

José L. Escalona, Ph.D.

December 31, 1971

Seville, Spain

Professor

Department of Mechanical and Manufacturing Engineering

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EDUCATION

Escuela Superior de Ingenieros, Universidad de Sevilla Sevilla, Spain

Ph.D., Mechanical Engineering, March, 2001

Thesis: Dynamic Analysis of Impacts in Elastic Beams

B.S., Mechanical Engineering, March, 1996

University of Sheffield Sheffield, U.K.

Academic year under the European Erasmus Program of exchange of students, 1993-1994

APPOINTMENTS

Aarhus University Aarhus, Denmark

Associate Professor of Mechanical Engineering, 2017-2023

Universidad de Sevilla Sevilla, Spain

Professor of Mechanical Engineering, 2016-

Universidad de Sevilla Sevilla, Spain

Associate Professor of Mechanical Engineering, 2004-2016

Universidad de Sevilla Sevilla, Spain

Assistant Professor of Mechanical Engineering, 1999-2004

University of Illinois at Chicago Chicago, Illinois

Visiting Scholar, Jan.1997-May 1997, Sept. 2001-Dec. 2002

Institut B für Mechanik, University of Stuttgart Stuttgart, Germany

Visiting Scholar, Fall 1998

SCHOLARSHIPS

University of Illinois at Chicago Chicago, Illinois

Fulbright Research Scholarship, Sept. 2001-Dec.2002

Supervised by Prof. Ahmed A. Shabana

Lappeenranta University of Technology Lappeenranta, Finland

Visiting Professor, June 2016-October 2016

Hosted by Prof. Aki Mikkola

RESEARCH INTERESTS

- *Railroad dynamics*
- *Reeving systems dynamics*
- *Flexible multibody dynamics*
- *Contact and impact problems*
- *Large deformation problems*
- *Stability of mechanical systems*

PUBLICATIONS

- 64 papers published in scientific journals. List of publications attached.
- More than 100 papers published in proceedings of international conferences.

RECENT RESEARCH PROJECTS

- Principal investigator of the following projects with public funding:
 - PID2020-117614R, “Desarrollo de un gemelo digital para la dinámica de vehículos ferroviarios”, 2021-2023, 151250 €.
 - TRA2017-86355-C2-1-R, “Desarrollo de observadores en sistemas embarcados para la estimación dinámica de vehículos ferroviarios”, 2018-2020, 5 researchers, funding: 116800 €.
 - TRA2014-57609, “Estimation of wheel-rail contact forces with optical and inertial sensors using advanced computational models”, 2015-2017, 5 researchers, funding: 93000 € + 1 PhD student contract (~48000 €).
- H2020 - European Commission Project. ETN (European Training Network). Leader of the Spanish Project. Consortium of 12 European Universities
 - THREAD, “Joint Training on Numerical Modeling of Highly Flexible Structures for Industrial Applications”, funded by the European Commission. Total funding: 3.637.896,96 €. Local funding: 217.624,88 €. 2019 – 2023.
- H2020 - European Commission Project. HORIZON-MSCA-2022-PF-01-01 — MSCA Postdoctoral Fellowships 2022
 - 101107363 — DETECT4WE, Post Doc: Dr. Xinxin Yu, IP: José L. Escalona. Participants: U. of Seville, TU-Delft, Pro-Rail (public rail company at The Netherlands). Funding: 206.641,20 €. 2023 – 2025.
- Projects with private funding:
 - “SefFer: Development of on-board software for the evaluation of ride safety in railway vehicles”, funded by the Spanish Ministry of Industry. Funding: 300000 €. 2015-2017.
 - “SIMUVIA: On-board simulation for track geometry monitoring using state observation of railroad vehicles”, funded by SANDO company in cooperation with ADIF (Spanish railroad tracks administration). Funding: 1500000 € (total), 96000 € (virtualmech). 2014-2015.

OTHER PROFESSIONAL EXPERIENCE

- Founder partner of the spin-off company VIRTUALMECH (www.virtualmech.com). The company develops industrial applications of computational mechanics.

