



TO MAGNIFICO RETTORE OF UNIVERSITA' DEGLI STUDI DI MILANO

ID CODE : 6077

I the undersigned asks to participate in the public selection, for qualifications and examinations, for the awarding of a type B fellowship at **Dipartimento di Fisica Aldo Pontremoli dell'Università degli Studi di Milano**

Scientist- in - charge: **Prof.Prati Enrico**

CURRICULUM VITAE - VINCENZO D'ANTUONO

PERSONAL INFORMATION

Surname	D'Antuono
Name	Vincenzo

PRESENT OCCUPATION

Appointment	Structure
PhD candidate	Department of mechanical and aerospace engineering at Sapienza University of Rome

EDUCATION AND TRAINING

Degree	Course of studies	University	year of achievement of the degree
Bachelor Degree	Aerospace engineering	Sapienza University of Rome	2016
Masters degree	Aeronautical engineering	Sapienza University of Rome	2020
PhD	Aeronautical and space engineering	Sapienza University of Rome	I will achieve in january 2024

FOREIGN LANGUAGES

English	Professional english/B2
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EXPERIENCES

<p>Visiting scholar - Jan 2023- July 2023 The University of Texas at Austin - Austin, Texas USA I served as a visiting scholar with the Nonlinear Estimation and Autonomy Research Group led by Prof. Renato Zanetti at the University of Texas at Austin, to pursue</p>
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research on system identification and estimation applied for aerospace vehicles.

Flight Dynamics Tutor - Mar 2022-Sept 2022

Sapienza University - Rome, Italy

I provided support to the students for the production of the assigned group projects during the course and in the exam preparation.

Flight Mechanics Tutor - Sept 2021-Sept 2022

Sapienza University - Rome, Italy

I provided support to students in the exam preparation.

Post-graduate Research Fellow - Aug 2020 – Oct 2020

Sapienza University - Rome, Italy

"Analysis of techniques for trajectory reconstruction of launch vehicles in atmospheric flight"

TRAINING

Introduction to Matlab on HPC systems at CINECA - Nov 2023

The course provided an introduction to utilizing parallel computing techniques in MATLAB for solving compute- and data-intensive problems to leverage multicore processors, GPUs, and computer clusters.

PhD courses - 2021 - 2022

Sapienza University – Rome, Italy

- Nonlinear Spacecraft Attitude Control
- Probabilistic robotics
- Filtering and optimal control

General english course - Aug 2021

Everest Language School – Dublin, Ireland

four-week course with 20 hours per week.

Coding Python and Deep Learning Applications - Sep 2018 – Nov 2018

Spazio Chirale – Rome, Italy

Object Oriented programming in Python - Use of standard and nonstandard Python libraries - Basic knowledge of Tensor flow library - Analysis of different DNN (Deep Neural Network) codes in Python.



RESEARCH ACTIVITY

Estimation - Since 2021

Sapienza University – Rome, Italy

Estimation of dynamic systems from indirect, inaccurate and noisy observations, in particular, the last work concerned the offline estimation of aerodynamic angles and the atmospheric wind components for a LV flight exploiting true airspeed, IMU, and GPS observations, whereas in early 2022, filters for trajectory reconstruction were developed in order to estimate position, velocity, attitude and IMU systematic errors for a generic Launch vehicle (LV). Estimation algorithms such as Extended Kalman filter (EKF) and Unscented Kalman filter (UKF) were employed for this purpose together with the use of smoothing algorithm (e.g. Fraser Potter or Rauch-Tung-Striebel smoother). These filters were realized in the framework of independent support and cross-check activity for ESA-ESRIN, and ASI PhD research agreement activity.

Adaptive Augmenting control (AAC) - Since 2021

Sapienza University – Rome, Italy

I studied the effects of integration of Adaptive augmenting control (AAC) in a LV flight control system, in the framework of independent support and cross-check activity for ESA-ESRIN.

Launch vehicle modeling - Since 2021

Sapienza University – Rome, Italy

I worked on LV medium-fidelity modelling and simulation characterizing i) Rigid-body translation and rotation, ii) Aerodynamic and thrust force and moments, iii) Structural elastic dynamics modeled using rocket bending modes, iv) Inertial coupling effects due to nozzle rotation, v) Sensors, vi) Attitude Control system with notch and low-pass filters to manage the elastic dynamics.

