University Academic Curriculum Vitae

Personal Information Santos Miguel Orozco Soto

Education since leaving school

- 2009 Bachelor of Electronics and Communications Engineering. Universidad Tecnológica de México
- 2011 Master of Science in Mechatronics. Universidad Politécnica de Pachuca
- 2020 Doctor of Science in Automatic Control. Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional

Present appointment

- Full Professor
- February 1st, 2023
- Universidad Autónoma de la Ciudad de México (UACM)
- Teaching undergraduate courses at the Industrial Electronic Systems Engineering program. Research in Automatic Control theory and applications. Graduate and undergraduate thesis supervision. Collaboration with the master degree program in Energy Engineering.

Professional experience

From / to	Job title	Name of academic Institution	Academic level	responsibilities
2020 - 2022	Postdoctoral researcher	Universitá degli Studi di Napoli Federico II	graduate	Research in development of control systems for aerial manipulators
2015	Associate professor	Universidad Tecnológica del Norte de Aguascalientes	undergraduate	Teaching, research, Mechatronics Engineering Academy Management, thesis supervision
2009 - 2015	Consultant Engineer	Self employment	undergraduate	Industrial automation and networking equipment installation

Experience in academic teaching

- **Universidad Autónoma de la Ciudad de México**
  - **Undergraduate courses:** Signal conditioning and amplification (2023), Metrology and instrumentation (2023), Power electronics I (2023), Digital control (2023), Power electronics II (2024, English), Robotics (2024, English), Programmable logic controllers (2024, English), Process automation (2024, English), Industrial Control Networks (2024, English).

- **Universidad Panamericana**
  - **Graduate courses:** Mobile robotics (2023, 2024), Robotics (2023, 2024).

- **Universidad Tecnológica de México**
  - **Graduate courses:** Electronics (2020), Logical design (2020, 2021), Electrical circuits (2020, 2021).

- **Universidad Tecnológica Metropolitana de Aguascalientes**
  - **Graduate courses:** AC motors control (2019, English), Electrical circuits (2019, English).

- **Postgraduate supervision (PhD level):**
  - Daniela Vazquez – Control of humanoid robots interacting with the environment. Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional
  - Hameed Ullah – Control of aerial manipulators interacting with the environment. Universitá degli Studi di Napoli Federico II

Other academic responsibilities

- **Conference and symposia organization**
  - Engineering Symposium organizer (UACM 2023, 2024)
  - Energy Engineering Students Conference organizer (UACM 2024)

- **Study programs review**
  - Industrial Electronic Systems Engineering Program curricula reviewer (UACM 2023, 2024)

Research and scholarships

- **Current research**
  - 2020 – 2024 Aerial manipulators interacting with the environment (3 journal papers, 1 int. conf. paper, 1 book chapter, 1 Ph.D. student mentoring)
  - 2022 – 2024 Control of humanoid robots interacting with the environment (1 journal paper, 1 int. conf. paper, 1 Ph.D. student supervision)
  - 2023 – 2024 Development of control strategies for electrical energy generation systems with renewable sources (1 journal paper)
- **Past research**
  - 2016 – 2020 Robust control of humanoids and UAVs (5 int. conf. papers, 1 journal paper)
  - 2018 Development of robotic systems for rehabilitation purposes (2 book chapters, 1 journal paper)

Date granted	Award Holder(s)	Funding Body	Title	Amount received
May 2023 – May 2024	Santos Miguel Orozco Soto	Science and Technology College, Universidad Autónoma de la Ciudad de México	Impact Research Project	3,000 EUR
January 2023 – December 2025	Santos Miguel Orozco Soto	National Sciences and Technology Council (CONAHCYT)	Candidate to National Researcher scholarship	400 EUR monthly
January 2016 - December 2019	Santos Miguel Orozco Soto	National Sciences and Technology Council (CONAHCYT)	Scholarship for national doctoral studies	800 EUR monthly

Publications

[1] Vazquez Muñoz, S.D., Ibarra Zannatha, J.M. and *Orozco Soto, S.M.*, 2024. Robust Balance of Humanoid Robots Through a LQR with Integral Action. *Journal of Control, Automation and Electrical Systems*, p.1-19. **DOI:** 10.1109/COMRob60035.2023.10349716

[2] *Orozco Soto, S.M.*, and Lippiello, V., 2024. Increasing Horizontal Controlled Force Delivery Capabilities of Aerial Manipulators by Leveraging the Environment. *Robotics*, *13*(10), p.147. **DOI:**

10.3390/robotics13100147.
[3] Rodríguez, M., Jara, R., Baes, M., López, Y. and *Orozco, S.*, 2024. Closed-loop Speed Control for a Three-Phase Alternating-Current Motor using a Modbus Network. *Revista Politécnica*, *54*(1), pp.25-32. **DOI:** https://doi.org/10.33333/rp.vol54n1.03

[4] Ullah, H., D'Angelo, S., Ruggiero, F., Lippiello, V. and *Orozco Soto, S.M.*, 2024, May. Horizontal Sustained Force Delivery with an Aerial Manipulator Using Hybrid Force/Position Control. In *2024 25th International Carpathian Control Conference (ICCC)* (pp. 1-5). IEEE. **DOI:** 10.1109/ICCC62069.2024.10569948

[5] González Dorantes, A.N. and *Orozco Soto, S.M.*, 2024. Realimentación Visual Robusta para el Control de un Robot Manipulador con Actuadores de Posición. *Ingeniería Electrónica, Automática y Comunicaciones*, *45*(1), pp.38-50.

