Bernardo Martinez Rocamora Jr.

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RESEARCH INTERESTS

Aerial Robotics, Motion Planning, Autonomous Systems, Artificial Intelligence.

EDUCATION

2020-present **Ph.D. in Aerospace Engineering**
Advisor: Guilherme A. S. Pereira.
West Virginia University (WVU), Morgantown, WV. USA.

2015-2019 **M.Sc. in Mechanical Engineering**
Experimental Analysis of Fan Noise and Performance at the EESC-USP Fan Rig Workbench.
Advisor: Paulo C. Greco Jr.
University of São Paulo (USP), São Carlos, SP. Brazil.

2010-2015 **B.Sc. in Aeronautical Engineering**
Propeller Aerodynamic Design and Performance for a Commuter Aircraft.
Advisor: Hernán D. Cerón-Muñoz.
University of São Paulo (USP), São Carlos, SP. Brazil.

2013-2014 **B.Sc. in Aeronautics and Aerospace Engineering**
Brazil's Science without Borders program. "Sandwich" year.
University of Southampton (Soton), Southampton, UK.

PROFESSIONAL EXPERIENCE

2020-present **Graduate Research Assistant**
Field and Aerial Robotics (FARO) Laboratory. Department of Mechanical and Aerospace Engineering, Benjamin M. Statler College of Engineering and Mineral Resources, West Virginia University (WVU), Morgantown, WV 26505. USA. https://farolab.wvu.edu/.

2019 **Independent Consultant**
Mentor for Udacity's Sensor Fusion Nanodegree Program. https://www.udacity.com/.

2018-2019 **Design and Development Engineer**
Birdview DroneScan. Botucatu, SP. Brazil. https://birdview.com.br/.

2016-2018 **Graduate Research Assistant**

Fan Noise Research Group, Department of Aeronautical Engineering, São Carlos School of Engineering, University of São Paulo. São Carlos, SP. Brazil. http://www.saa.eesc.usp.br/.

2015 **Undergraduate Research Assistant**
Fan Noise Research Group, Department of Aeronautical Engineering, São Carlos School of Engineering, University of São Paulo. São Carlos, SP. Brazil. http://www.saa.eesc.usp.br/.

PROJECTS

Current Projects

2021-present **Cooperative Energy-aware Navigation of Hybrid Airships in the Atmosphere of Venus**
Sponsor: NASA.
Contributions: Development of a motion planning algorithm for a hybrid aerobot that aims the maximization the vehicle's lifetime, exploiting solar power and the natural wind flow in the atmosphere.

2020-present **Autonomous Robotic Early Warning System for Underground Stone Mining Safety**
Sponsor: Alpha Foundation.
Contributions: Design of the quadrotor that is part of a complex and fully operational unmanned ground-aerial vehicle (UGV/UAV) robotic system. Development of autonomy software integrating with open source autopilot PX4.

2020-present **Forestry Drones: Flight Under Trees Canopies**
Sponsor: Statler Ph.D. Fellowship.
Contributions: Development of motion planning and obstacle avoidance algorithms for autonomous flight of a drone under tree canopies without previous knowledge of the obstacles. Design of a caged drone for collision-resilient navigation in cluttered environments.

Past Projects

2020 **Parallel and Cloud Computation for Long-term Robotics**
Sponsor: Amazon Research Award.
Contributions: Parallelization of motion planning algorithms for the development of long-term autonomous mobile robots, also known as long-running robots, using CUDA toolkit.

2018-2019 **Automatic Dispensers for Agricultural Drones**
Sponsor: Birdview DroneScan.
Contributions: Design of embedded systems (automatic dispensers) of unmanned aerial vehicles for pest control in agriculture. Concept development, CAD modeling, PCB design and manufacturing, microcontroller programming, rapid prototyping, and assembly on DJI Phantom 3 and DJI Phantom 4 quadrotors.

2018-2019 **Seedling Survival with Computer Vision**
Sponsor: Birdview DroneScan.

Development of an image analysis software for counting trees and estimation of seedlings' survival rate using the open-source computer vision library (OpenCV) for a major Brazilian wood industry company.

2018-2019 **Land Evaluation Algorithms**
Sponsor: Birdview DroneScan.
Contributions: Development of algorithms for land and properties evaluation with satellite imagery and geospatial datasets using Google Earth Engine.

2016-2019 **Silence Project**
Sponsor: Embraer S.A. and Financiadora de Estudos e Projetos (FINEP).
Contributions: Responsible for the experimental activities of the aeroacoustics wind-tunnel EESC-USP Fan Rig including planning, conducting, and analyzing experiments. Design of an instrumented stator vane for a scaled-down version of the NASA Advanced Noise Control Fan. Research in the parametric characterization of fan noise and performance.

