluation	103
7.1	Track Testing	103
7.2	Synchronization-assistance Strategy	104
7.2.1	Clio II K9K Prototype	104
7.2.2	Control Sequencing	107
7.2.3	First Phase: Open-loop Control	108
7.2.4	Second Phase: Optimal Control	108
7.2.5	Third Phase: Final Clutch Closure.....	112
7.2.6	Experimental Results	112
7.3	Conclusions	118

8	Open Problems and Conclusions	119
8.1	Conclusions	119
8.2	Further Work	121
Appendix A	Optimization Methods	123
A.1	Dynamic Lagrangian Multipliers	123
A.1.1	Inequality Constraints-free Optimization	124
A.1.2	Optimization Under Inequality Constraints	125
A.2	TPBVP by Generating Functions	127
A.2.1	Generating Functions	129
A.2.2	Hamiltonian System Flow	129
A.2.3	Two-point Boundary-value Problem Solution	130
A.3	Reconduction to a Quadratic Programming Formulation	131
Appendix B	Proof of Theorem 6.1	135
Appendix C	Brief Description of the LuGre Model	137
References	139
Index	141