[6] *Orozco-Soto, S.M.*, Cuniato, E., Cacace, J., Selvaggio, M., Ruggiero, F., Lippiello, V. and Siciliano, B., 2023. Aerial manipulator interaction with the environment. In *Control of Autonomous Aerial Vehicles: Advances in Autopilot Design for Civilian UAVs* (pp. 319-347). Cham: Springer Nature Switzerland. **DOI:** 10.1007/978-3-031-39767-7_12

[7] Vazquez Muñoz, S.D., Ibarra Zannatha, J.M. and *Orozco Soto, S.M.*, 2023, November. Optimal Control for the Humanoid Robots Balance. In *2023 IEEE XXV Robotics Mexican Congress (COMRob)* (pp. 31-36). IEEE. **DOI:** 10.1109/COMRob60035.2023.10349716

[8] *Orozco Soto, S.M.*, Ruggiero, F. and Lippiello, V., 2022. Globally attractive hyperbolic control for the robust flight of an actively tilting quadrotor. *Drones*, *6*(12), p.373. **DOI:** 10.3390/drones6120373

[9] *Orozco Soto, S.M.*, Cacace, J., Ruggiero, F. and Lippiello, V., 2022. Active disturbance rejection control for the robust flight of a passively tilted hexarotor. *Drones*, *6*(9), p.258. **DOI:** 10.3390/drones6090258

[10] *Orozco-Soto, S.M.*, Ibarra-Zannatha, J.M. and Kheddar, A., 2022, August. Robust position regulation of a seesaw actuated by a humanoid. In *2022 IEEE 18th International Conference on Automation Science and Engineering (CASE)* (pp. 1315-1320). IEEE. **DOI:** 10.1109/CASE49997.2022.9926663

[11] *Orozco-Soto, S.M.*, Ibarra-Zannatha, J.M. and Kheddar, A., 2021, October. Gait Synthesis and Biped Locomotion Control of the HRP-4 Humanoid. In *2021 IEEE XXIII Robotics Mexican Congress (ComRob)* (pp. 68-74). IEEE. **DOI:** 10.1109/ComRob53312.2021.9628845

[12] Flores-Salgado, G., Quijano, G., Vital-Jácome, M., Buitrón, G., *Orozco-Soto, S.M.,* Vera-Bustamante, P., Zannatha, J.M.I. and Thalasso, F., 2021. Novel photo-microrespirometric method for the rapid determination of photosynthesis-irradiance (PI) curves in microalgal-bacterial systems. *Algal Research*, *58*, p.102414. **DOI:** 10.1016/j.algal.2021.102414

[13] Cacace, J., *Orozco-Soto, S.M.*, Suarez, A., Caballero, A., Orsag, M., Bogdan, S., Vasiljevic, G., Ebeid, E., Rodriguez, J.A.A. and Ollero, A., 2021. Safe local aerial manipulation for the installation of devices on power lines: Aerial-core first year results and designs. *Applied Sciences*, *11*(13), p.6220. **DOI:** 10.3390/app11136220

[14] Ramírez-Moreno, M.A., *Orozco-Soto, S.M.*, Ibarra-Zannatha, J.M. and Gutiérrez, D., 2019. Artificial vision algorithm for object manipulation with a robotic arm in a semi-autonomous brain-computer interface. In *Wearable Robotics: Challenges and Trends* (pp. 187-191). Springer International Publishing. **DOI:** 10.1007/978-3-030-

01887-0_36

[15] *Orozco-Soto, S.M.*, Pérez-SanPablo, A.I., Avila, E.R., Disselhorst-Klug, C. and Zannatha, J.M.I., 2019. Modelo neurodifuso para el control de un exoesqueleto para rehabilitación de brazo en pacientes con EVC. *Research in Computing Science*, *148*(7), pp.267-275.

[16] *Orozco-Soto, S.M.*, Pérez-Sanpablo, A.I., Vera-Bustamante, P. and Ibarra-Zannatha, J.M., 2019. Development of a Visual-Inertial Motion Tracking System for Muscular-Effort/Angular Joint-Position Relation to Obtain a Quantifiable Variable of Spasticity. In *Wearable Robotics: Challenges and Trends* (pp. 210-215). Springer International Publishing. **DOI:** 10.1007/978-3-030-01887-0_41

[17] González-Miranda, O., *Orozco-Soto, S.M.* and Zannatha, J.M.I., 2019. Control basado en campos potenciales para un vehículo autónomo usando realimentación visual. *Research in Computing Science*, *148*(8), pp.253-262.

