Mauricio Espinoza B.

Curriculum Vitae

Academic background

2014-2018 **Doctor of Engineering (Dr.-Ing.)**, *University of Chile*, Chile.
Research area: Modular Multilevel Converters applied to control of high power machines and interface of renewable energy resources to the grid.

2011-2012 **Licentiate Degree (Lic.)**, *University of Costa Rica*, Costa Rica.
Thesis title: Robust PID Control for First Order Non-Synchronous Models.

2005-2010 **Bachelor of Applied Science (B.A.Sc.)**, *University of Costa Rica*, Costa Rica.
Thesis title: Induction Motor AC Drive Simulation for Automotive Propulsion Applications.

Interests

Modular multilevel converters, wave energy conversion systems, micro-grids, power conversion for renewable energy resources, electrical drives.

Work Experience

2010-2014, 2018-present *Full-time Instructor at the University of Costa Rica, Department of Electrical Engineering. A researcher at Control Engineering Research Laboratory and Power Conversion Group. Courses taught: Linear Circuits I, System Analysis, Control Systems, Control Systems Laboratory, Data acquisition and GUIs design.*

Research and development activities

2020-present *Associate Editor of the IET Journal on Power Electronics.*

2015-present *Reviewer in research journals, including: IEEE Transactions on Industrial Electronics, IEEE Transactions on Power Electronics, IEEE Transactions on Emerging and Selected Topic on Power Electronics, IEEE Transactions on Industry Applications, IET Journal of Engineering.*

2019-2023 *AC-AC Modular Multilevel Converters for Large-Power Wind Energy Conversion Systems (DICYT 091813DD).* Funded by the University of Santiago de Chile.

2019-2023 *Control and Evaluation of Multi-Level Modular Converters Operating as Wind Energy Conversion Systems (B9242).* Funded by the University of Costa Rica.

2019-2020 *Design and manufacture of the electronic system of an ultra-fast broad-spectrum fiber optic laser for biomedical applications (B9716).* Funded by the University of Costa Rica.

2018-2021 *Modular Multilevel Technologies For Future Generations of High Power Machine (Fondecyt Project 1180879).* Funded by Government of Chile.

2016-2019 *All Electrical Drive train for Marine Energy Converters (United Kingdom, Project EP/N021452/1).* Funded by Engineering and Physical Sciences Research Council (EPSRC).

2014-2018 *Modular Multilevel Converter Technologies for High Power Drives (Fondecyt Project 1140337).* Funded by Government of Chile.

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2012-2014 *Support to the Automation of Systems and Processes in Nuclear Facilities (RLA1011)*. Funded by International Atomic Energy Agency (IAEA).

2012-2014 *Development and Strengthening of Research in Control Systems in the School of Electrical Engineering (Costa Rica, B2727)*. Funded by the University of Costa Rica.

2009-2013 *Updated Knowledge, Introducing New Techniques and Improving the Quality of the Activities of Nuclear Instrumentation (RLA/4/022)*. Funded by International Atomic Energy Agency (IAEA).

Publications

Journal papers

2020 E. Espina, R. Cárdenas-Dobson, **M. Espinoza-B.**, C. Burgos-Mellado and D. Sáez, "Cooperative Regulation of Imbalances in Three-Phase Four-Wire Microgrids Using Single-Phase Droop Control and Secondary Control Algorithms," in IEEE Transactions on Power Electronics, vol. 35, no. 2, pp. 1978-1992, Feb. 2020. doi: 10.1109/TPEL.2019.2917653. URL: `http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8718359&isnumber=8903439`.

2019 A. Mora, R. Cardenas, M. Urrutia, **M. Espinoza** and M. Diaz, "A Vector Control Strategy to Eliminate Active Power Oscillations in 4-Leg Grid-Connected Converters Under Unbalanced Voltages," in IEEE Journal of Emerging and Selected Topics in Power Electronics. doi: 10.1109/JESTPE.2019.2921536. URL: `http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8732350&isnumber=6507303`.

2019 Y. Muñoz-Jadán, **M. Espinoza-Bolaños**, F. Donoso Merlet, R. Hidalgo-León, G. Soriano Idrovo and P. Jácome-Ruíz, "Hardware-in-the-Loop for Wind Energy Conversion with Resonant Current Control and Active Damping," in IEEE Latin America Transactions, vol. 17, no. 07, pp. 1146-1154, July 2019. doi: 10.1109/TLA.2019.8931203. URL: `http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8931203&isnumber=8931191`.

