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Editorial

Optimal Control, Safety Technology, and Electromagnetic Compatibility in the Driving System of Electric Vehicle

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The objective of this special issue is to address recent research trends and developments in the optimal control, safety technology, and electromagnetic compatibility in the driving system of electric vehicle. A substantial number of papers were submitted, and after a thorough peer review process, eleven papers were selected to be included in this special issue. These papers cover PID control for electric vehicles, stability evaluation of fault diagnosis, Event-Triggered Bipartite Consensus, robust control for vehicle, an equivalent circuit model for lithium battery of electric vehicle, cooperative anomaly detection method, electrical insulator defects detection, Target Track, low frequency radiated emission in electric vehicle, estimating remaining useful life, and backstepping control for motor. We believe that the original papers collected in this special issue highlight the contemporary topics in research related to optimal control and safety technology and will introduce readers to the latest advances in the field.

The paper by A. F. O. de A. Dantas et al. proposes a PID control for electric vehicles subject to input armature voltage and angular velocity signal constraints. The demonstrate controller constraints can improve the electric vehicle DC motor dynamic and consequently protect the motor from overvoltage, and it should be considered in the tuning process. Its author is with the Universidade Potiguar, Brazil.

The paper by Y. Hu et al. is aiming at the stability evaluation of the fault diagnosis model based on the characteristic clustering, where an image edge detection method based on the Elliptic Fourier Descriptor (EFDSE) is proposed to evaluate the stability of the fault diagnosis model, which applies similarity measurement of image to effective evaluation of faulty diagnosis algorithm. The effectiveness of the stability evaluation is verified by the fault data of the motor bearings. Its author is with Beijing University of Posts and Telecommunications, China.

The paper by C.-Q. Ma et al. presents event-triggered bipartite consensus of single-integrator multiagent systems being investigated in the presence of measurement noise. A time-varying gain function is proposed in the event-triggered bipartite consensus protocol to reduce the negative effects of the noise corrupted information processed by the agents. Its authors are with Qufu Normal University, China

The paper by P. Oke et al. examines the problem of designing a robust H1 output feedback yaw controller with both input and output constraints for four independently in-wheel driven Electric Vehicles (EVs) with differential steering. Specifically, the controller aims are to ensure the stability and improve the performance of the EV despite variations in the road adhesion coefficient, longitudinal velocity, and external disturbance. Finally, the capability of the developed controller is simulated on a vehicle model with uncertain road conditions and longitudinal velocities. Its author is with the University of Auckland, New Zealand.

The paper by L. Wu et al. proposes a self-healing characteristic based equivalent circuit model of lithium battery. The mathematical description of the lithium battery in the

self-healing process is obtained through the analysis of the equivalent circuit model. Based on experimental platform, an experiment considering self-healing characteristics was performed. Result shows that the self-healing characteristic based lithium battery equivalent circuit model can describe the voltage of the lithium battery accurately during the self-healing process. Its author is with Capital Normal University, China.

The paper by D. Huang et al. proposes a cooperative detection method based on Pulse Coupling Neural Network (PCNN) and wavelet transform theory to detect the abnormal points of the stacker running rail in industrial environment by analyzing the variation signals. The experimental simulation and example simulation show that the cooperative detection method based on PCNN and wavelet transform theory can effectively detect and locate the anomaly points of the stacker running tracks. The expansibility in engineering applications is promising. The paper was reviewed three times by the editor Daniel Morinigo-Sotelo, because the paper is related to the guest editor Darong Huang, who is with Chongqing Jiaotong University, China.

The paper by Y. Liao et al. proposes an insulator defect detection method inspired by human receptive field model, which meets the requirements for detecting defect insulator in a simple background. In this method, the defect detection combine human receptive field model of human visual system is constructed and applied on the different insulators, so as to achieve accurate detection of the insulator defected parts. Experimental results show that the method can accurately and robustly detect the defect (such as cracks and damages) of electrical insulator in case of noise affect. Its author is with Hubei University for Nationalities, China

The paper by Bo. Hou et al. presents four Jerk models commonly used in the maneuvering target track. The performance of different Jerk models for target track with the state variables and the characters are compared. The Jerk model is widely used for the track of the maneuvering targets. The mathematical simulations show that Jerk model with self-adaptive noise variance has the best robustness while other models may diverge when the initial error is much larger. If the process noise level is much lower, the track accuracy for four Jerk models is similar and stationary in the steady track situation, but it will be descended greatly in the much highly maneuvering situation. Its author is with National University of Defense Technology, China

The paper by F. Gao et al. proposes a methodology for improving of vehicle-level radiated electromagnetic interference (EMI) in electric vehicle (EV). This methodology predicts vehicle-level radiated EMI by using the multiport network theory, based on analyzing the contribution from each electronic component to find out the main EMI source. To validate its effectiveness, the proposed methodology is applied in an actual EV for low-frequency radiate demissions. Simulation in a commercially available electromagnetics software and measurement in the EV are combined to predict the vehicle-level emissions, and then the electronic component with the greatest EMI that causes failure to meet the EMC standard is identified. After improving this component, the vehicle-level radiated emission is reduced to comply with the EMC standard, proving that the presented numerical method is effective. The proposed methodology can also be used in other EMC issues, regardless of the amount of interference sources and sensitive equipment. The paper was reviewed three times by the editor Daniela Proto, because the paper is related to the guest editor Xu Li's group; the author is with Chongqing University, China.

The paper by C.-H. Hu et al. proposes a new degradation model for remaining useful life (RUL) estimation based on the volatility of degradation data. Degradation model base RUL prediction method has been one of the most important parts in prognostics and health management; at last, two practical cases show that the proposed model can deal with the degradation data with many fluctuations better and get the more reasonable result which is convenient for maintenance decision. Its author is with High-tech institute of Xi'an, China

The paper by Y.-H. Lan et al. presents a disturbance observer-based (DOB) backstepping speed tracking control method, for the speed tracking control problem of Permanent Magnet Synchronous Motor (PMSM). The obtained controller can achieve high precision speed tracking and disturbance rejection. Finally, some results of evaluative experiments verified the effectiveness of the proposed method for high-performance control and disturbance rejection for the PMSM drive. Its author is with Xiangtan University, China

Conclusion

The eleven papers are from eleven universities or institutes and from three countries. The topic is an interesting topic, and many researchers required delaying the call for paper, but there are also some regrets, as EV researcher, EV company, and EV administer could not present their studies.

Conflicts of Interest

All editors declare that there are no conflicts of interest or private agreement with companies regarding the publication of their papers.

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