Guest Editor's Introduction

Computing in Railway Engineering

In light of the booming of Chinese high-speed railways, we formed the idea of organizing this special issue (SI) of Computing in Science and Engineering together with the Editor-in-Chief Prof. J. X. Chen. Great help has been provided to us by the editors to make this SI come together today. We really hope you can enjoy this SI.

The fact that computing has been widely employed in almost every field of railway engineering makes this SI fit the magazine wonderfully on one hand, and leaves enormous possibilities for paper selection on the other. Considering our expertise and the research hotspots in the past years, we finally decided to focus on the dynamic service performance of railway systems, especially of the high-speed trains. All of the six selected papers are from the Southwest Jiaotong University, the leading Chinese research institute in railway engineering, especially from the State Key Laboratory of Traction Power at the university. Furthermore, with the rapid network expansion of Chinese high-speed railways, more publications on better maintenance strategies and nondestructive examination methods for higher safety and reliability in operation may also come in the future if possible.

IN THIS ISSUE

S. Zhu *et al.* proposed an algorithm for the stochastic dynamics analyses of a vehicle–bridge system, in which a hybrid method consisting of the pseudoexcitation method and the self-adaptive gauss integration was employed. The results of a high-speed vehicle–bridge system had shown that the computational time of the hybrid method was only 1/8 of that of Monte Carlo method when reaching the same accuracy.

To avoid the high computational costs of stochastic dynamics analyses, Y. Zeng *et al.* employed the neural network method to develop a map between excitations, vehicle state parameters, and dynamic responses for high-speed trains with the ultimate purpose of online or real-time computation. Trial in an actual case had shown that the developed approach could output several dynamic indexes accurately, providing good indicators for damage diagnosis and condition-based maintenance of railway vehicles.

T. Li *et al.* developed a numerical model to calculate the aerodynamic drag forces of a high-speed train with and without round pits on the coupling cover. It was found that the drag force was reduced by nearly 2% when distributed round pits with optimized parameters were present, although the coupling cover was very small with respect to the train.

L. Jiang *et al.* developed a finite-element model using LS-Dyna to study the connection strength, failure mode, and adhesive stress of a single-strap butt joint of carbon fiber reinforced composite under dynamic tensile loads. The carbon fiber has been considered nowadays as a favored material candidate for lighter high-speed trains in the future. The presented results provided some guidance for the joint design of carbon fiber reinforced composite.

J. Yang *et al.* studied the dynamic effects of two countermeasures against the stiffness variation at the gaps between discontinuous floating

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slabs that had been widely used in metros to reduce the soil vibrations caused by running trains. To such an end, a 3-D train-track coupled dynamic model was developed with the consideration of discontinuous floating slabs and the countermeasures (stiffness enhancement measures). The optimized parameters for the two countermeasures provided some valuable guidance for the floating slab design.

Targeting the dynamic performance of high-temperature superconducting maglev trains, a future high-speed rail transport mode, Z. Deng *et al.* developed a coupled dynamic model of the maglev vehicle and the elevated guideway. With such a model, detailed parameter variations were performed, starting a basis for the design of future maglev rail systems.

FEEDBACKS AND FUTURE DISCUSSIONS

If you are interested in the papers included in this issue and/or want more detailed discussions about these works or other railway-related research topics, do not hesitate to contact us through the emails provided in the following or in the papers. We would be very happy to see any feedback, comments, and suggestions, and are confident to find a researcher at Southwest Jiaotong University working in a field close enough to yours if your question is out of our expertise.

Xin Zhao is an Associate Professor of vehicle application engineering with the State Key Laboratory of Traction Power, Southwest Jiaotong University, Chengdu, China. He is a member of the Committee of International Conference on Contact Mechanics and Wear of Rail/Wheel Systems. He received the B.S. degree in mechanical engineering and the M.S. degree in vehicle application engineering from Southwest Jiaotong Univeristy in 2003 and 2005, respectively, and the Ph.D. degree from the Delft University of Technology, The Netherlands, in 2012. Contact him at xinzhao@swjtu.edu.cn.

S. C. Wu is a Professor of mechanical engineering with the State Key Laboratory of Traction Power, Southwest Jiaotong University, Chengdu, China. He developed an improved 3-D fracture mechanics software entitled ZonCrack based on the extended finite-element method integrated with in-house virtual-node polygonal elements. He also focus on the defect characterization and assessment of high-strength metallic materials and structures, including welded Al alloys, AMed Ti alloys, and surface-hardened steels potentially applied to next-generation high-speed railway vehicle structures by developing *in situ* tensile and fatigue testing setups mounted at the third synchrotron radiation light source. He received the joint-training doctoral degree from the Huazhong University of Science and Technology and National University Singapore in 2009. Contact him at wusc@swjtu.edu.cn.