

CURRICULUM VITAE

1. PERSONAL DETAILS

Name: Yang Song
Date of Birth: 13th August 1989
Nationality: P. R. China
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2. WORK EXPERIENCE

2019. 11- present Postdoctoral Research Fellow, Department of Structural Engineering, Norwegian University of Science and Technology, Norway.
2018. 10-2019. 09 Research Fellow, Institute of Railway Research, University of Huddersfield, UK.

3. EDUCATION

2015. 09-2016. 09 Visiting Scholar in Vehicle Dynamics, University of Liverpool, UK. (Sponsored by China Scholarship Council)
2013. 09-2018. 07 PhD in Electrical Engineering, Southwest Jiaotong University, China. (MSc-Ph.D. Combined Programme)
2012. 09-2013. 07 MSc. in Electrical Engineering, Southwest Jiaotong University, China.
2007. 09-2011. 07 BSc. in Mechanical Engineering; Shanghai University of Electric Power, China.

4. RESEARCH

My research interests involve the assessment of current collection system in electrified railway, the wind-induced vibration of long-span structures of railway transportation, and the coupling dynamics in railway engineering.

5. ACADEMIC ACTIVITIES

- 1) **Chair of Technical Session** ‘Pantograph-catenary interaction’ at World Transport Convention (WTC), China National Convention Centre, Beijing, China, 15-19. June 2021.
- 2) **Editorial Board Member** of 5th International Conference on Railway Technology: Research, Development and Maintenance (Railways 2022) organized by Elsevier in Montpellier, France, 22-25 August 2022.
- 3) **Chair of Invited Session** "Modelling, Control, Optimization and Maintenance of Traction Power Systems in Electrified Railways" at 5th International Conference on Railway Technology: Research, Development and Maintenance (Railways 2022) organized by Elsevier in Montpellier, France, 22-25 August 2022.
- 4) **Chief Guest Editor** of Special Issue ‘Sustainability and Digital Transformations in

Railway Systems: Modelling, Planning, and Management’ in ‘*Sustainability*’.

- 5) **Guest Editor** of Special Issue ‘Wind-induced vibration of long-span structures in transportation systems’ in ‘*Shock and Vibration*’.
- 6) Memberships of IAVSD (The International Association for Vehicle System Dynamics), IEEE (The Institute of Electrical and Electronics Engineers), I&M (The IEEE Instrumentation and Measurement) Society, VTS (The IEEE Vehicular Technology Society), IAS (IEEE Industry Applications Society), ITSS (The IEEE Intelligent Transportation Systems Society).
- 7) Reviewers for over 30 prestigious international journals, including ‘*Mechanical Systems and Signal Processing*’, ‘*Journal of Rail and Rapid Transit*’, ‘*Journal of Vibration and Control*’, ‘*Measurement*’, ‘*Vehicle System Dynamics*’, ‘*IEEE Transactions on Vehicular Technology*’, ‘*IEEE Transactions on Power Delivery*’, ‘*IEEE Transactions on Instrumentation and Measurement*’, ‘*International Journal of Rail Transportation*’, ‘*Mechanism and Machine Theory*’...

