Hemjyoti Das

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Education

PhD - Aerial Robotics and Control **Aug. 2022 – Present**
Vienna University of Technology *Vienna, Austria*
Thesis: *Control of Underactuated Aerial Manipulator System for Interaction Tasks.*
Advisor: Prof. Christian Ott

Master of Science in Aerospace Engineering **Sep. 2018 – July 2020**
Delft University of Technology *Delft, The Netherlands*
Thesis: *Incremental Nonlinear Dynamic Inversion Control of Pneumatic Actuators.*
Advisors: Prof. Erik-Jan Van Kampen and Prof. Daan Pool

Bachelor of Technology in Electrical Engineering **Sep. 2012 – May 2016**
National Institute of Technology *Silchar, India*
Thesis: *Visual Servoing and Hand Gesture-based Control of Mobile Robot.*

Experience

Vienna University of Technology **Aug 2022 – Present**
PhD Researcher *Vienna, Austria*

- Working on passivity-based control of underactuated aerial manipulators for interaction with unknown environments.
- Working on control of a suspended load with an underactuated aerial platform.
- Developed an impedance-based method for hardware-in-the-loop simulation (HILS) of vehicle-manipulator systems.

University of Twente **Aug 2020 – July 2022**
Research Engineer *Enschede, The Netherlands*

- Worked on Moving Horizon Estimation (MHE) for prediction of human-pilot behaviour, and implemented Mixed-Initiative Model Predictive Control (MI-MPC) in order to blend inputs for shared autonomy of a quadrotor.
- Worked on perception-based cooperative target tracking with heterogeneous UAVs using Nonlinear Model Predictive Control (NMPC). Supervised a master's thesis student as a part of this project.
- Worked on closed-loop speed control of brushless DC motors using D-Shot protocol.
- Developed a Gazebo simulation environment for the physical interaction between a human and an UAV.

Delft University of Technology **June 2021 – Dec 2022**
External Researcher *Delft, The Netherlands*

- Developed reinforcement learning algorithms for resolving Air Traffic Control (ATC) conflict.

German Aerospace Center (DLR) **April 2019 – August 2019**
Research Intern *Munich, Germany*

- Formulated the closed-chain model of an aerial manipulation platform and designed a damping controller for it.

Indian Institute of Science **Jan 2017 – July 2018**
Project Assistant *Bangalore, India*

- Designed bio-inspired guidance for a safe and smooth landing of a quadrotor.
- Developed an improved state estimation technique for quadrotors by fusing visual odometry and IMU sensors.

Indian Institute of Technology **Aug 2016 – Nov 2016**
Project Assistant *Mumbai, India*

- Analyzed the electric propulsion system of a quadrotor to increase its efficiency and total time of flight by choosing the proper combination of hardware equipment.

Selected Publications

- *Observer-based Controller Design for Oscillation Damping of a Novel Suspended Underactuated Aerial Platform*; H. Das, M.N. Vu, T. Egle, and C. Ott. (Accepted, IEEE International Conference on Robotics and Automation (ICRA), 2024)
- *Hardware-in-the-Loop Simulation of Vehicle-Manipulator Systems for Physical Interaction Tasks*; H. Das, B. K. Sæbø, K. Y.Pettersen, C. Ott. (IEEE/RSOJ International Conference on Intelligent Robots and Systems (IROS), 2023)
- *Motor-level N-MPC for Cooperative Active Perception in Heterogeneous Multi-agent UAVs* ; M. Jacquet, M. Kivits, H. Das and A. Franchi. (IEEE Robotics and Automation Letters (RAL), 2022)

- *Nonlinear model predictive control for human-robot handover with application to the aerial case*; G Corsini, M Jacquet, H Das, A Afifi, D Sidobre, A Franchi. (IEEE/RSOJ International Conference on Intelligent Robots and Systems (IROS), 2022)
- *Incremental Nonlinear Dynamic Inversion Control of Long-Stroke Pneumatic Actuators* ; H. Das, D. Pool and E. van Kampen. (European Control Conference (ECC), 2021)
- *Bio-inspired Landing of Quadrotor using Improved State Estimation*; H. Das, K. Sridhar and R. Padhi (IFAC 3rd International Conference on Advances in Control and Optimization of Dynamical Systems, 2018)
- *Dynamic inversion control of quadrotor with a suspended load*; H. Das (IFAC 3rd International Conference on Advances in Control and Optimization of Dynamical Systems, 2018)

Teaching

Manipulation and Locomotion **Spring Semesters 2023, 2024**

Vienna University of Technology

- Developed assignments and projects to evaluate the students with both robotic manipulation and humanoid walking.

Control of UAVs **Spring Semester 2022**

University of Twente

- Provided students with a simulation environment for UAVs. Assisted them with the given assignments on UAV actuation mechanisms and control effectiveness.

Students Mentored

Rene Zwiletitsch **Nov 2023 - Present**

Automation Project, Vienna University of Technology

- Software Framework for Onboard Control of an Aerial Platform.

Sandra Foith **June 2023 - Present**

Masters Thesis, Vienna University of Technology

- Control of a Suspended Aerial Platform for Contact-based Applications.

M.P.W. Kivits **May 2021 - Sep 2021**

Masters Thesis, University of Twente

- Heterogeneous Cooperative Control Tracking Using Nonlinear Model Predictive Control.

H. Osama Hussein Abdelrahma **May 2021 - June 2021**

Bachelors Thesis, University of Twente

- Software Integration of Electronic Speed Controller (ESC) for an Unmanned Aerial Vehicle.

M.T. Brink **May 2021 - June 2021**

Bachelors Thesis, University of Twente

- Hardware Integration of Electronic Speed Controllers (ESC) for an Unmanned Aerial Vehicle.

Review Activities

- IEEE International Conference on Robotics and Automation (ICRA), 2023

References

Available on Request.