JOURNALS

- Associate Editor of the *ASME Journal of Computational and Nonlinear Dynamics*. 2011-2017, 2021- .
- Member of Scientific Board of *Multibody System Dynamics*.
- Member of the Editorial Board of *International Journal of Mechanical System Dynamics*.
- Guest Editor of the Special Issue of the *ASME Journal of Computational and Nonlinear Dynamics* with selected papers from the ASME IDETC/CIE 2021 Multibody Systems and Nonlinear Dynamics Conference (MSNDC). 2021.
- Guest Editor of the Special Issue “A Roadmap to High-Speed Trains” of the *ASME Journal of Computational and Nonlinear Dynamics*. October 2012.
- Associate Editor and member of the Scientific Board of the *International Journal of Railway Technology*.

INTERNATIONAL SCIENTIFIC COMITEES

- Member of the ASME Technical Committee of Multibody Systems and Nonlinear Dynamics (2016 -).
- Secretary of the IFToMM Technical Committee for Multibody Dynamics (2014 -).
- Member of the Steering Committee of the International Association of Multibody System Dynamics (IMSD) (2023 -)
- Member of the Board of the International Society of Mechanical Systems Dynamics (ISMSD) (2023 -)



José L. Escalona

Signed in Seville, Spain, on January 13, 2024

List of journal publications

1. Escalona, J.L., Shabana, A.A., Hussien, A.H., "Application of the Absolute Nodal Coordinate Formulation to Multibody System Dynamics", *Journal of Sound and Vibration*, 214(5), 833-851, Elsevier, 1998.
2. Shabana, A.A., Hussien, A.H., Escalona, J.L., "Application of the Absolute Nodal Coordinate Formulation to Large Rotation and Large Deformation Problems", *Journal of Mechanical Design*, 120(2), 188-195, ASME International, 1998.
3. Escalona, J.L., Mayo, J., Domínguez, J., "A Critical Study of the Use of the Generalised Impulse Momentum Balance Equations in Flexible Multibody Systems", *Journal of Sound and Vibration*, 217(3), 523-545, Elsevier, 1998.
4. Escalona, J.L., Mayo, J., Domínguez, J., "New Numerical Method for the Dynamic Analysis of Impact Loads in Flexible Beams", *Mechanisms and Machine Theory*, 34, 765-780, Elsevier, 1999.
5. Escalona, J.L., Mayo, J., Domínguez, J., "Influence of Reference Conditions on the Analysis of Impact-Induced Elastic Waves", *Multibody System Dynamics*, 7 (2), pp. 209-228, Kluwer Academic Publishers, 2002.
6. Escalona, J.L., Sany, J.R., Shabana, A.A., "On the Use of the Restitution Condition in Flexible Body Dynamics", *Nonlinear Dynamics*, 30, 71-86, Kluwer Academic Publishers, 2002.
7. Escalona, J.L., Valverde, J., Mayo, J.M., Domínguez, J., "Reference Motion In Deformable Bodies Under Rigid Body Motion And Vibration. Part I: Theory", *Journal of Sound and Vibration*, 264(5), 1045-1056, Elsevier, 2003.