2019 M. Díaz, R. Cardenas, **M. Espinoza**, F. Rojas, C. Hackl, J. Clare and P. Wheeler, Vector Control of a Modular Multilevel Matrix Converter Operating Over the Full Output-Frequency Range," in IEEE Transactions on Industrial Electronics, vol. 66, no. 7, pp. 5102-5114, July 2019. doi: 10.1109/TIE.2018.2870367. URL: `http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8469159&isnumber=8657433`.

2019 **M. Antonio Espinoza Bolaños**, M. Díaz, F. Donoso, A. Letelier and R. Cárdenas, "Control and operation of the MMC-based drive with reduced capacitor voltage fluctuations," in The Journal of Engineering, vol. 2019, no. 17, pp. 3618-3623, 6 2019. doi: 10.1049/joe.2018.8080. `URL:http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8737272&isnumber=8737023`.

2019 S. P. McDonald, N. J. Baker, **M. Espinoza** and V. Pickert, "Power-take-off topology comparison for a wave energy converter," in The Journal of Engineering, vol. 2019, no. 18, pp. 5012-5017, 7 2019. doi: 10.1049/joe.2018.9345. URL: `http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8804884&isnumber=8804848`.

2019 M. Diaz, **M. Espinoza**, F. Rojas, P. Wheeler and R. Cardenas, "Vector control strategies to enable equal frequency operation of the modular multilevel matrix converter," in The Journal of Engineering, vol. 2019, no. 17, pp. 4214-4219, 6 2019. doi: 10.1049/joe.2018.8028. URL: `http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8737061&isnumber=8737023`.

2019 A. Mora, M. Urrutia, R. Cardenas, A. Angulo, **M. Espinoza**, M. Diaz, and P. Lezana. "Model-Predictive-Control-Based Capacitor Voltage Balancing Strategies for Modular Multilevel Converters," in IEEE Transactions on Industrial Electronics, vol. 66, no. 3, pp. 2432-2443, March 2019. doi: 10.1109/TIE.2018.2844842. URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8384287&isnumber=8519637.

2019 **M. Espinoza**, R. Cárdenas, J. Clare, D. Soto-Sanchez, M. Diaz, E. Espina and C. M. Hackl, "An Integrated Converter and Machine Control System for MMC-Based High-Power Drives," in IEEE Transactions on Industrial Electronics, vol. 66, no. 3, pp. 2343-2354, March 2019. doi: 10.1109/TIE.2018.2801839. URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8281073&isnumber=8519637.

2017 M. Diaz, R. Cardenas, **M. Espinoza**, F. Rojas, A. Mora, J. C. Clare, and P. Wheeler. "Control of Wind Energy Conversion Systems Based on the Modular Multilevel Matrix Converter," in IEEE Transactions on Industrial Electronics, vol. 64, no. 11, pp. 8799-8810, Nov. 2017. doi: 10.1109/TIE.2017.2733467. URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7995125&isnumber=8062949.

2017 **M. Espinoza**, R. Cárdenas, M. Díaz and J. C. Clare, "An Enhanced dq-Based Vector Control System for Modular Multilevel Converters Feeding Variable-Speed Drives," in IEEE Transactions on Industrial Electronics, vol. 64, no. 4, pp. 2620-2630, April 2017. doi: 10.1109/TIE.2016.2637894. URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7781663&isnumber=7874245

Conference papers

2019 J. Lillo, F. Rojas, D. Verdugo, M. Diaz, J. Pereda, G. Gatica, **M. Espinoza**. "Dynamic DC-Link Voltage Control of Back to Back Modular Multilevel Converter for Drive Applications," IECON 2019 - 45th Annual Conference of the IEEE Industrial Electronics Society, Lisbon, Portugal, 2019, pp. 6120-6126. doi: 10.1109/IECON.2019.8927583. URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8927583&isnumber=8926608.

2019 E. Ibaceta, M. Diaz, A. Duran, F. Rojas, **M. Espinoza** and A. Mora. "Vector Control of a Modular Multilevel Matrix Converter for Variable-Speed Drive Applications". In CHILECON19, Valparaíso, Chile, 29 - 31, October, 2019.

2019 **M. Espinoza**, R. Cardenas, M. Diaz, F.Donoso, E. Espina, A. Letelier, A. Mora. "Effects of a Variable dc-Port Voltage on the Half-Bridge-Based Modular Multilevel Converter for Drive Systems," 2019 21st European Conference on Power Electronics and Applications (EPE '19 ECCE Europe), Genova, Italy, 2019, pp. P.1-P.10. doi: 10.23919/EPE.2019.8915500. URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8915500&isnumber=8914733.