2015 **Silent Aircraft Project**
Sponsor: Embraer S.A. and Financiadora de Estudos e Projetos (FINEP).
Contributions: Design and manufacture of mechanical parts and instrumentation systems for the EESC-USP Fan Rig, including the wind-tunnel pressure measurement system, a throttling device, an inlet control device, and rotor-stator spacers.

PUBLICATIONS

Total number of publications: 11.

Peer-reviewed journal papers (3):

1. **Bernardo Martinez R. Jr.**, and Guilherme A. S. Pereira. "Parallel Sensor-Space Lattice Planner for Real-Time Obstacle Avoidance." Sensors 22.13 (2022): 4770.
2. Cagri Kilic*, **Bernardo Martinez R. Jr.***, Christopher A. Tatsch*, Jared Beard, Jared Strader, Shounak Das, Derek Ross, Yu Gu, Guilherme A. S. Pereira, and Jason N. Gross. "NASA Space Robotics Challenge 2 Qualification Round: An Approach to Autonomous Lunar Rover Operations." IEEE Aerospace and Electronic Systems Magazine 36, no. 12 (2021): 24-41. (*contributed equally)
3. André M. N. Spillere, Danilo S. Braga, Leonardo A. Seki, Lucas A. Bonomo, Julio A. Cordioli, **Bernardo Martinez R. Jr.**, Paulo C. Greco Jr., Danillo C. dos Reis, and Eduardo L. C. Coelho. "Design of a single degree of freedom acoustic liner for a fan noise test rig." International Journal of Aeroacoustics 20, no. 5-7 (2021): 708-736.

Peer-reviewed papers in international conferences (6):

1. **Bernardo Martinez R. Jr.**, Anna Puigvert I Juan, and Guilherme A. S. Pereira. "Towards Finding Energy Efficient Paths for Hybrid Airships in the Atmosphere of Venus." In 2022 International Conference on Unmanned Aircraft Systems (ICUAS). IEEE, 2022.

2. **Bernardo Martinez R. Jr.**, and Guilherme A. S. Pereira. "Fast Path Computation using Lattices in the Sensor-Space for Forest Navigation." In 2021 IEEE International Conference on Robotics and Automation (ICRA), pp. 1117-1123. IEEE, 2021.
3. Andre Spillere, Danilo S. Braga, Leonardo Seki, Lucas A. Bonomo, Julio A. Cordioli, **Bernardo Martinez R. Jr.**, Paulo C. Greco, Danillo C. Reis, and Eduardo L. Coelho. "Inlet liner design for a fan noise test rig." In 25th AIAA/CEAS Aeroacoustics Conference, p. 2724. 2019.
4. Rafael G. Cuenca , Paulo C. Greco Jr, and **Bernardo Martinez R. Jr.**. "Parametric Investigation of EESC-USP Aeroacoustic Fan Rig." In 31st Congress of the International Council of Aeronautics Sciences (ICAS). 2018.
5. **Bernardo Martinez R. Jr.**, Luciano C. Caldas, Rafael G. Cuenca, Rudner Lauterjung Q., Paulo C. Greco Jr.. "Design of an Instrumented Stator Vane for Unsteady Pressure Measurements using MEMS Microphones." In 31st Congress of the International Council of Aeronautics Sciences (ICAS). 2018.
6. **Bernardo Martinez R. Jr.**, Paulo C. Greco Jr., Luciano C. Caldas, Luiz A. Baccalá, Rafael G. Cuenca, and Rudner L. Queiroz. "Baseline acoustic levels of the EESC-USP fan rig." In 23rd AIAA/CEAS Aeroacoustics Conference, p. 3384. 2017.

Thesis (2):

1. **Bernardo Martinez Rocamora Jr.**. "Experimental analysis of fan noise and performance at the EESC-USP Fan Rig Workbench." M.Sc. thesis, Universidade de São Paulo, 2019.
2. **Bernardo Martinez Rocamora Jr.**. "Projeto aerodinâmico e performance de hélice para uma aeronave de transporte regional." B.Sc. thesis, Universidade de São Paulo, 2019. (In Portuguese)

HONORS/AWARDS

2021-present	Statler Ph.D. Fellowship. Benjamin M. Statler College of Engineering and Mineral Sciences, West Virginia University.
2020	Graduate Research Assistantship. West Virginia University.
2017-2018	Graduate Research Scholarship. Fundação para o Incremento da Pesquisa e do Aperfeiçoamento Industrial (FIPAI).
2016-2018	Master's Studies Scholarship. Conselho Nacional de Desenvolvimento Cientifico e Tecnológico (CNPq).
2015	Undergraduate Research Scholarship. Conselho Nacional de Desenvolvimento Cientifico e Tecnológico (CNPq).
2013-2014	Science Without Borders Scholarship. Conselho Nacional de Desenvolvimento Cientifico e Tecnológico (CNPq).

