Mohamed Elobaid

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Experienced Controls and Robotics Engineer with a cotutelle Ph.D. in Control Systems theory and a strong background in controller design, analysis and implementation in different domains from the Process industry (Heat exchangers) to advanced electro-mechanical systems (Bipedal and wheeled robots) with over 8 years of combined professional industrial, and research & teaching experience. Proven track record of handling research projects, managing technology transfer initiatives with leading institutions (e.g. currently responsible of a joint research initiative with Honda R&D). Taught and supervised Engineering students at the undergraduate level and Currently helping with the supervision of PhD fellows in robotics.

Education

Sapienza University of Rome and University of Paris Saclay, Ph.D. in Control Engineering — Nov. 2018 – Feb. 2022

- Thesis: A sampled-data approach in control problems involving partial dynamics cancellation (a link to thesis pdf) - GPA: cum laude.
- Supervisors: Prof. Salvatore Monaco and Dr. Dorothee Normand-Cyrot.

Sapienza University of Rome , M.Sc in Control Engineering — Sept. 2015 – Oct. 2017

- Thesis: Some insights on the geometry of networked control systems - GPA: 110 cum laude.
- Supervisors: Prof. Salvatore Monaco

University of Khartoum, B.Sc. in Electrical and Electronics Engineering — Nov. 2006 – Aug. 2011

- Thesis: Giad Steel factory control system case study and development - GPA: Second upper class.
- Supervisors: Prof. Kamal Ramadan

Work and Research

Postdoc researcher, Italian Institute of Technology – Genoa, IT — Feb. 2022 – Now

- Developed and Implemented Teleoperation interfaces for robotic avatar systems based on VR devices and Other peripherals in C/C++ and validated both on simulations and real hardware.
- Developed MPC based locomotion controllers for Legged robots (both Bipedal and Quadrupeds) with closed loop stability certificates and validated on both the ergoCub humanoid and the quadruped Aliengo.
- Managed a small team handling technology transfer projects on robotics teleoperation in an agile fashion.
- Responsible of a joint research initiative with Honda R&D on their newly designed avatar robot.
- Part of the team working on the ergoCub project concerning the design and validation of new wearable technologies, artificial intelligence, and humanoid robots for proactive risk mitigation in work environments.
- Supporting PhD and Fellows of the research lab on day to day experimental and technical activities.

Robotics Engineer Fellow, Italian Institute of Technology – Genoa, IT — Jan. 2018 – Nov. 2018

- Developed the first version (and release) of what would become the walking-teleoperation software suite for robot teleoperation applications. Check the following release tag link: github.com/robotology/walking-teleoperation
- Successfully teleoperated the Humanoid iCub for both locomotion and manipulation tasks. Check the following video link: youtube.com/icub-walking-teleoperation.

Automation Engineer, Kenana Engineering and Technical Services – Khartoum, SD — Jan. 2012 – May. 2015

- Provided Front-End engineering design of PLCs/DCS projects based on Siemens (TIA Portal/ PCS7) and Yokogawa Centum VP (e.g. Kenana Sugar Factory modernization study and Elreddais Sugar Plant basic design).
- Provided detailed P&ID diagrams, Control system architecture documents, Functional Specifications and Tender oriented BOQs.
- Provided field support for inspections, troubleshooting, commissioning during the initial operation of the White

Nile Sugar Plant - Power house DCS control works.

- Collaboration with external partners (Southafrica's SIVEST group) on the initial project phase.

Teaching

Teaching Assistant, University of Khartoum – Khartoum, SD Aug. 2011 – Aug. 2012

- **Lecture courses** Regular tutorial sessions on the following senior level courses

  SC5121: Linear Control Theory
  SC5226: Design of Control systems

- **Lab Courses** Regular teacher and students mentor of the following lab courses worthing 3 credits

  SC4210: Control systems lab I, SC5124: Control systems lab II and SC5228: Control systems lab III
  Freshman course EC1102: Computer systems lab I

- **Mentoring** supervision of semester based projects for senior students. Mentoring of projects on design of OPC and ModBus interfaces on embedded devices. Design and grading of coursework fulfilling semester projects for senior year E&E students specializing in control and Instrumentation.
- **Outreach** Recurring one-day workshop on "*control engineering practice and prospects*" for senior year students specializing on control and Instrumentation. This workshop was held in person on the U of K central Campus on 2012, 2015, 2017 and more recently online on 2022.