[18] *Orozco-Soto, S.M.*, Vera-Bustamante, P. and Ibarra-Zannatha, J.M., 2018, September. ORB-SLAM based active disturbance rejection control for quadrotor autonomous flight. In *2018 IEEE XX Robotics Mexican Congress (COMRob)* (pp. 1-6). IEEE. **DOI:** 10.1109/COMROB.2018.8689410

[19] *Orozco-Soto, S.M.*, Ibarra-Zannatha, J.M., Malo-Tamayo, A.J. and Cureño-Ramirez, A., 2018, September. Active disturbance rejection control for UAV hover using ROS. In *2018 XX IEEE XX Robotics Mexican Congress (COMRob)* (pp. 1-5). IEEE. **DOI:** 10.1109/COMROB.2018.8689424

[20] Tamayo, A.J.M., Ríos, C.A.V., Zannatha, J.M.I. and *Soto, S.M.O.*, 2018. Quadrotor input-output linearization and cascade control. *IFAC-PapersOnLine*, *51*(13), pp.437-442. **DOI:** 10.1016/j.ifacol.2018.07.317

[21] *Orozco-Soto, S.M.*, Ibarra-Zannatha, J.M., Malo-Tamayo, A.J. and Cureño-Ramírez, A., 2017, October. Active disturbance rejection control for UAV pose regulation. In *2017 IEEE 14th International Conference on Electrical Engineering, Computing Science and Automatic Control (CCE)* (pp. 1-6). IEEE. **DOI:** 10.1109/ICEEE.2017.8108882

[22] Tamayo, A.J.M., Ríos, C.A.V., Zannatha, J.M.I. and *Soto, S.M.O.*, 2017, October. Multirotor modelling and simulation: Screws, SOA, Euler angles, quaternions, wind. In *2017 IEEE 14th International Conference on Electrical Engineering, Computing Science and Automatic Control (CCE)* (pp. 1-6). IEEE. **DOI:** 10.1109/ICEEE.2017.8108853

[23] *Orozco-Soto, S.M.* and Ibarra-Zannatha, J.M., 2017, October. Motion control of humanoid robots using sliding mode observer-based active disturbance rejection control. In *2017 IEEE 3rd colombian conference on automatic control (CCAC)* (pp. 1-8). IEEE. **DOI:** 10.1109/CCAC.2017.8276383

[24] *Orozco-Soto, S.M.* and Zannatha, J.M.I., 2017. Control con rechazo activo de perturbaciones para el equilibrio de robots humanoides. *Research in Compuing Science*, *135*, pp.159-171.

[25] *Orozco-Soto, S.M.*, Núnez-Cruz, R.S. and Ibarra-Zannatha, J.M., 2016, September. Active disturbance rejection control for humanoid stable walking. In *2016 IEEE 13th International Conference on Electrical Engineering, Computing Science and Automatic Control (CCE)* (pp. 1-6). IEEE. **DOI:** 10.1109/ICEEE.2016.7751242

[26] *Orozco-Soto, S.*, 2015. Control PD+ G Difuso Tipo 2 de Intervalo para Regulación de Posición de Robots Manipuladores. *Revista de Tecnología*, *2*(4), pp.899-909.

[27] *Orozco-Soto, S.M.* and Fernández, J.C.R., 2015. Control par

calculado difuso basado en pasividad para seguimiento de trayectorias de robots manipuladores. *Research in Compuing Science*, *91*, pp.131-141.

[28] *Orozco-Soto, S.M.*, Ramos-Fernández, J.C., García-Barrientos, A., Vilchis-Rodríguez, C.A. and Domínguez-Ramírez, O.A., 2013, May. Fuzzy sliding mode control for trajectory tracking and force compensation of a robotic haptic interface. In *2014 IEEE 14th International Carpathian Control Conference (ICCC)* (pp. 267-273). IEEE. **DOI:** 10.1109/CarpathianCC.2013.6560551

Further data

- **Awards**
  - Candidate to National Researcher (CONAHCYT, Mexico, 2023 – 2026)
- **Invited speaker**
  - 11th Engineering Symposium (UACM 2023) Conference: Modeling and control of aerial manipulators
- **Best student paper award**
  - Energy Program Student Conference (UACM 2023)

Entrepreneurship

- **Patent registration**
- Title: Microphotobioreactor for metabolic parameters measurement and determination in aquatic ecosystems
- Registration number: MX/E/2021/017495

Statement of interest

My primary research interest is the development of automatic control systems and their implementation to diverse types of robots. The control techniques that I master span from basic model-based approaches up to complex model-free robust controllers and observers. I make use of various technological tools such as programming, computer vision, power electronics, among other useful appliances to implement and assess the developed controllers. I look forward to keep on learning and sharing knowledge regarding robotics and control, so that my colleagues and I can contribute to the improvement of such disciplines.

Language competence

Spanish (mother tongue)
English B2 (certificate)
Italian (fluent)
French (basic)

Date: December 20th, 2024

Signature