8. Escalona, J.L., Valverde, J., Mayo, J.M., Domínguez, J., "Reference Motion In Deformable Bodies Under Rigid Body Motion And Vibration. Part II: Evaluation of the Coefficient of Restitution for Impacts", *Journal of Sound and Vibration*, 264(5), 1057-1072, Elsevier, 2003.
9. Sugiyama, H., Escalona, J.L., Shabana, A.A., "Formulation of Three-Dimensional Joint Constraints Using the Absolute Nodal Coordinates", *Nonlinear Dynamics*, 31, 167-195, Kluwer Academic Publishers, 2003.
10. Valverde, J., Escalona, J.L., Mayo, J.M., Domínguez, J., "Dynamic Analysis of a Light Structure in Outer Space: Short Electrodynamical Tether", *Multibody System Dynamics*, 10 (1), 125 – 135, Kluwer Academic Publishers, 2003.
11. Shabana, A.A., Zaazaa, K.E., Escalona J.L., Sany, J.R., "Development of Elastic Force Model for Wheel/Rail Contact Problems", *Journal of Sound and Vibration*, 269(1-2), 295-325, Elsevier, 2003.
12. García-Vallejo, D., Escalona, J.L., Mayo, J., Domínguez, J., "Describing Rigid-Flexible Multibody Systems Using Absolute Coordinates", *Nonlinear Dynamics*, 34(1), 75-94, Kluwer Academic Publishers, 2003.
13. García-Vallejo, D., Mayo, J., Escalona, J.L., Domínguez, J., "Efficient evaluation of the elastic forces and the jacobian in the absolute nodal coordinate formulation", *Nonlinear Dynamics*, 35(4), 313-329, Kluwer Academic Publishers, 2004.
14. Valverde, J., Escalona, J.L., Freire, E., Domínguez, J., "Stability and bifurcation analysis of a modified geometrically nonlinear orthotropic Jeffcott model with internal damping", *Nonlinear Dynamics*, 42, 137-163, 2005.
15. Valverde, J., Escalona, J.L., Domínguez, J., Champneys, A.R., "Stability and bifurcation analysis of a spinning space tether", *Journal of Nonlinear Science*, 16, 507-542, 2006.
16. García-Vallejo, D., Mikkola, A., Escalona, J.L., "A new locking-free shear deformable finite element based on absolute coordinates", *Nonlinear Dynamics*, 50, 249-264, 2007.
17. García-Vallejo, D., Mayo, J., Escalona, J.L., Domínguez, J., "Three-dimensional formulation of rigid-flexible multibody systems with flexible beam elements", *Multibody System Dynamics*, 20, 1 – 28, 2008.
18. Escalona, J.L., Chamorro, R., "Stability analysis of vehicles on circular motions using multibody dynamics", *Nonlinear Dynamics*, 53, 237-250, 2008.
19. Rathod, C., Chamorro, R., Escalona, J.L., El-Sibaie, M., Shabana, A.A., "Validation of three-dimensional multibody system approach for modeling track flexibility", *IMEchE Journal of Multi-body Dynamics*, 223, 269-282, 2009.
20. Chamorro, R., Escalona, J.L., González, M.J., "An approach for modelling long flexible bodies with application to railroad dynamics", *Multibody System Dynamics*, 26, 135–152, 2011.
21. Recuero, A.M., Escalona, J.L., Shabana, A.A., "Finite element analysis of unsupported sleepers using three-dimensional wheel/rail contact formulation", *IMEchE Journal of Multi-body Dynamics*, 225(2), 153-165, 2011.