6. PUBLICATIONS

a) Journal Articles

- [1] **Song Y**, Liu Z, Rønquist A, Nåvik P and Liu Z, Contact Wire Irregularity Stochastics and Effect on High-Speed Railway Pantograph–Catenary Interactions, *IEEE Transactions on Instrumentation and Measurement*, 2020, 69(10): 8196-8206 (SCI Journal, IF: 3.658, **ESI highly cited paper**)
- [2] **Song Y**, Rønquist A, Nåvik P. Assessment of the High-frequency Response in Railway Pantograph-Catenary Interaction Based on Numerical Simulation. *IEEE Transactions on Vehicular Technology*, 2020, 68(10): 10596-10605. (SCI Journal, IF: 5.379)
- [3] **Song Y**, Ouyang H, Liu Z, et al. Active control of contact force for high-speed railway pantograph-catenary based on multi-body pantograph model. *Mechanism and Machine Theory*, 2017, 115: 35-39. (SCI Journal, IF: 3.312)
- [4] **Song Y**, Wang H*, Liu Z. An Investigation on the Current Collection Quality of Railway Pantograph-catenary Systems with the Degradation of Contact Wire Wear. *IEEE Transactions on Instrumentation and Measurement*, 2021, 10.1109/TIM.2021.3078530. (SCI Journal, IF: 3.658)
- [5] **Song Y**, Rønquist A, Jiang T, Nåvik P. Identification of Short-Wavelength Contact Wire Irregularities in Electrified Railway Pantograph-Catenary System. *Mechanism and Machine Theory*, 2021, 162: 104338. (SCI Journal, IF: 3.312)
- [6] **Song Y**, Wang Z, Liu Z, Wang R. A spatial coupling model to study dynamic performance of pantograph-catenary with vehicle-track excitation. *Mechanical Systems and Signal Processing*, 2021;151:107336. (SCI Journal, IF: 6.471)
- [7] **Song Y**, Antunes P, Pombo J, Liu Z. A methodology to study high-speed pantograph-catenary interaction inclusive of realistic geometrical contact wire irregularities. *Mechanism and Machine Theory*, 2020, 152: 103940. (SCI Journal, IF: 3.312)
- [8] **Song Y**, Liu Z, Wang H, et al. Nonlinear modelling of high-speed catenary based on analytical expressions of cable and truss elements. *Vehicle System Dynamics*, 2015, 53(10): 1455-1479. (SCI Journal, IF: 2.581)
- [9] **Song Y**, Liu Z, Wang H, et al. Nonlinear analysis of wind-induced vibration of high-speed railway catenary and its influence on pantograph–catenary interaction. *Vehicle System Dynamics*, 2016, 54(6): 723-747. (SCI Journal, IF: 2.581)

- [10] **Song Y**, Liu Z, Wang H, et al. Analysis of the galloping behaviour of an electrified railway overhead contact line based on the non-linear finite element method. *Journal of Rail and Rapid Transit*, 2018, 232(10): 2339-2352. (SCI Journal, IF: 1.228, **Editor's Choice Collection**)
- [11] **Song Y**, Liu Z, Duan F, et al. Study on wind-induced vibration behaviour of railway catenary in spatial stochastic wind field based on nonlinear finite element procedure. *Journal of Vibration and Acoustics-Transactions of The ASME*, 2017, 140(1): 011010. (SCI Journal, IF: 2.343)
- [12] **Song Y**, Liu Z, Duan F, et al. Wave propagation analysis in high-speed railway catenary system subjected to a moving pantograph. *Applied Mathematical Modelling*, 2018, 59: 20-38. (SCI Journal, IF: 3.633)
- [13] **Song Y**, Liu Z, Lu X. Dynamic Performance of High-speed Pantograph-catenary Interaction with Local Dropper Defect. *IEEE Transactions on Vehicular Technology*, 2020, 69(6): 5958 - 5967. (SCI Journal, IF: 5.379)
- [14] **Song Y**, Zhang M, Hongrui Wang. Response Spectrum Analysis of Electrified Railway Overhead Contact Line Wind Deflection Using Pseudo-Excitation Method. *IEEE Transactions on Vehicular Technology*, 2021, DOI: 10.1109/TVT.2021.3054459. (SCI Journal, IF: 5.379)
- [15] **Song Y**, Liu Z, Xu Z, Zhang J. Developed moving mesh method for high-speed railway pantograph-catenary interaction based on nonlinear finite element procedure, *International Journal of Rail Transportation*, 2019, 7(3): 173-190 (SCI Journal)
- [16] **Song Y**, Liu Z, Ouyang H, et al. Sliding mode control with PD sliding surface for high-speed railway pantograph-catenary contact force under strong stochastic wind field. *Shock and Vibration*, 2017, 2017(4): 1-16. (SCI Journal, IF: 1.298)
- [17] Chu W, **Song Y**, Duan F, Liu Z. Development of Steady Arm Damper for Electrified Railway Overhead Contact Line with Double Pantographs Based on Numerical and Experimental Analysis. *IET Electrical Systems in Transportation*, 2021, DOI: 10.1049/els2.12024 (SCI Journal)
- [18] Xu Z, **Song Y***, Liu Z. Effective measures to improve current collection quality for double pantographs and catenary based on wave propagation analysis. *IEEE Transactions on Vehicular Technology*, 2020, 69(6): 6299-6309. (SCI Journal, IF: 5.379)
- [19] Wang Z, **Song Y***, Yin Z, Zhang W. Random response analysis of axle-box bearing of a high-speed train excited by crosswinds and track irregularities. *IEEE Transactions on Vehicular Technology*, 2019, 68(11): 10607-10617. (SCI Journal, IF: 5.379)
- [20] Peng B, Iwnicki S, Shackleton P, **Song Y**. General conditions for railway wheel polygonal wear to evolve. *Vehicle System Dynamics*, 2019, 10.1080/00423114.2019.1697458. (SCI Journal, IF: 2.581)
- [21] Lu X, Liu Z, Zhang J, Wang H, **Song Y**, Duan F. Prior information-based finite frequency H_∞ control for active double-pantograph in high-speed railway. *IEEE Transactions on Vehicular Technology*, 2017, 66(10): 8723-8733. (SCI Journal, IF: 5.379)
- [22] Wang H, Liu Z, **Song Y**, et al. Detection of contact wire irregularities using a quadratic time-frequency representation of the pantograph-catenary contact force. *IEEE Transactions on Instrumentation and Measurement*, 2016, 65(6):1385-1397. (SCI Journal, IF: 3.658)
- [23] Liu Z, Zhou H, Huang K, **Song Y**, Zheng Z, Cheng Y. Extended Black-Box Model of