2019 M. Rodríguez, **M. Espinoza**, R. Cárdenas, S. McDonald and N. Baker, "A Novel Topology and Control System for Interconnected Wave Energy Converters (IWECs)," 2019 21st European Conference on Power Electronics and Applications (EPE '19 ECCE Europe), Genova, Italy, 2019, pp. 1-10. doi: 10.23919/EPE.2019.8914970. URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8914970&isnumber=8914733.

2019 E. Espina, R. Cárdenas, F. Donoso, M. Urrutia and **M. Espinoza**, "A Novel Distributed Secondary Control Strategy Applied to Hybrid AC/DC Microgrids," 2019 21st European Conference on Power Electronics and Applications (EPE '19 ECCE Europe), Genova, Italy, 2019, pp. P.1-P.9. doi: 10.23919/EPE.2019.8915135. URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8915135&isnumber=8914733.

2019 F. Donoso, A. Mora, **M. Espinoza**, M. Urrutia, E. Espina and R. Cardenas, "Predictive-based Modulation Schemes for the Hybrid Modular Multilevel Converter," 2019 21st European Conference on Power Electronics and Applications (EPE '19 ECCE Europe), Genova, Italy, 2019, pp. P.1-P.9. doi: 10.23919/EPE.2019.8914876. URL. http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8914876&isnumber=8914733.

2019 C. Melendez, M. Diaz, F. Rojas, R. Cardenas and **M. Espinoza**, "Control of a Double Fed Induction Generator based Wind Energy Conversion System equipped with a Modular Multilevel Matrix Converter," 2019 Fourteenth International Conference on Ecological Vehicles and Renewable Energies (EVER), Monte-Carlo, Monaco, 2019, pp. 1-11. doi: 10.1109/EVER.2019.8813552. URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8813552&isnumber=8813510.

2018 C. Contreras, D. Guajardo, M. Diaz, F. Rojas, **M. Espinoza** and R. Cardenas, "Fast Delayed Signal Cancellation based PLL for unbalanced grid conditions," 2018 IEEE International Conference on Automation/XXIII Congress of the Chilean Association of Automatic Control (ICA-ACCA), Concepcion, 2018, pp. 1-6. doi: 10.1109/ICA-ACCA.2018.8609741. URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8609741&isnumber=8609696.

2018 F. Donoso, **M. Espinoza**, M. Diaz, A. Letelier and R. Cardenas, "Back-to-Back Modular Multilevel Converter for drive applications under unbalanced grid conditions," 2018 20th European Conference on Power Electronics and Applications (EPE'18 ECCE Europe), Riga, 2018, pp. P.1-P.10. URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8515322&isnumber=8515301.

2018 **M. Espinoza**, F. Donoso, E. Espina, M. Diaz and R. Cardenas, "A Novel Control Strategy for Modular Multilevel-Based Drives Considering the System Operating Point," 2018 20th European Conference on Power Electronics and Applications (EPE'18 ECCE Europe), Riga, 2018, pp. P.1-P.10. URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8515624&isnumber=8515301.

2018 M. Diaz, F. Rojas, F. Donoso, R. Cardenas, **M. Espinoza**, A. Mora, and P. Wheeler. "Control of modular multilevel cascade converters for offshore wind energy generation and transmission," 2018 Thirteenth International Conference on Ecological Vehicles and Renewable Energies (EVER), Monte-Carlo, 2018, pp. 1-10. doi: 10.1109/EVER.2018.8362406. URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8362406&isnumber=8362327.

2017 E. Espina, **M. Espinoza** and R. Cárdenas, "Active power angle droop control per phase for unbalanced 4-wire microgrids," 2017 IEEE Southern Power Electronics Conference (SPEC), Puerto Varas, 2017, pp. 1-6. doi: 10.1109/SPEC.2017.8333637. URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8333637&isnumber=8333542

2017 M. Diaz, F. Rojas, **M. Espinoza**, A. Mora, P. Wheeler and R. Cardenas, "Closed loop vector control of the modular multilevel matrix converter for equal input-output operating frequencies," 2017 IEEE Southern Power Electronics Conference (SPEC), Puerto Varas, 2017, pp. 1-6. doi: 10.1109/SPEC.2017.8333629. URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8333629&isnumber=8333542.

2017 **M. Espinoza**, M. Díaz, E. Espina, C. M. Hackl and R. Cardenas, "Control strategies for modular multilevel converters driving cage machines," 2017 IEEE Southern Power Electronics Conference (SPEC), Puerto Varas, 2017, pp. 1-6. doi: 10.1109/SPEC.2017.8333628. URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8333628&isnumber=8333542.

