Midhun E K

Robotics and Artificial Intelligence
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Research Interests

Robotics and AI, Computer Vision, Path planning, Guidance and control, Unmanned Aircraft Systems(UAS), UAS Traffic Management (UTM), Visual Language Model(VLM), SLAM

Education

Ph.D., Indian Institute of Science(IISc) Bengaluru, Department of Aerospace Engineering 2019 to 2024

- Thesis title: Bearings-Only Quadrotor Guidance in Gap Traversal Scenarios.
- Supervisor: Dr. Ashwini Ratnoo

M.Tech., National Institute of Technology Calicut, Department of Electrical Engineering 2014 to 2016

- Thesis title: Design and real-time implementation of LabVIEW-based Fractional Order PID controller for a Magnetic Levitation system.
- Supervisor: Dr. T K Sunil Kumar

B.Tech., LBS College of Engineering Kasargode, Kannur University, Electrical and Electronics Engineering 2009 to 2013

Publications

Journal Articles

1. E. K. Midhun and A. Ratnoo, “Quadrotor Guidance for Window Traversal: A Bearings-Only Approach,” *Journal of Guidance, Control, and Dynamics (Accepted for publication)*, May 2025. https://arxiv.org/abs/2410.14367
2. E. K. Midhun and A. Ratnoo, “Local Information-Based Guidance for Lane Transition in Air Corridors," *Journal of Guidance, Control, and Dynamics,* Vol. 47, No. 3, pp. 564-572, 2024. https://doi.org/10.2514/1.G007752
3. E. K. Midhun and A. Ratnoo, “Gap Traversal Guidance Using Bearing Information,” *Journal of Guidance, Control, and Dynamics,* Vol. 45, No. 12, pp. 2360-2368, 2022. https://doi.org/10.2514/1.G006898

Conference Proceedings

1. E. K. Midhun and A. Ratnoo, “Bearing Information-based Trajectory Planning for Window Traversal," *2023 9th International Conference on Control, Decision and Information Technologies (CoDIT),* Rome, Italy, 2023, pp. 1291-1295, doi:10.1109/CoDIT58514.2023.10284194.
2. E. K. Midhun and A. Ratnoo, “Quadrotor Guidance for Traversal Through Moving Gaps Using Bearing-Only Information", in *AIAA Scitech 2022 Forum*, AIAA Paper 2022-0539, 2022. doi:10.2514/6.2022-0539
3. E. K. Midhun and A. Ratnoo, “Safe Traversal Guidance for Quadrotors Using Gap Bearing Information", in *2021 International Conference on Unmanned Aircraft Systems (ICUAS)*, pp. 482–487, 2021. doi:10.1109/ICUAS51884.2021.9476785
4. E. K. Midhun and Sunil Kumar T.K., "LabVIEW based real time implementation of Fractional Order PID controller for a magnetic levitation system," *2016 IEEE 1st International Conference on Power Electronics, Intelligent Control and Energy Systems (ICPEICES)*, Delhi, India, 2016, pp. 1-6, doi: 10.1109/ICPEICES.2016.7853463.

5. G. Satheesh Krishnan, P. T. Bijilesh, S. P. Simon, G. V. Puthusserry, E. K. Midhun and T. Mithun, "Maximum Power Point tracking in PV Systems using Plant Reproduction algorithm," *2020 IEEE International Conference on Power Electronics, Smart Grid and Renewable Energy (PESGRE2020)*, Cochin, India, 2020, pp. 1-6, doi: 10.1109/PESGRE45664.2020.9070629.

Presentations

- Midhun, E. K., and A. Ratnoo, "Local Information-based Guidance for Lane Transition in Air Corridors", *16th International Conference on COMmunication Systems & NETworkS (COMSNETS)*, Jan 03-07, 2024, Bangalore, India.

Courses

Guidance Theory and Applications, Autonomous Navigation, Control Systems Design, Topics in Neural Computation, Dynamics of Linear Systems, Digital Control Systems, Optimal and Adaptive Control, Nonlinear System Analysis, Mathematical Methods for Aerospace Engineers, Mathematics for Electrical Engineers.

Experience

Lulea University of Technology, Sweden , Researcher — Lulea, Sweden, Jan 2025 to Present
- Research experience in developing AI models for virtual forest creation using LiDAR point cloud data.
- VLM-based autonomous navigation of Husky ground robot through forest environment.

Indian Institute of Science, Bengaluru , Research Associate — Bangalore, India, July 2024 to Dec 2024
- Research experience in guidance and control of UAVs

National Institute of Technology Tiruchirapalli, Assistant Professor — Tiruchirapalli, India, July 2017 to May 2018, 11 months
- Teaching experience in Control systems, Network theory, Linear integrated circuits, Measurements and measuring instruments

Greendzine Technologies Pvt. Ltd, Electronics Design Engineer, Intern — Bangalore, India, Aug. 2018 to Nov. 2018, 4 months
- Design and Implementation of PFC Boost converter for an EV charging application
- Controller design for LLC Resonant converter for an EV smart charging application

Awards and Achievements

- **Gold medalist, Kannur University:** Awarded 1st rank in B.Tech Electrical and Electronics Engineering.
- **Prize winner, Department of Aerospace Engineering, IISc Bangalore**: Awarded for oral presentation in Aerospace Research Symposium 2024.

Professional Services

- Reviewer for European Control Conference (ECC) 2025, American Control Conference (ACC) 2024, Indian Control Conference (ICC) 2024, Society of Automotive Engineers (SAE) International 2024, International Conference on Unmanned Aircraft System (ICUAS) 2025.

Skills

Programming and Scripting Languages: C, C++, Python

Tools and Libraries: MATLAB® and Simulink®, ROS/ROS2, CloudCompare, LABVIEW, Ki-CAD, LaTeX

References

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