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A Novel Adaptive Operation Mode based on Fuzzy Logic Control of Electrical Vehicle

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Abstract

This research study presents an Adaptive Operation Mode (AOM) of an Electric Vehicle (EV) in order to reduce its energy consumption. This AOM can be Economic, Dynamic or Eco-Dynamic (EOM, DOM or EDOM) according to the battery State Of Charge (SOC). The control principle is based on specific Adaptive Fuzzy Logic (AFL) combined with the Maximum Control Structure (MCS) of EMR simulator of the studied vehicle. The AFL-MCS contributes to the robustness of motor drives of the vehicle and is used to meet the required autonomy regarding to the SOC. Also, to ensure the reaching and sustaining of speed and stability of the EV control with the on-line adaptive EV performances. Finally, the computer simulation results verify the validity of the proposed controller and developped AOM and demonstrate that the proposed control scheme provides robust dynamic characteristics with saving 10% of SOC.

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Keywords: Adaptive Operation Mode, Energetic Macroscopic Representation, Maximum Control Structure, Fuzzy Logic, Electric Vehicle;

1. Introduction

The growth in consumption of fossil fuels accompanied by an increasing concentration of greenhouse gases in the atmosphere and the inevitable exhaustion of fossil resources expected by the end of this century are the basis of orientation towards the use of Electric Vehicles (EVs). In order to answer to the new constraints of study of more complex electromechanical systems, such as the EVs and wind turbines, an Energetic Macroscopic Representation (EMR) is proposed. The EMR has been first developed by L2EP laboratory (Lille, France) and has been applied to energetic and multi-physic systems by Femto-ST CNRS Lab (Belfort, France) [1]. It does not have the role to replace the traditional representations, but rather to supplement them by a more overall view. Maximum Control Structure

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