2017 F. Rojas, M. Díaz, **M. Espinoza** and R. Cárdenas, "A solid state transformer based on a three-phase to single-phase Modular Multilevel Converter for power distribution networks," 2017 IEEE Southern Power Electronics Conference (SPEC), Puerto Varas, 2017, pp. 1-6. doi: 10.1109/SPEC.2017.8333627. URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8333627&isnumber=8333542.

2016 M. Diaz, R. Cárdenas, **M. Espinoza**, A. Mora and P. Wheeler, "Modelling and control of the Modular Multilevel Matrix Converter and its application to Wind Energy Conversion Systems," IECON 2016 - 42nd Annual Conference of the IEEE Industrial Electronics Society, Florence, 2016, pp. 5052-5057. doi: 10.1109/IECON.2016.7793945. URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7793945&isnumber=7792929.

2016 A. Mora, R. Cárdenas, **M. Espinoza** and M. Díaz, "Active power oscillation elimination in 4-leg grid-connected converters under unbalanced network conditions," IECON 2016 - 42nd Annual Conference of the IEEE Industrial Electronics Society, Florence, 2016, pp. 2229-2234. doi: 10.1109/IECON.2016.7792960. URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7792960&isnumber=7792929.

2016 **M. Espinoza**, R. Cárdenas, M. Díaz, A. Mora and D. Soto, "Modelling and control of the modular multilevel converter in back to back configuration for high power induction machine drives," IECON 2016 - 42nd Annual Conference of the IEEE Industrial Electronics Society, Florence, 2016, pp. 5046-5051. doi: 10.1109/IECON.2016.7793979. URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7793979&isnumber=7792929.

2016 M. Díaz, **M. Espinoza**, A. Mora, R. Cárdenas and P. Wheeler, "The application of the modular multilevel matrix converter in high-power wind turbines," 2016 18th European Conference on Power Electronics and Applications (EPE'16 ECCE Europe), Karlsruhe, 2016, pp. 1-11. doi: 10.1109/EPE.2016.7695437. URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7695437&isnumber=7695111.

2016 **M. Espinoza**, E. Espina, M. Diaz, A. Mora and R. Cárdenas, "Improved control strategy of the modular multilevel converter for high power drive applications in low frequency operation," 2016 18th European Conference on Power Electronics and Applications (EPE'16 ECCE Europe), Karlsruhe, 2016, pp. 1-10. doi: 10.1109/EPE.2016.7695557. URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7695557&isnumber=7695111.

2015 M. Díaz, R. Cardenas, **M. Espinoza**, A. Mora and F. Rojas, "A novel LVRT control strategy for Modular Multilevel Matrix Converter based high-power Wind Energy Conversion Systems," 2015 Tenth International Conference on Ecological Vehicles and Renewable Energies (EVER), Monte Carlo, 2015, pp. 1-11. doi: 10.1109/EVER.2015.7113026. URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7113026&isnumber=7112913.

2015 A. Mora, **M. Espinoza**, M. Díaz and R. Cárdenas, "Model Predictive Control of Modular Multilevel Matrix Converter," 2015 IEEE 24th International Symposium on Industrial Electronics (ISIE), Buzios, 2015, pp. 1074-1079. doi: 10.1109/ISIE.2015.7281621. URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7281621&isnumber=7281431.

2015 **M. Espinoza**, J. D. Rojas, R. Vilanova and O. Arrieta, "Robustness/performance tradeoff for anisochronic plants with two degrees of freedom PID controllers," 2015 IEEE Conference on Control Applications (CCA), Sydney, NSW, 2015, pp. 1230-1235. doi: 10.1109/CCA.2015.7320780. URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7320780&isnumber=7320604.

2015 **M. Espinoza**, J.D. Rojas, R. Vilanova, O. Arrieta. Identification and Control of Chemical Processes Using the Anisochronic Modeling Paradigm, *9th International Symposium on Advanced Control of Chemical Processes of the International Federation of Automatic Control (ADCHEM)*, June 7-10, 2015, Whistler, British Columbia, Canada. URL: https://doi.org/10.1016/j.ifacol.2015.08.208.

2015 **M. Espinoza**, A. Mora, M. Díaz, R. Cárdenas, "Balancing energy and low frequency operation of the Modular Multilevel Converter in Back to Back configuration," 2015 Tenth International Conference on Ecological Vehicles and Renewable Energies (EVER), Monte Carlo, 2015, pp. 1-9. doi: 10.1109/EVER.2015.7113005. URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7113005&isnumber=7112913.