Graduate Teaching Assistant, Sapienza University of Rome, IT Jan. 2021 – Oct. 2021

- **Exams organization** Regular particpation to exams sessions organization and control of the following courses

  Nonlinear systems and Control (M.Sc. level)
  Teoria di sistemi (B.Sc. level)

Honors and awards

IEEE ICRA - Outstanding paper on Human robot interaction finalist June 2023

A control approach for human-robot ergonomic payload lifting

https://www.icra2023.org/awards-finalists

Intelligent Systems Conference 2019 best paper finalist Sept. 2019

Telexistence and teleoperation for walking humanoid robots

Université Franco Italienne - Program Vinci funding winner June. 2019

Grant number: cap. 2 Vinci 2019 C2-897.

Funded Research Projects

Honda-AMI joint research on robot avatars Feb. 2022 - Feb. 2025

- Technology transfer project dealing with teleoperation and control methods for humanoid robots that need to grasp, position and place packages in warehouses-like environment.
- Tools Used: C++, YARP, ROS, Gazebo, RViz, Docker.

Software suite for the teleoperation and control of Workfar's Syntro Jan. 2024 - June. 2024

- Technology transfer project dealing with the development and design of a full stack teleoperation and control software for the newly under-development robot Syntro of Workfar.
- Tools Used: C++, YARP, Gazebo, CAD.

Technologies

Languages: C++, C, Matlab/Simulink, Octave, IEC 61131-3 PLC programming.

Technologies: Git, CMake, Linux, YARP, ROS, Gazebo, CI/CD, Agile, TIA Portal, Wonderware Intouch

Publications

For a somewhat complete list, h-index and citations, see google scholar page: scholar.google.com/mebbaid

Under review works

[J5] **M. Elobaid**, et. al. "*Online Non-linear Centroidal MPC with Stability Guarantees for Robust Locomotion of Legged Robots*", IEEE Robotics and Automation Letters RA-L, 2024

[C11] S. Taliani, G. Nava, G. L'Erario, **M. Elobaid**, G. Romualdi and D. Pucci "*Online Nonlinear MPC for Multimodal Locomotion* ", IEEE Internation Conference on Robotics and Automation ICRA, 2025

[C10] V. S. Raghavan , **M. Elobaid**, S. Micheletti, J. Woolfrey, D. Pucci and L. Natale " *Make Way! A Planning and Control Architecture for Avoiding Humans for Collaborative Humanoid Robots*", IEEE Internation Conference on Robotics and Automation ICRA, 2025

Journal papers

[J4] C. Cardenas-Pere, G. Romualdi, **M. Elobaid**, S. Dafarra and D. Pucci "*XBG: End-to-end Imitation Learning for Autonomous Behaviour in Human-Robot Interaction and Collaboration*", IEEE Robotics and Automation Letters RA-L, 2024, To appear.

[J3] S. Dafarra, U. Pattacini, G. Romualdi, L. Rapetti, R. Grieco, K. Darvish, G. Milani, E. Valli, I. Sorrentino, P. M. Viceconte, A. Scalzo, S. Traversaro, C. Sartore, **M. Elobaid**, N. Guedelha, C. Herron, A. Leonessa, F. Draicchio, G. Metta, M. Maggiali, D. Pucci "*iCub3 avatar system: Enabling remote fully immersive embodiment of humanoid robots*", Science Robotics, 2024, vol 9 (86), eadh 3834

[J2] **M. Elobaid**, M. Mattioni, D. Normand-Cyrot and S. Monaco "*Station-Keeping of L_2 Halo Orbits Under Sampled-Data Model Predictive Control*", Journal of Guidance, Control, and Dynamics, 2022, vol 45 (7), pp 1337-1346

[J1] **M. Elobaid**, S. Monaco and D. Normand-Cyrot "*Approximate transverse feedback linearization under digital control*", IEEE Control Systems Letters L-CSS, 2020, vol 6, pp 13-18

Conference papers

[C9] **M. Elobaid**, S. Dafarra, E Ranjbari, G Romualdi, T Chaki, T Kawakami, T. Yoshiike and D. Pucci "*Remote telepresence over large distances via robot avatars: case studies*", IEEE Telepresence, 2024, To appear.