22. LUGRÍS, U., ESCALONA, J.L., DOPICO, D., CUADRADO, J., "Efficient and accurate simulation of the rope-sheave interaction in weight-lifting machines", *IMechE Journal of Multi-body Dynamics*. Special Issue paper, 225, 331-343, 2011.
23. Escalona, J.L., Recuero, A.M., "A bicycle model for education in multibody dynamics and real-time interactive simulation", *Multibody System Dynamics*, 27, 383-402, 2012.
24. Escalona, J.L., Park, T.W., Zaazaa, K.E., "Guest Editorial", *ASME Journal of Computational and Nonlinear Dynamics*, 7(4), 2012.
25. Harper, M.B., Recuero, A.M., Escalona, J.L., Shabana, A.A., "Use of finite element and finite segment methods in modeling rail flexibility: a comparative study", *ASME Journal of Computational and Nonlinear Dynamics*, 7(4), 2012.
26. Escalona, J.L., Chamorro, R., Recuero, A.M., "Description of methods for eigenvalue analysis of railroad vehicles including track flexibility", *ASME Journal of Computational and Nonlinear Dynamics*, 7(4), 2012.
27. Recuero, A.M., Escalona, J.L., Chamorro, R., "A trajectory frame-based dynamic formulation for railroad vehicle simulation", *International Journal of Railway Technology*, 1(2), pp. 21-44, 2012.
28. Escalona, J.L., Sugiyama, H., Shabana, A.A., "Modelling structural flexibility in multibody railroad vehicle systems", *Vehicle System Dynamics*, 51(7), pp.1027-1058, 2013.
29. Recuero, A.M., Escalona, J.L., "Application of the trajectory coordinate system and the moving modes method approach to railroad dynamics using Krylov subspaces", *Journal of Sound and Vibration*, 332(20), 5177-5191, 2013.
30. Recuero, A.M., Escalona, J.L., "Dynamics of the coupled railway vehicle-flexible track system with irregularities using a multibody approach with moving modes", *Vehicle System Dynamics*, 52(1), pp. 45-67, 2013.
31. Chamorro, R., Escalona, J.L., Recuero, A.M., "Stability analysis of multibody systems with long flexible bodies using the moving modes method and its application to railroad dynamics", *ASME Journal of Computational and Nonlinear Dynamics*, 9, 2014.
32. Recuero, A.M., Aceituno, J.F., Escalona, J.L., Shabana, A.A., "A nonlinear approach for modeling rail flexibility using the absolute nodal coordinate formulation", *Nonlinear Dynamics*, 83, pp. 463-481, 2016.
33. Recuero, A.M., Escalona, J.L., "Analytical and numerical validation of a moving modes method for traveling interaction on long structures", *ASME Journal of Computational and Nonlinear Dynamics*, 11, 2016.
34. Halminen, O., Aceituno, J.F., Escalona, J.L., Sopanen, J., Mikkola, A., "A touchdown bearing with surface waviness: Friction loss analysis", *Mechanism and Machine Theory*, 110, 73-84, 2017.
35. Halminen, O., Aceituno, J.F., Escalona, J.L., Sopanen, J., Mikkola, A., "A touchdown bearing with surface waviness: A dynamic model using a multibody approach", *Journal of Multi-Body Dynamics*, 2017.
36. Halminen, O., Aceituno, J.F., Escalona, J.L., Sopanen, J., Mikkola, A., "Models for dynamic analysis of backup ball bearings of an AMB-system", *Mechanical Systems and Signal Processing*, 95, 324-344, 2017.
37. Escalona, J.L., "An arbitrary Lagrangian-Eulerian discretization method for modelling and simulation of reeving systems in multibody dynamics", *Mechanism and Machine Theory*, 112, 1-21, 2017.
38. Aceituno, J.F., Chamorro, R., García-Vallejo, D., Escalona, J.L., "On the design of a scaled railroad vehicle for the validation of computational models", *Mechanism and Machine Theory*, 115, 60-76, 2017.
39. Escalona J.L., Orzechowski, G., Mikkola, A.M., "Flexible multibody modelling of reeving systems including transverse vibrations", *Multibody System Dynamics*, 44, 107-133, 2018.
40. Escalona J.L., Kłodowski, A., Muñoz, S., "Validation of multibody modelling and simulation using an instrumented bicycle: from the computer to the road", *Multibody System Dynamics*, 43(4) 297-319, 2018.
41. Escalona, J.L., Aceituno, J.F., "Multibody simulation of railroad vehicles with contact lookup tables", *International Journal of Mechanical Sciences*, 155, 571-582, 2019.
42. Muñoz, S., Aceituno, J.F., Urda, P., Escalona J.L. "Multibody model of railway vehicles with weakly coupled vertical and lateral dynamics", *Mechanical Systems and Signal Processing*, 115, 570-592, 2019.
43. Aceituno, J.F., Muñoz, S., Chamorro R., Escalona J.L. "An alternative procedure to measure track irregularities. Application to a scaled track", *Measurement*, 137, 417-427, 2019.

