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Modelling and Technical Assessment of Multi-Motor for Electric Vehicle Drivetrains by Using Electric Differential

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Abstract : This paper presents a technical assessment of an electric vehicle with two independent rear-wheel motor and an improved traction control system. The electric differential and the control strategy have been implemented to assure that in a straight trajectory, the two rear-wheels run exactly at the same speed, considering the same/different road conditions under the left and right side of the wheels. In case of turning to right/left, the difference between the two rear-wheels speeds assures a vehicle trajectory without sliding, thanks to a harmony between the electric differential and the control strategy. The present article demonstrates a complete model and analysis of a traction control system, considering four different traction scenarios, for two independent rear-wheels motors for electric vehicles. Furthermore, the vehicle model, including wheel dynamics, load forces, electric differential, and control strategy, is designed and verified by using MATLAB/Simulink environment.

Keywords : electric vehicle, energy saving, multi-motor, electric differential, simulation and control
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