[C8] L Rapetti, C Sartore, **M Elobaid**, Y Tirupachuri, F Draicchio, T Kawakami, T. Yoshiike and D. Pucci "*A control approach for human-robot ergonomic payload lifting*",IEEE Internation Conference on Robotics and Automation ICRA, 2023, pp 7504-7510

[C7] **M. Elobaid**, G Romualdi, G Nava, L Rapetti, HAO Mohamed, D Pucci "*Online Non-linear Centroidal MPC for Humanoid Robots Payload Carrying with Contact-Stable Force Parametrization*", IEEE Internation Conference on Robotics and Automation ICRA, 2023, pp 12233-12239

[C6] **M. Elobaid**, M. Mattioni, D. Normand-Cyrot and S. Monaco "*Virtual Holonomic Constraints for Euler-Lagrange systems under sampling*", IEEE European Control Conference - ECC, 2022, pp 693-698

[C5] **M. Elobaid**, M. Mattioni, D. Normand-Cyrot and S. Monaco "*Digital path-following for a car-like robot*", IFAC Control Conference Africa - CCA, 2021, IFAC-PapersOnLine 54 (21), 174-179

[C4] **M. Elobaid**, M. Mattioni, D. Normand-Cyrot and S. Monaco "*On stable right-inversion of non-minimum-phase systems*", IEEE Conference on Decision and Control - CDC, 2020, PP 5153-5158,

[C3] **M. Elobaid**, M. Mattioni, D. Normand-Cyrot and S. Monaco "*Sampled-data tracking under model predictive control and multi-rate planning*", IFAC World Congress, 2020, IFAC-PapersOnLine 53 (2), 3620-3625.

[C2] **M. Elobaid**, M. Mattioni, D. Normand-Cyrot and S. Monaco "*On unconstrained MPC through multirate sampling*", IFAC Nonlinear Control Conference NOLCOS, 2019, IFAC-PapersOnLine 52 (16), 388-393.

[C1] **M. Elobaid**, Y Hu, G Romualdi, S Dafarra, J Babic and D Pucci "*Telexistence and teleoperation for walking humanoid robots*", Proceedings of Intelligent Systems and Applications IntelliSys, 2019, pp 1106-1121

Presentations and invited Talks

Robust locomotion via online Nonlinear MPC Presented to the Honda R&D engineering, Saitama, JP, 2023.

Feedback Linearization via digital Control: Presented as part of a tutorial series offered to researchers in the Italian Institute of Technology. Genoa, 2022. See https://github.com/mebbaid/tutorials/

Path following problem under digital control: Presented to the annual meeting of the La Società Italiana Docenti e Ricercatori in Automatica. Ancona 2021

Transverse feedback linearization under digital control: Presented to the annual American Control Conference. 2021

On stable right-inversion of partially minimum phase systems: Presented to the annual IEEE Conference on Decision and Control. 2020

On unconstrained MPC under sampling: Presented to the 11th IFAC Symposium on Nonlinear Control Systems NOLCOS 2019 Vienna, 2019 and later to annual meeting of the La Società Italiana Docenti e Ricercatori in Automatica 2020

Services to the field

I am a member of the IEEE Control System Society CSS and the IEEE Robotics and Automation Socienty RAS. I have been, over the past 5 years, a regular reviewer to high impact journals and Conferences including ACC, CDC, ICRA, IROS, Humanoids, ECC, and IFAC WC, IEEE RA-L, IEEE L-CSS, IEEE TRO, among others. I have been invited as a session committee to the Control Conference Africa.