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Fuzzy Logic Maximum Structure and State Feedback Control Strategies of The Electrical Car

O. Kraa[a], A.Aboubou[a], M.Becherif[b], M.Y.Ayad[c*], R.Saadi[a], M.Bahri[a] and H.Ghodbane[a]

[a] Laboratory of Energy Systems Modeling, o.kraa@mselab.org, Mohamed Kheider University, Biskra, Algeria
[b] FCLab FR CNRS 3539 FEMTO-ST UMR CNRS 6174, mohamed.becherif@utbm.fr, UTBM Belfort, France
[c] Industrial Hybrid Vehicle Applications, ayadmy@gmail.com, France

Abstract

This paper treats the design and control of different models and control strategies for an Electric Vehicle (EV). An hybrid controller is designed using a fuzzy logic integrated in Maximum Control Structure (FL-MCS) , the FL nonlinear controller involves online estimation of the total reference force which corresponds to a torque reference to be applied to MCS. The second proposed regulator is a states feedback controller using the Linear Quadratic Regulation (LQR) to optimise and to determine the feedback control parameters. The LQR allows reducing the consumption of the energy according to the desired EV's dynamic performances , these lasts can be changed depending on the choice of Q and R matrices. In this work, we apply and validate the proposed control strategies by a comparison between our simulation results and the results of the classical MCS, which has been developed by L2EP (Lille, France) to control the EV speed under Matlab/Simulink,

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1. Introduction

In the race to cut carbon emissions, global demand for the clean, green technology and more sustainable modes of a transport is rising, the renewable energy has gained in popularity, since their efficiency is continuously improved and their cost is continuously reduced. Indeed, the renewable energy systems produce electric power without polluting the environment, transforming free inexhaustible energy resources, like the solar radiation, full cell or wind, into electricity. The world's demand for electrical energy has been continuously increasing and is expected to continue growing, while the majority of the electrical energy in most countries is generated by conventional energy sources. The ongoing global climate change, the diminution of fossil fuel resources and the collective fear of energy supply shortage

* Corresponding author. Tel: +33 (0) 3 84 58 33 46; fax: +33 (0) 3 84 57 00 32.
E-mail address: ayadmy@gmail.com

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