

Athanasios MARTSOPOULOS

Robotics Engineer

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I am a Robotics Engineer with six years of experience in both software and hardware development for aerospace and robotics applications. Skilled in C++, Python, and C. My interests and experience cover a wide range of tools and technologies, including mathematical modelling of dynamical systems, control systems design, state estimation and sensor fusion, system identification, trajectory optimization and path planning for robotic systems, high-performance computing, computer graphics and computer vision. I hold an MEng in Mechanical Engineering (First-Class Honours) and I am currently pursuing my PhD in Robotics at the University of Bristol.

SKILLS

Programming	C/C++, Python, MATLAB/Octave, GLSL.
Libraries/Frameworks	OpenCV, PCL, Eigen/Armadillo, OpenGL, CUDA, OpenMP, Unreal Engine 4, ROS, Gazebo, ThreeJS, Arduino, Simulink, ZeroMQ, IPC(UDP/TCP).
Software Development Tools	CMake, git, Docker, VSCode, Vim, Valgrind.
Operating Systems	Linux, Windows.
CAD	Inventor Autodesk, Fusion360, Blender.
Word Editors	LaTeX, Pack Office(Word, Excel, PowerPoint).
Robotics	Robot kinematics/dynamics, Computer Vision, Path Planning, SLAM, 3D Reconstruction, Lagrangian/Newtonian methods, ROS
Soft body simulation	FEM, Meshless Approaches, PBD, XPBD, Ansys, MSC Adams.
Control theory	PID, LQR, MPC/Trajectory Optimization, System Identification(e.g. SiNDY, DMD), Adaptive Control, Kalman Filters, Bayesian Filters.
Optimization	Sequential Quadratic Programming, Newton Methods, Interior-point method, NLPs, Automatic Differentiation.

EXPERIENCE

Present Oct 2022	Software Engineer, SLINK-TECH, <ul style="list-style-type: none">> Contributed to the development of a drone simulation environment in Unreal Engine 4.> Developed inter-process communication applications using UDP/TCP protocols and networking libraries (ZeroMQ).> Developed hardware-in-the-loop (HITL) and software-in-the-loop (SITL) simulations using embedded systems (ArduPilot/Pixhawk) and the MavLink communication protocol.> Used Docker to develop and deploy microservices architectures. <p>C++ Python Unreal Engine Docker ZeroMQ Agile Methodologies MAVLink Ardupilot/PX4 ROS</p>
Present Sep 2019	PhD Candidate Robotics and Autonomous Systems, UNIVERSITY OF BRISTOL, <ul style="list-style-type: none">> Programmed multiple robotic manipulators (UR5, UR10, Franka Emika Panda, Schunk LWA4P) using ROS and MoveIt.> Implemented computer vision algorithms with OpenCV for real-time motion tracking and 3D reconstruction of deformable objects.> Developed an autonomous robotic system using ROS. The system integrated motion planning, computer vision, optimal control (MPC), state estimation and sensor fusion algorithms (Kalman filters).> Developed a real-time physics-based surgical simulation environment using C++ and OpenGL.> Developed efficient computational architectures and used parallel computing frameworks (CUDA, OpenMP).> Developed mathematical and computational tools, based on the theory of continuum mechanics and flexible multibody dynamics to allow the modelling of both soft human tissue and flexible surgical instruments.> Developed and implemented highly efficient numerical algorithms for the solution of PDEs and ODEs for real-time applications. <p>C++ Python OpenGL OpenCV CUDA Mathematical Modelling Physics-Based Animation ROS Nonlinear Optimization Control Theory Sensor Fusion CAD</p>

- Mar 2022 | **Research Associate in Robotics, UNIVERSITY OF BRISTOL,**
 Nov 2021 | > Developed a HITL simulation using Arduino and OpenGL.
 > Developed motion tracking algorithms using machine learning and depth cameras.
 Computer Vision | RealSense | OpenGL | Machine Learning | Embedded systems | Motion Tracking | Depth Cameras
- Sep 2019 | **Research Associate in Flight Mechanics, CIRI-ARISTOTLE UNIVERSITY OF THESSALONIKI,**
 Dec 2018 | > Contributed to the development of a prototype VTOL UAV.
 > Developed mathematical models of UAVs.
 > Designed implemented and tested navigation and motion control algorithms.
 > Worked with embedded systems programming and hardware-in-the-loop simulations.
 > Conducted extensive testing and software development in C/C++, Python and MATLAB.
 C++ | C | Python | Physics-Based Animation | Mathematical Modelling | MATLAB | Pixhawk | Embedded Systems
 Sensors | MAVLink | ArduPilot/PX4
- Dec 2017 | **Principal Flight Dynamics and Control Engineer, ARISTOTLE SPACE & AERONAUTICS TEAM (ASAT),**
 Oct 2016 | > Contributed to the design and sizing of UAVs for Air Cargo Challenge (Aeronautical Engineering Competition).
 > Evaluated the static and dynamic stability UAV characteristics and implemented flight simulations using FlightGear and MATLAB.
 > Designed, constructed and programmed measuring devices for the experimental evaluation of mathematical models.
 > Trained new team members.
 C++ | C | Python | FlightGear | Physics-Based Animation | Mathematical Modelling | MATLAB

EDUCATION

- 2019- | **PhD Candidate Robotics and Autonomous Systems**, University of Bristol, Bristol Robotics Lab.
 Development of mathematical and computational tools for the real-time simulation of prostate biopsy/brachytherapy surgery.
- 2013-2018 | **Diploma in Mechanical Engineering (MEng)**, Aristotle University of Thessaloniki.
First-Class Honours, Valedictorian : 8.97/10
 > Specialization Field : Design and Structures
 > Level of Qualification : Integrated 1st and 2nd Cycle
 > Official Length of Programme : 10 Semesters, 300 ECTS

PUBLICATIONS

- 2020 | Spatial Rigid/Flexible Dynamic Model of Biopsy and Brachytherapy Needles Under a General Force Field, **IROS**
- 2023 | Modelling and real-time dynamic simulation of flexible needles for prostate biopsy and brachytherapy, **Mathematical and Computer Modelling of Dynamical Systems**
- 2023 | Development and Experimental Verification of a 3D Dynamic Absolute Nodal Coordinate Formulation Model of Flexible Prostate Biopsy/Brachytherapy Needles, **ICRA**

TEACHING AND MENTORING

- Oct 2020 | **Teaching assistant, ROBOTICS AND CONTROL, University of Bristol**
 Dec 2021 | > Forward and inverse kinematics of robotics manipulators.
 > Dynamics and control of robotics manipulators
 > Nonlinear control theory.
 Robotics and Control | Nonlinear control theory
- Oct 2018 | **Teaching assistant, MULTIVARIATE CONTROL THEORY, Aristotle University of Theassaloniki**
 Dec 2018 | > Linear quadratic regulators.
 > Gain scheduling.
 > Feedback linearization.
 Multivariate control | Nonlinear control theory