- Pantograph-Catenary Detachment Arc Considering Pantograph-Catenary Dynamics in Electrified Railway. *IEEE Transactions on Industry Applications*, 2019, 55(1): 776-785. (SCI Journal, IF: 3.488)
- [24] Liu Z, Wang H, Dollevoet R, **Song Y**, et al. Ensemble EMD-based automatic extraction of the catenary structure wavelength from the pantograph–catenary contact force. *IEEE Transactions on Instrumentation & Measurement*, 2017, 65(10):2272-2283. (SCI Journal, IF: 3.658)
- [25] Wang H, Alfredo N, Liu Z, **Song Y** et al. Analysis of the evolvement of contact wire wear irregularity in railway catenary based on historical data. *Vehicle System Dynamics*, 2017, 56(8), 1207-1232. (SCI Journal, IF: 2.581)
- [26] Lu X, Liu Z, **Song Y**, et al. An estimator-based multi-objective robust control strategy for an active pantograph in high-speed railway. *Journal of Rail and Rapid Transit*, 2017, 0954409717707399. (SCI Journal, IF: 1.228)
- [27] Wang H, Liu Z, **Song Y**, et al. Ensemble EMD-based signal denoising using modified interval thresholding. *IET Signal Processing*, 2017, 11(4): 452-461. (SCI Journal, IF: 1.754)
- [28] Zhang J, Liu J, Wang C, **Song Y**, et al. Study on multidisciplinary design optimization of a 2-degree-of-freedom robot based on sensitivity analysis and structural analysis. *Advances in Mechanical Engineering*, 2017, 9(4): 168781401769665. (SCI Journal, IF: 1.161)
- [29] Liu Z, **Song Y**, Han Y, et al. Advances of research on high-speed railway catenary. *Journal of Modern Transportation*, 2017, 51(3): 1-23. (ESCI Journal)
- [30] Lu X, Zhang H, Liu Z, Duan F, **Song Y**, and Wang H. Estimator-based H^∞ control considering actuator time delay for active double-pantograph in high-speed railways. *Journal of Low Frequency Noise, Vibration and Active Control*, 2019: 1461348419876791.
- [31] Chu W, **Song Y***. Study on dynamic interaction of railway pantograph-catenary including reattachment momentum impact. *Vibration*, 2020, 3(1): 18-33.
- [32] **Song Y**, Liu Z, Wang H, et al. Establishment of 3d model for catenary and nonlinear solution for its wind deflection. *Journal of The China Railway Society*, 2015, 37(4), 30-38. (in Chinese) (EI Journal, IF 5000 paper)
- [33] **Song Y**, Liu Z, Wang H, et al. Analysis on influence of stochastic wind field on wind vibration fatigue of high-speed railway catenary. *Journal of The China Railway Society*, 2015 37(7), 20-26. (in Chinese) (EI Journal)
- [34] **Song Y**, Liu Z, Wang H, et al. Influence of high-speed railway catenary buffeting on pantograph-catenary current collection under fluctuating wind. *Journal of The China Railway Society*, 2014, 36(6): 27-34. (in Chinese) (EI Journal)
- [35] **Song Y**, Liu Z, Wang H, et al. Study on aerodynamic parameters and wind vibration responses of iced contact wires of high-speed railways. *Journal of The China Railway Society*, 2014, 36(9), 20-27. (in Chinese) (EI Journal)
- [36] **Song Y**, Liu Z, Lu X, et al. Study on characteristics of dynamic current collection of high-speed pantograph-catenary considering aerodynamics of catenary. *Journal of The China Railway Society*, 2016, 38(3), 48-58. (in Chinese) (EI Journal)
- [37] Liu Z, **Song Y**, Liu Y. Aeolian vibration characteristics of high-speed railway catenary, *Journal of Southwest Jiaotong University*, 2015, 50(1), 1-6. (in Chinese) (EI Journal)
- [38] Liu Z, **Song Y**, Han Y, et al. Advances of research on high-speed railway catenary. *Journal of Southwest Jiaotong University*, 2016, 51(2-3), 495-518. (in Chinese) (EI

