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DETERMINATION OF MAXIMUM POSSIBLE FUEL ECONOMY OF HEV FOR KNOWN DRIVE CYCLE: GA BASED APPROACH

A dissertation submitted to the
Department of Electrical Engineering, University of Moratuwa
In partial fulfillment of the requirements for the
Degree of Master of Science

By

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CONTENTS

		PAGE
DECLARATION		ii
CONTENTS		iii
ABSTRACT		vi
ACKNOWLEDGEMENT		vii
LIST OF FIGURES		viii
LIST OF TABLES		ix
CHAPTER - 1		
1 Introduction		**01**
1.1	HEV Evolution	01
1.2	Motivation for HEV	02
1.3	Literature Review	02
1.4	Objectives	04
CHAPTER – 2		
2 Hybrid Electric Vehicles		**06**
2.1	The need of HEV	06
2.1.1	Environmental Concern	07
2.1.2	Energy Consumption	07
2.2.	Clarification of HEV	08
2.2.1.	Series Hybrid Vehicles	08
2.2.2	Parallel Hybrid vehicles	09
2.2.3	Series – Parellel Hybrid vehicle	10
2.3	Characteristics of Hybrid Systems	11
2.4.	HEV components	12
2.4.1	Electric Motors	12
2.4.2	Battery	13
2.4.3	Transmission	14
2.5	Energy Management Systems of HEVs	14

CHAPTER – 3

3	**Modeling and Simulation of HEV**		**16**
3.1	Modeling of Drivetrain		16
3.2.	Modeling of Engine		20
3.3	Modeling of Motor		21
3.4	Modeling of Energy Storage System		21
3.5	Specifications of Selected Vehicle		22
3.6	Advanced Vehicle Simulation Tools		26
	3.6.1	ADVISOR	27
	3.6.2	Dymola	27
	3.6.3	SAT	28

CHAPTER – 4

4	**Drive Cycles**		**29**
4.1	Transient Drive Cycle		30
4.2	Model Drive Cycle		30
4.3	Drive Cycles Used in The Study		30
	4.3.1	NEDC	30
	4.3.2	CDC	31

CHAPTER – 5

5	**Overview of Genetic Algorithm**		**33**
5.1	Introduction & Background		33
5.2	Overview		34
5.3	Coding		35
5.4	Genetic Operators		36
	5.4.1	Selection	36
	5.4.2	Crossover	37
	5.4.3	Mutation	38

CHAPTER – 6

6 Optimization using GA **40**

6.1 Power Split in HEV 40

6.2 Optimization problem formulation 41

6.2.1 Domain and Constrain 41

6.2.2 Population and Individuals 43

6.2.3 Chromosome 43

6.2.4 Fitness Function 45

CHAPTER – 7

7 Results & Analysis **49**

CHAPTER – 8

8 Conclusion and Remarks **57**

References **59**

Appendix A **63**

ABSTRACT

Hybrid electric vehicles (HEVs) have great potential as new alternative means of transportation. The specific benefits of HEVs, compared to conventional vehicles, include improved fuel economy and reduced emissions. Hybrid systems using a combination of an internal combustion engine and Electric motor (EM) have the potential of improving fuel economy by operating Internal Combustion Engine (ICE) in the optimum operating range and by making use of regenerative braking during deceleration This paper described a methodological approach to find out the maximum fuel economy that can be achieved by a hybrid vehicle with parallel configuration for a known drive cycle. A backward looking hybrid vehicle model is used for computation of fuel consumption. The optimization process represents a constrained nonlinear and time-varying problem that is not easily solved. Here GA approach was used to find out optimum power split between two power sources over a driving cycles that make maximum possible overall fuel economy for the given drive cycle by the vehicle. In this approach using parallel Hybrid Electric Vehicle (HEV) configuration optimization problem is formulated so as to minimize the overall fuel consumption. The whole set of Electric Motor power contribution along the drive cycle is then coded as the chromosomes. Variables are defined to find out optimum power contribution from EM and ICE. The objective function is defined to minimize weighted sum of the fuel economy and to keep the battery SOC within the desired range throughout the drive cycle. These results represent the maximum fuel economy any power management system of a Hybrid Electric Vehicle with the selected HEV configuration can ever achieve and does allow a benchmark to be set against which the fuel economy is measured. It is obvious that fuel economy varies with the driving cycle and hence the result obtained from this study is valid only for the selected drive cycle. The optimum fuel economy for the selected drive cycle is compared with that of conventional vehicle

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LIST OF FIGURES

Figure	Description	Page
Figure 2.1	Globe Oil Consumption Perspectives	07
Figure 2.1:	Series Hybrid Electric Vehicle	09
Figure 2.2:	Parallel Hybrid Electric Vehicle	10
Figure 2.3:	Series-Parallel Hybrid Electric Vehicle	11
Figure 3.1	HEV Model Schematic Diagram	17
Figure 3.2	Free body diagram of a vehicle	18
Figure 3.3:	Sample Drive Cycle	19
Figure 3.4	Engine Model Schematic Diagram	20
Figure 3.5	Motor Model Power Flow	21
Figure 3.6	Energy Storage System Model	22
Figure 3.7	Fuel consumption map of the ICE of tested HEV	24
Figure 3.8	Engine fuel efficiency map	25
Figure 3.9	Engine fuel efficiency contours	25
Figure 3.10	Motor Efficiency Map	26
Figure 4.1:	New European Drive Cycle	31
Figure 4.2:	Colombo Drive Cycle	32
Figure 5.1:	Segment decoding	35
Figure 5.2:	Proportionate Selection Schemes	36
Figure 5.3:	One-point crossover	37
Figure 5.4:	Multi point Crossover	37
Figure 5.5:	Mutation Operator	38
Figure 6.1:	Block Diagram of Energy Flow	40
Figure 6.2:	Block diagram of the parallel hybrid vehicle	41
Figure 6.3:	Example of EM contribution (Top), Chromosome (Bottom)	44
Figure 6.4:	Flow chart of calculation of Objective function	47
Figure 6.4:	Flow chart of GA	48
Figure 6.5:	Evolutionary Algorithm	48
Figure 7.1:	History of genetic algorithm optimization process for NEDC	51
Figure 7.2:	History of genetic algorithm optimization process for CDC	51
Figure 7.3:	Power demand to achieve the NEDC speed profile	52
Figure 7.4:	Power demand to achieve CDC	53

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Figure 7.5: Contribution from EM over NEDC 54
Figure 7.6: Contribution from EM over CDC 54
Figure 7.7: Battery SOC variation over NEDC 55
Figure 7.8: Battery SOC variation over CDC 56

LIST OF TABLES

Table **Description** **Page**

Table 2.1: Parameters of HEV Batteries 13
Table 3.1: Vehicle model specifications 23
Table 3.2: Engine Torque map 24
Table 4.1: CDC parameters 32
Table 6.1: Upper and Lower limits for decision variables 45
Table 7.1: Fuel Economies for conventional and optimized HEV 50

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