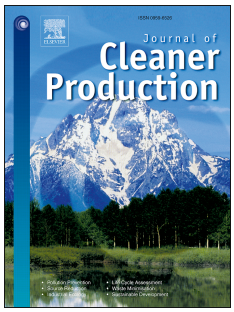
Accepted Manuscript



Optimized predictive energy management of plug-in hybrid electric vehicle based on traffic condition

Morteza Montazeri-Gh, Mehdi Mahmoodi-K

PII: S0959-6526(16)31108-8

DOI: 10.1016/j.jclepro.2016.07.203

Reference: JCLP 7775

To appear in: *Journal of Cleaner Production*

Received Date: 4 March 2015

Revised Date: 8 July 2016

Accepted Date: 29 July 2016

Please cite this article as: Montazeri-Gh M, Mahmoodi-K M, Optimized predictive energy management of plug-in hybrid electric vehicle based on traffic condition, *Journal of Cleaner Production* (2016), doi: 10.1016/j.jclepro.2016.07.203.

Optimized Predictive Energy Management of Plug-in Hybrid Electric Vehicle based on Traffic Condition

Morteza Montazeri-Gh, Mehdi Mahmoodi-k*

Systems Simulation and Control Laboratory, School of Mechanical Engineering, Iran University of Science and Technology, Tehran, P.O. Box 16846-13114, Iran

*Corresponding author email: M_mahmoodi_k@iust.ac.ir

Abstract: Reduction of fuel consumption (FC) and emissions are an indispensable part of automotive industry in recent years, which caused hybrid electric vehicle (HEV) be taken into consideration. The main objective of this paper is developing a predictive optimized control strategy based on traffic condition prediction for minimizing FC and emissions. For this purpose, initially traffic condition is predicted by utilizing driving cycle classification based on its specifications. Then, control strategy based on fuzzy logic controller (FLC) is developed for various driving conditions which their membership function (MF) parameters and rules are tuned by employing genetic algorithm (GA). In the next step, by recognition and prediction of upcoming traffic condition, control strategy is switched between optimized FLCs to enhance the optimal power split between sources and manage the internal combustion engine (ICE) to work in the vicinity of its optimal condition. Finally, the effects of control strategy, mass and aerodynamic parameters on HEV performance and energy usage of components are investigated. Simulation results indicate that proposed approach in real world driving condition reduces emissions and FC significantly.

Keywords: Plug-in and hybrid electric vehicle; traffic condition; genetic-fuzzy control; predictive control; fuel consumption and emissions

1. Introduction

HEVs combine ICE and electric propulsion system to reduce FC and emissions. The presence of the electric powertrain is intended to achieve either better fuel economy than a conventional vehicle mainly by downsizing the original engine, or obtaining optimal performance. In order to overcome the