REVIEWER WORK

- IEEE Robotics and Automation Letters (RA-L).
- IEEE International Conference on Robotics and Automation (ICRA).

- IEEE International Conference on Intelligent Robots and Systems (IROS).
- Journal of Navigation.

DEVELOPMENT EXPERIENCE

Design of Autonomous Vehicles and Robots (in collaboration with others):

- Tether-powered drone.
- Caged drone.
- Automatic dispenser drones.

Software Experience:

- Languages: C++, Matlab, Python, JavaScript.
- Libraries and Tools: Robot Operating System (ROS), Open Motion Planning Library (OMPL), Open-source Computer Vision Library (OpenCV), Point Cloud Library (PCL), Boost Graph Library (BGL), CUDA toolkit, Open-source Autopilot (PX4).
- Simulation: Gazebo, CoppeliaSim, StarCCM+, ANSYS.
- CAD: Solidworks, SolidEdge, Autodesk Inventor, Fusion 360, CATIA.
- Operating Systems: Linux, MS Windows.

Experience with Commercial Robots and Sensors:

- Aerial robots: DJI Phantom 3, Phantom 4, and Matrice M100 quadrotors, Holybro QAV250, S500, and X500 quadrotors.
- Ground mobile robots: iRobot Create II, ClearPath Husky.
- Manipulators: Universal Robots UR3.
- LiDARS: Ouster OS1, Hokuyo UTM-30LX, YDLIDAR X4 and G4, Intel RealSense L515.
- Cameras: Raspberry Pi Camera Module, Intel RealSense D435, D435i, and T265, MS Azure Kinect, and USB Cameras.

ROBOTICS COMPETITIONS

- International Conference on Unmanned Aircraft Systems (ICUAS) **Unmanned Aerial Vehicle (UAV) Competition** (2022). Team Mountaineers' Mentor and Task 1 Lead. Virtual/simulated competition motivated by the challenges faced by fire-fighting UAVs. Results: 10th place (no prize).
- **NASA Space Robotics Challenge 2** (2020-2021). Team Mountaineers' Autonomy and Manipulation Lead, and Systems Integration Co-lead. Virtual/simulated competition on multi-robot coordination for Lunar exploration and excavation. Results: 6th place (total prize U$45,000.00).

CERTIFICATES

- Deep Learning Specialization. DeepLearning.AI (Coursera, ~17 weeks).
  - ➢ Neural Networks and Deep Learning;
  - ➢ Improving Deep Neural Networks: Hyperparameters Tuning, Regularization, and Optimization;
  - ➢ Structuring Machine Learning Projects;

    - ➢ Convolutional Neural Networks;
    - ➢ Sequence Models.
- Fundamentals of Reinforcement Learning. University of Alberta and Alberta Machine Intelligence Institute (Coursera).
- Flying Car Nanodegree Program. Udacity.
- Design Sprint Nanodegree Program. Udacity.
- Control of Mobile Robots. Georgia Institute of Technology (Coursera).
- Robotics Specialization. University of Pennsylvania (Coursera, ~26 weeks).
    - ➢ Aerial Robotics;
    - ➢ Mobility;
    - ➢ Perception;
    - ➢ Estimation and Learning;
    - ➢ Computational Motion Planning;
    - ➢ Capstone Project.

PRESS COVERAGE

- WVU Press: WVU engineers creating software for aerobots to explore Venus.
- WVU Press: WVU Robotics Team Places 6th in Final Round of NASA Centennial Challenge.
- NASA Press: Teams Develop Code to Coordinate Robots, Win $535,000 in Space Robotics Challenge.
- WVU Let's Go... Engineers! Podcast: Setting Our Sights On The Moon.
- NASA Press: 22 Teams Crack Code, Qualify for Final Stage of NASA Space Robotics.
- WVU Press: Shooting for the moon: WVU qualifies for final round of NASA Centennial Challenge.

MEMBERSHIPS AND AFFILIATIONS

- IEEE Student Member.
- IEEE Robotics & Automation Society Member.
- AIAA Student Member.
- West Virginia University's Brazilian Student Association (BSA) Member.
- Brazilian Student Association (BRASA) Member
    - ➢ Mentor for the BRASA Pré program, which prepares students to apply to international graduate programs.

LANGUAGE SKILLS

English	Proficient/Fluent.
Portuguese	Native Speaker.
Spanish	Native Speaker.
French	Intermediate.

Most recent update: Jul 8, 2022