Journal)

- [39] Wang H, Liu Z, **Song Y**. Time-frequency analysis of pantograph-catenary contact force and contact wire irregularity in high-speed railway based on ZAMD. *Journal of The China Railway Society*, 2016, 38(1): 41-47. (*in Chinese*) (EI Journal)
- [40] Lu X, Liu Z, **Song Y**, et al. Review of pantograph active control. *Review of pantograph active control*, 2014, 14(2): 49. (*in Chinese*) (EI Journal)
- [41] Wang H, Liu Z, Han Z, **Song Y**. Feature extraction of pantograph-catenary contact force power spectrum of electrified railway. *Journal of The China Railway Society*, 2014, 36(11): 23-28. (*in Chinese*) (EI Journal)
- [42] Wang H, Liu Z, **Song Y**. Analysis on wavelength components in pantograph-catenary contact force of electric railway based on multiple EEMD. *Journal of The China Railway Society*, 2015, 37(5): 34-41. (*in Chinese*) (EI Journal)
- [43] Liu Y, Liu Z, **Song Y**, et al. Simulation calculation and wind tunnel test of static aerodynamic parameters of high-speed railway contact line. *Journal of The China Railway Society*, 2014, 36(5): 33-38. (*in Chinese*) (EI Journal)
- [44] Hou Y, Liu Z, **Song Y**, et al. Modelling of steady state of electric railway catenary based on nonlinear cable and truss. *Journal of The China Railway Society*, 2014, 36(7): 24-29. (*in Chinese*) (EI Journal)
- [45] Wang H, Liu Z, **Song Y**, et al. Aerodynamic parameters simulation and wind-induced vibration response of contact wire of high-speed railway. *Journal of Shock and Vibration*, 2015, 34(6): 6-12. (*in Chinese*) (EI Journal)
- [46] Lu X, Liu Z, **Song Y**. Analysis and verification of pantograph active control based on MR damper. *Chinese Journal of Scientific Instrument*, 2015, 36(1): 103-109. (*in Chinese*) (EI Journal)
- [47] Zhang J, Liu Z, Lu X, **Song Y**. Study on aerodynamics development of high-speed pantograph and catenary. *Journal of The China Railway Society*, 2015, 37(1): 7-15. (*in Chinese*) (EI Journal)
- [48] Jiang J, Liu Z, Lu X, Duan F, **Song Y**. Coupling performance between pantograph parameters and dropper spacing considering the amplitude-frequency characteristics of pantograph. *Journal of Vibration and Shock*, 2016, 35(18): 134-139. (*in Chinese*) (EI Journal)
- [49] Jiang J, Liu Z, **Song Y**. Simulation study on dynamic behavior of pantograph-catenary considering the nonlinear characteristics of pantograph. *Computer Simulation*, 2015, 2: 039. (*in Chinese*) (CSCD Journal)

