

新型並聯式複合電動重型機車之性能分析與電控系統研製

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摘要

近年來由於環保意識抬頭及能源危機問題，使得節省能源以及降低污染變成非常迫切需要解決的問題。所以發展零排氣污染的環保電動車輛成為一個極重要的課題，但由於續航力與性能不佳，影響純電動車輛的市場價值。在另一方面，因為複合電動車輛(HEV)不只可以節省燃料，同時也可以減少環境污染，在現今世界上逐漸佔有舉足輕重的地位。本論文主要研究的對象是複合動力重型機車，包括研發一種新型並聯式複合電動重型機車的完整電控系統與性能分析，其中包含：(1)整體系統的模擬分析：模擬與分析車輛在各種路面及負載狀況下運轉特性；(2)完整電控系統實作：使用數位訊號處理器(DSP)為主控制器，控制車輛在各種行車模式下之運轉，均能維持內燃機在最佳運轉區操作，達成節省能源與降低污染之目的。本論文的理論分析是藉由線性矩陣不等式(LMI)方法應用在非匹配不確定輸出回授可變結構系統(VSS)，經由此理論推導之新型控制器，能有效減少非匹配不確定成份的不良影響，保證系統穩定而且性能良好。本文之電控系統與新型可變結構控制器已經在並聯式複合電動重型機車的平台中實現，而且也完整組裝一台原型車，經實際操作與實驗證明此平台與原型車都能符合預期目標與系統效能。

關鍵詞：並聯式複合電動車輛；數位訊號處理器；可變結構系統；能量管理策略；線性矩陣不等式

目錄

COVER CREDENTIAL AUTHORIZATION LETTERS ABSTRACT (CHINESE) ABSTRACT (ENGLISH)	
ACKNOWLEDGMENT CONTENTS LIST OF FIGURES LIST OF TABLES ABBREVIATIONS AND SYMBOLS	Chapter 1
INTRODUCTION	1.1 Motivation 1.2 Parallel Hybrid System 1.3 Series Hybrid System 1.4 Series-Parallel Hybrid System 1.5 Newly Parallel-type Hybrid Electric System 1.6 Advantage and Drawback of Series and Parallel Hybrid System
Chapter 2	FRAMEWORK AND ENERGY MANAGEMENT STRATEGY OF THE NEW PARALLEL-TYPE HYBRID ELECTRIC SYSTEM
2.1 The components of new parallel-type Hybrid Electric System	2.1.1 Electric Motor 2.1.2 Internal Combustion Engine 2.1.3 Magnetism Powder Type Break Unit
2.2 The Framework of the New Parallel-type Hybrid Electric System	2.3 Power Output of Electric Motor Only 2.4 Power Output of Internal Combustion Engine Only 2.5 Dual Powers Output By Electric Motor and Internal Combustion Engine 2.6 Low Power Control Procedure 2.7 Medium Power Control Procedure 2.8 High Power Control Procedure
Chapter 3	ESTABLISHING SYSTEM DYNAMIC EQUATIONS AND MODELS
3.1 The Electric Motor Model	3.2 The Internal Combustion Engine Model 3.3 Dual Energy Integration Mechanism Model 3.4 Vehicles Travel Environment Model
3.4.1 Acceleration Resistance 3.4.2 Rolling Resistance 3.4.3 Air Resistance	Chapter 4 DYNAMIC OUTPUT FEEDBACK CONTROLLERS USING LMI THEORY FORMISMATCHED UNCERTAIN VARIABLE STRUCTURE SYSTEMS
4.1 Introduction	4.2 Description of the Problem 4.2.1 Stability in the Sliding Mode 4.2.2 The Hitting Phase Design
Chapter 5	EXPERIMENT AND SIMULATION RESULT
5.1 Simulation result	5.2 Experiment Result 5.2.1 Low Power Control Procedure 5.2.2 Medium Power Control Procedure 5.2.3 High Power Control Procedure
Chapter 6	CONCLUTIONS APPENDIXES
REFERENCE	

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