Francesco Russo

Electronic Engineer & student in Control Engineering

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in *francesco-russo-MSc*

Education

2022–Present	**Master's Degree in Control Engineering**, *Università degli Studi La Sapienza*, Rome, Italy
2018–2022	**Bachelor's Degree in Electronics Engineering**, *Università degli Studi di Catania*, Italy, Final Mark: 105/110
2012–2017	**Electronics High School Diploma**, *ITIS Ettore Majorana*, Ragusa, Italy

Academic Work-Projects (Details available on the website franc-r.github.io)

Dynamic Mode Decomposition, recognition of Spatial-Temporal patterns in large-scale Neural Recordings for imagination and movement tasks:

Neural recordings are essential for investigating the nervous system. Although they typically generate data that reside in a high-dimensional space, their underlying structure often lies in a low-dimensional one. Thus, the Dynamic Mode Decomposition technique is used to construct a reduced-order representation of these data, enabling the extraction of meaningful spatio-temporal patterns from large-scale neural recordings.

DC-Motor Velocity Control Problem:

The goal of the project was to design a controller capable of driving the rotor of a DC motor at steady state and at a given angular velocity, while rejecting noise and attenuating disturbances through a closed-loop approach. The design involved minimizing the H_∞ norm of the sensitivity, complementary sensitivity, and control sensitivity functions.

DC-Motor Position Control Problem:

The goal of the project was to design an H_∞ controller which is able to stop the rotor of DC-Motor at steady state at a given angular position and, at the same time, rejecting noise and attenuating disturbances, through a closed-loop approach.

MIMO Analisys:

The goal of the project was to analyse the directional properties of MIMO systems, and assess how ill-conditioned the system is, by means Singular Value Decomposition. It also aimed to design an H_∞ controller capable of robustly stabilising the MIMO system, taking into account both structured and unstructured uncertainties.

Two Wheels Self-Balancing Robot:

The aim of the project was to build a wheeled robot, designed with Autodesk Inventor and manufactured using a 3D printer, capable of autonomously maintaining balance. This was achieved by designing a controller implemented on an Arduino Nano, able to asymptotically stabilize the system's equilibrium point.

Academic Work-Thesis (Details available on the website franc-r.github.io)

Bachelor's Degree
Motion Control of Robots: An Approach Based on Light Source Tracking

Bachelor's degree thesis focused on the design and development of a 4-DOF bipedal robot, including the design and implementation of a control system, deployed on Arduino, to track a light source through bipedal locomotion.

Master's Degree
Safety Management and Trust beetween Humans and Robots in BCI system:

Master's degree thesis focuses on the design and control of an underactuated quadrotor controlled through brain–computer interface signals, where a safety-critical controller was implemented to ensure that the system operates within a predefined safe set. A novel trust-based approach was proposed to dynamically evaluate the reliability of the BCI signal before execution. Additionally, the physical platform was customized using 3D-printed components designed in Fusion 360, and Visual-Inertial Odometry (VIO) was integrated to enable robust indoor localization.

Languages

Italian	Native
English	B2

Tech Skills

Operating Systems	Windows, Ubuntu (Linux)
Control Theory & Systems	Analysis and design of linear and nonlinear systems, Optimal control, State estimation, Digital control systems, Geometric control of UAVs, Control Barrier Functions for safety-critical control, Force control for Human-Robot interaction
Programming & Software Tools	MATLAB/Simulink, Python, Arduino IDE, LTSpice, LaTeX, GitHub, Microsoft PowerPoint, Word
Robotics & Control	Stateflow, Robot Kinematics, PX4 Autopilot, ROS, jMAVSim, QGroundControl, Visual-Inertial Odometry (VIO)

Hardware & Design	Circuit Board Soldering Printed Circuit Board Design (EAGLE), Autodesk Fusion 360
Machine Learning	Supervised & Unsupervised Learning, Model Reduction (DMD), Reinforcement Learning, Neural Network

Soft Skill

Highly motivated and committed to continuous learning and self-improvement, Strong ability to work in teams, with experience in coordinating and motivating group members, Adaptable and open to acquiring new knowledge and skills quickly, Critical thinker with a proactive approach to problem solving, Strong sense of responsibility and dedication to delivering high-quality results.

Additional Information

Driving License	Full European AM, B