b) Submitted Journal Articles

- [1] **Song Y**, Jiang T*, Rønquist, Petter Nåvik, Gunnstein Frøseth. Assessment of Railway Pantograph-catenary Interaction Performance Including Measurement Damping Ratio Variation. *IEEE Transactions on Instrumentation and Measurement*, 2020, Accept with minor revision.
- [2] **Song Y**, Duan F*, Liu Z, Gao S. Assessment of Current Collection Quality of Pantograph-Overhead Conductor System with Contact Line Height Variability. *IEEE Transactions on Transportation Electrification*, 2020, Accept with minor revision.
- [3] **Song Y**, Jiang T*, Rønquist A, Nåvik P. Geometry Deviation of Railway Catenary and Effect on Pantograph-Catenary Interaction: A Case Study in Norwegian Railway System. *Railway Engineering Science*, 2021, Submitted.

c) Conference Articles

- [1] Liu Z, **Song Y**, Wang Y, et al. The catenary vibration response of high-speed electrified railway considering horizontal wind. Proceedings of the 2013 International Conference on Electrical and Information Technologies for Rail Transportation, 2014, (Volume I): 45-54. Springer, Berlin, Heidelberg.
- [2] **Song Y**, Liu Z, Wang H, et al. Numerical simulation for the vertical vehicle-track-pantograph-catenary coupled system. Proceedings of the Third International Conference on Railway Technology Research, Development and Maintenance (Railways 2016), 2016: 109, Civil-Comp Press, Stirlingshire, Scotland.
- [3] **Song Y**, Liu Z, Zhang J, et al. Numerical Simulation and Nonlinear Analysis for Galloping of Electrified Railway Catenary. First International Conference on Rail Transportation (ICRT 2017), 2017: 96, ICRT, Chengdu.
- [4] **Song Y**, Liu Z. Study on Wind-induced Vibration of Railway Catenary under 3D Stochastic Wind Field. Proceedings of the 25th International Symposium on Dynamics of Vehicle on Roads and Tracks (IAVSD 2017), 2017: 1005-1010, CRC Press Taylor & Francis Group.
- [5] Duan F, Liu Z, **Song Y**. Study on the current collection of high speed pantograph-catenary system considering static wind perturbation and friction coupling. 2016 35th Chinese Control Conference, 2016: 10236-10241. IEEE, Chengdu.
- [6] **Song Y**, Antunes P, Pombo J, A Methodology to Study High-Speed Catenary Systems with Realistic Contact Wire Irregularities, Proceedings of the 26th International Symposium on Dynamics of Vehicle on Roads and Tracks (IAVSD 2019), 2019: 346, v4.