44. Escalona, J.L., Aceituno, J.F., Urda, P., Balling, O., “Railway multibody simulation with the knife-edge-equivalent wheel-rail constraint method”, *Multibody System Dynamics*, 48, 373-402, 2020.
45. Urda, P., Muñoz, S., Aceituno, J.F., Escalona, J.L., “Wheel-rail contact force measurement using strain gauges and distance lasers on a scaled railway vehicle”, *Mechanical Systems and Signal Processing*, 138, 2020.
46. Aceituno, J.F., Urda, P., Briaies, E., Escalona J.L., “Analysis of the two-point wheel-rail contact scenario using the knife-edge-equivalent contact constraint method”, *Mechanism and Machine Theory*, 148, 2020.
47. Urda, P., Aceituno, J.F., Muñoz, S., Escalona, J.L., “Artificial neural networks applied to the measurement of lateral wheel-rail contact force: A comparison with a harmonic cancelation method”, *Mechanism and Machine Theory*, 153, 2020.
48. Urda, P., Muñoz, S., Aceituno, J.F., Escalona, J.L., “Application and experimental validation of a multibody model with a weakly coupled lateral and vertical dynamics to a scaled railway vehicle”, *Sensors*, 20, 3700, 2020.
49. Escalona, J.L., Yu, X., Aceituno, J.L., “Wheel-rail contact simulation with lookup tables and KEC profiles: A comparative study”, *Multibody System Dynamics*, 52, 339-375, 2021.
50. Escalona, J.L., Urda, P., Muñoz, S., “A track geometry measuring system based on multibody kinematics, inertial sensors and computer vision”, *Sensors*, 21, 683, 2021.
51. Muñoz, S., Ros, J., Urda, P., Escalona, J., “Estimation of lateral track irregularity through Kalman filtering techniques”, *IEEE Access*, 9, 2021.
52. Muñoz, S., Ros, J., Urda, P., Escalona, J., “Estimation of lateral track irregularity using a Kalman filter. Experimental validation”, *Journal of Sound and Vibration*, 504, 2021.
53. Urda, P., Aceituno, J.F., Muñoz, S., Escalona, J.L., “Measurement of railroad track irregularities using an automated recording vehicle”, *Measurements*, 183, 2021.
54. Briaies, E., Urda, P., Escalona, J.L., “Track frame approach for heading and attitude estimation in operating railways using on-board MEMS sensor and encoder”, *Measurements*, 184, 2021.
55. Muñoz, S., Urda, P., Escalona, J., “Experimental measurement of track irregularities using a scaled track recording vehicle and Kalman filtering techniques”, *Mechanical Systems and Signal Processing*, 169, 2022.
56. Yu, X., Aceituno, J.F., Kurivnen, E., Matikainen, M.K., Korkealaakso, P., Rouinen, A., Jiang, D., Escalona, J.L., Mikkola, A., “Comparison of numerical and computational aspects between two constraint-based contact methods in the description of wheel/rail contacts”, *Multibody System Dynamics*, 54, 303-344, 2022.
57. Escalona, J.L., Mohammadi, N., “Advances in the modeling and dynamic simulation of reeving systems using the arbitrary Lagrangian-Eulerian modal method”, *Nonlinear Dynamics*, 108, 3985-4003, 2022.
58. Orzechowski, G., Escalona, J.L., Dmitrochenko, O., Mohammadi, N., Mikkola, A., “Modeling viscous damping for transverse oscillations in reeving systems using the Arbitrary Lagrangian-Eulerian approach”, *Journal of Sound and Vibration*, 534, 2022.
59. Chamorro, R., Aceituno, J.F., Urda, P., del Pozo, E., Escalona, J.L., “Design and manufacture of a scaled railway track with mechanically variable geometry”, *Scientific Reports*, 12, 2022.
60. Yu, X., Mikkola, A., Pan, Y., Escalona, J.L., “The explanation of two semi-recursive multibody methods for educational purpose”, *Mechanism and Machine Theory*, 175, 2022.
61. González-Carbajal, J., Urda, P., Muñoz, S., Escalona, J.L., “Estimation of the trajectory and attitude of railway vehicles using inertial sensors with application to track geometry measurement”, *Vehicle System Dynamics*, 2023.
62. Escalona, J.L., “An analytical solution of the rope-sheave contact in static conditions based on a bristle model”, *Mechanism and Machine Theory*, 185, 2023.
63. Blanco, B., Escalona, J.L., Lambert, R., Ling, R., Balling, O., “On the definition and effect of optimum gear microgeometry modifications for the gearbox of an offshore 10-MW wind turbine”, *Wind Energy*, 2023.
64. Muñoz, S., Urda, P., Yu, X., Mikkola, A., Pan, Y., Escalona, J.L., “Real time measurement of track irregularities using an instrumented axle and Kalman filter techniques”, *ASME Journal of Computational and Nonlinear Dynamics*, 18, 2023.