Optimal tuning for Robust control of a fixed wing UAVs – Since 2020

Sapienza University, Laboratory of Flight Dynamics - Rome, Italy

I've been working on optimization of UAV's control system inner loop gains by exploiting a genetic algorithm in order to maximize a weighted sum of suitably defined performance metrics. A systematic design approach was developed to reduce the burden of trial and error procedures generally adopted in control systems tuning.

Robust control for fixed wing UAVs - Apr 2019 – Mar 2020

Sapienza University, Laboratory of Flight Dynamics - Rome, Italy



The work relative to the Master's thesis forms part of the development projects of autopilot systems for small Remotely Piloted Vehicle (RPV), conducted in recent years by the Department of Mechanical and Aerospace Engineering of Sapienza University of Rome. Main aspects:

- Study of Robust control techniques for fixed-wing UAVs.
- Study of frequency domain analysis method for MIMO systems.
- Model Based Design approach for the realization of an entire flight control system for an UAV autopilot in Matlab e Simulink. Development of PID controllers for external control loops and use of RSLQR (robust servomechanism LQR) technique for the realization of the inner loops.
- Software in the Loop (SIL) simulation carried out in Matlab e Simulink to demonstrate control system robustness and command tracking performance in presence of model parameters uncertainties, noise and atmospheric disturbances

PROJECT ACTIVITY

Year	Project
Oct 2017 - May 2018	<p>Sapienza Flight Team Member</p> <p>The team focuses on designing an Unmanned Aerial Vehicle (UAV) and present their work at international competitions (AUVSI-SUAS) among peer teams;</p> <ul style="list-style-type: none"> - Development of experimental methodologies to building servo models, subsequent implementation of the models in Simulink and testing via Software in the Loop (SIL) and Hardware in the Loop (HIL) simulations. - Integration of sensors using the S-Function for embedded devices in the autopilot software - Use of Simulink to automatically generate C code for embedded platform. - Sizing and data management of telemetry system.

PATENTS

Patent



CONGRESSES AND SEMINARS

Date	Title	Place
January 2021	AIAA Scitech 2021 Forum	Virtual session
August 2022	AAS/AIAA Astrodynamics Specialist Conference	Charlotte, NC, USA
January 2023	AIAA Scitech 2023 Forum	National Harbor, AR, USA
January 2024	AIAA Scitech 2024 Forum (I'll be attending)	Orlando, FL, USA

PUBLICATIONS

Articles in reviews
<p>V. D'antuono, G. De Matteis, D. Trotta and A. Zavoli. <u>Optimization of UAV Robust Control Using Genetic Algorithm</u>, in <i>IEEE Access</i>, vol. 11, pp. 122252-122272, 2023, doi: 10.1109/ACCESS.2023.3325845.</p>

Congress proceedings
<p>Vincenzo D'Antuono, Alessandro Zavoli, Guido De Matteis, Renato Zanetti, Simone Pizzurro, and Enrico Cavallini, <u>Post-Flight Estimation of Aerodynamic Angles for a Launch Vehicle</u>, In AIAA Scitech 2024 Forum, Orlando, FL, USA (accepted)</p>
<p>Giovanni Di Monaco, Vincenzo D'Antuono, Alessandro Zavoli, Guido De Matteis, Simone Pizzurro, and Enrico Cavallini. <u>Trajectory reconstruction of launch vehicle in atmospheric flight using the unscented kalman filter</u>. In AIAA Scitech 2023 Forum, National Harbor, AR, USA, page 2315, 2023</p>
<p>Vincenzo D'Antuono, Giovanni Di Monaco, Alessandro Zavoli, Guido De Matteis, Simone Pizzurro, and Enrico Cavallini. <u>Estimation of aerodynamic angles and wind components for a launch vehicle</u>. In Proceedings of the AAS/AIAA Astrodynamics Specialist Conference, Charlotte, NC, USA, 2022</p>
<p>Vincenzo D'Antuono, Guido De Matteis, Domenico Trotta, and Alessandro Zavoli. <u>Optimal tuning for robust control of a small fixed-wing uav</u>. In AIAA Scitech 2021 Forum, page 1057, 2021</p>

OTHER INFORMATION



Declarations given in the present curriculum must be considered released according to art. 46 and 47 of DPR n. 445/2000.

The present curriculum does not contain confidential and legal information according to art. 4, paragraph 1, points d) and e) of D.Lgs. 30.06.2003 n. 196.

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Place and date: Rome, 10/12/2023