7. AWARDS

- 1) Excellent Doctoral Thesis of Southwest Jiaotong University, SWJTU, 2018. (**Top 10%**)
- 2) Excellent Doctoral Thesis Cultivation Programme, SWJTU, 2015-2017. (**Top 1%**)
- 3) Cao Jianyou Award for PhD Candidate, China, 2017. (**2 nationwide per annum**)
- 4) First-class Academic Scholarship for Postgraduate, SWJTU, 2014-2016. (**Top 5%, awarded three times**)
- 5) National Scholarship for Postgraduate, China, 2014/2016. (**0.2% nationwide, awarded two times**)
- 6) Postgraduate Innovation Fund, SWJTU, 2014. (**Top 10%**)
- 7) Top Creative Talents in Rail Transit, SWJTU, 2014. (**Top 10%**)
- 8) Visiting Ph. D Student Scholarship, CSC (China Scholarship Council), 2015-2016.

8. RESEARCH PROJECTS

a) Principle Investigators

- 1) “*Mechanism and Control Strategy of Electrified Railway Catenary in Complex Mountainous Terrain*”, sponsored by Open Project of National Rail Transit Electrification and Automation Engineering Technique Research Centre. (Jan. 2020 — Dec. 2021)
- 2) “*Research on High-speed Railway Pantograph-catenary Interaction under Stochastic Wind Field*”, sponsored by Postgraduate Innovation Fund of Southwest Jiaotong University. (Sep. 2014 — Sep. 2015)

- 3) “*Study on Multiple Pantograph-catenary Interaction under Stochastic Wind Field*”, sponsored by Excellent Doctoral Thesis Cultivation Programme of Southwest Jiaotong University. (Sep. 2015 — Sep. 2018)

b) Cooperation Principle Investigators

- 1) “*TOPCAT: Pantograph-Catenary numeric analysis tool for Network Rail (NR Strategic University Partnership)*”, sponsored by Network rail. (Oct. 2018 — May. 2019) **Project Leader**
- 2) “*Real Time Electrification Monitoring*”, sponsored by UoH-RSSB Strategic Partnership. (2019.05 — 2019.09) **Project Leader**
- 3) “*Wave propagation analysis in catenary and optimization of parameters of pantograph-catenary system*”, sponsored by National Natural Science Foundation of China & China Railway Corporation High-Speed Railway Joint Key Project. (Jan. 2018 — 2021.12) **Sub-project Leader**
- 4) “*S2R-PantOCL: Dynamic Behaviour and Quality of the Current Collection*”, sponsored by Shift Rail. (2018.01 -2019.09)
- 5) “*Contact Wire Heights at Level Crossings*”, sponsored by UoH - RSSB Strategic Partnership. (2019.05-2019.09)
- 6) “*HS2: Pantograph\OLE compatibility studies for high-speed and conventional lines*”, Consulting project sponsored by Hitachi. (2019.03-2019.08)

9. PATENTS OF INVENTION

- 1) Liu Z, **Song Y**, Duan F, Han Z, Zhang J. “*A simulation method for high-speed railway pantograph-catenary interaction considering reattachment impact*”, China, CN201511018869. X. 2015-12-29.
- 2) Liu Z, **Song Y**, Duan F, Han Z, Zhang J. “*An iteration method for high-speed railway vehicle-track-pantograph-catenary coupling system*”, China, CN201511004665.0. 2015-12-29.
- 3) Liu Z, **Song Y**, Xu Z, Duan F. “*A procedure for eliminating unbalanced forces in moving mesh method with application to pantograph-catenary interaction*”, China, CN201711239896.9. 2017-11-30.
- 4) Liu Z, **Song Y**, Xu Z. “*A determination method for tension and reflection coefficient of high-speed railway catenary in full frequency domain*”, China, CN201711426770.2. 2017-12-26.
- 5) Liu Z, Hou Y, **Song Y**, Wang H. “*A computational method for equilibrium state of electrified railway catenary*”, China, CN201410487650.3. 2014-9-23.
- 6) Liu Z, Han Z, Wang H, **Song Y**. “*An evaluation method for dynamic performance of pantograph-catenary interaction based on correlation coefficient*”, China, CN201210496227.0. 2012-11-28.
- 7) Fan W, Liu Z, Han Z, **Song Y**. “*An identification method for vulnerable line of power system*”, China, CN201610688015.0. 2016-8-28.