Ashutosh Mukherjee

Email: ashutosh.mukherjee@rwth-aachen.de
Phone: +4915901950326
Projects Website
Github

Education

M.Sc., Computer-Aided Conception of Machines in Mechanical Engineering CGPA : 1,6
RWTH Aachen University, Aachen, Germany October 2021 - April 2024

B.Tech., Mechanical Engineering CGPA : 8.3/10
Punjab Engineering College, Chandigarh, India August 2016 - June 2020

Work Experience

Master Thesis Student/Working Student **October 2023 - August 2024**
Rheinmetall Technology Centre - New Technologies, Rheinmetall AG, Neuss, Germany
Distributed Data-Fusion and Control over a network of Unmanned Aerial Vehicles

- Development of a localization algorithm for a swarm of GPS-denied UAVs using Ultra-wideband (UWB) sensors and embedding the algorithm into *Ardupilot*, an open-source auto-pilot for UAVs, in order to facilitate verification through flight tests.
- Development of a simulation model of an integrated flight control system for a single UAV, including a flight controller, 6 degree-of-freedom UAV dynamic model, IMU, Magnetometer, Barometer and GPS sensor models and an Extended Kalman Filter for attitude estimation.

Werkstudent (Working Student) **June 2022 - September 2023**
Rheinmetall Technology Centre - New Technologies, Rheinmetall AG, Neuss, Germany

- Development of a mathematical model for the force analysis of a flexible electrostatic synchronous actuator based on the concept of *Method of Moments*, a discretization technique for electric fields.
- Maintainance of the developed mathematical model code-base, making use of software engineering principles like object orientation, version control and comprehensive code documentation

Project Assistant **October 2022 - April 2023**
Institut für Getriebetechnik, Maschinendynamik und Robotik (IGMR), RWTH Aachen

- Development of a virtual control system to stabilize the multi-body model of a standard mountain bike being excited by external loads measured by sensors fitted on the bike.
- The work in this project culminated in a mini-thesis worth 9 ECTS.

Research Assistant **September 2020 - July 2021**
Thapar Institute of Engineering and Technology, Patiala, India

- Reduced-order dynamic modeling of a strength augmentation exoskeleton designed by *Defence Bio-Engineering and Electro-Medical Laboratory* (DEBEL), India and development of a *Computed Torque Control* algorithm for strength augmentation.
- All published work output from this project can be referred from *Conference Presentations and Publications* section.

Teaching Assistant **February 2021 - June 2021**
Thapar Institute of Engineering and Technology, Patiala, India

- Teaching Assistant for the graduate level course *Modern Control of Dynamic Systems*, which covers basic and advanced topics in linear systems theory like state-space representations, canonical forms, controller and observer design using pole-placement, and some concepts of optimal control theory.
- Helped set mid-term examinations and quizzes, and grade them as part of assitantship duties.

Technical Skills

Programming	Computational Techniques
1. **Scripting Languages** • MATLAB & Simulink • Python 2. **Programming Languages** • C++ • Java 3. **General** • Object-Oriented Programming • Version Control using Git • Windows Subsystem for Linux (WSL) • Docker • Oracle VM VirtualBox	1. State Estimation using Extended-Kalman Filters 2. Strapdown Algorithms for Inertial Navigation 3. Sensor Fusion 4. Sensor Noise Parameter Identification using Allan-Deviation Anaylsis 5. Unconstrained Non-linear Optimization using Gauß-Newton and Quasi-Newton methods 6. Regression and Classification using Neural Networks 7. Multi-Body Dynamics 8. Finite Element Analysis 9. Method of Moments in Electrostatics

Conference Presentations and Publications

1. Chander, S., Mukherjee, Shivling, V.D., and Singla, A. (June 24, 2024). Enhanced Euler-Lagrange Formulation for Analyzing Human Gait with Moving Base Reference, *ASME Journal of Mechanisms and Robotics*. January 2025; 17(1): 011006, DOI, PDF.
2. Chander, S., Mukherjee, A., & Singla, A. (2023, July). *Estimation of Ground Reaction Force for Coupled Dynamic Modelling and Control of the Lower-Limb Exoskeleton*, AIR 2023: Proceedings of the 2023 6^{th} International Conference on Advances in Robotics, July 2023, Article No.: 37, Pages 1-8, DOI
3. Chander, S., Mukherjee, A., Shivling, V., & Singla, A. (2022, October 16-20). *Modelling and Validation of Human Gait Dynamics using Modified Euler-Lagrange Approach* [Paper Presentation], 6^{th} Joint International Conference on Multibody System Dynamics and 10^{th} Asian Conference on Multibody Dynamics, New Delhi, India, URL