Stefano Mutti

☑ stefano.mutti@stiima.cnr.it

Q github.com/muttistefano

Employment History

2021 – · · · ·	PhD in informatics, University of Bari.
2017 – · · · ·	Research Assistant, STIIMA CNR.
2016 – 2017	Automation Engineer Intern, Brembo SPA.

Education

2014 – 2016	Master degreee in Automation and control engineering Politecnico di Milano.
	Thesis title: A novel distributed approach to power control in wireless cellular networks. grade 89/110
2015 - 2015	Erasmus visiting student Universidade Nova de Lisboa.
2010 – 2014	Bachelor degree in automation and control engineering Politecnico di Milano. grade 90/110

Skills

Languages	 English(C1), Italian(first language)
Coding	 C++, Python
Libraries	 CUDA, OpenCV, Eigen, PCL, PyTorch
Tools	 ROS2, Linux\Linux RT, industrial fieldbus.
Robots	 ABB, KUKA, Universal Robots, Comau
Typesetting	 Latex

Research interests

Mobile robotics	Research activity on calibration and performance optimization of mobile ma- nipulators, through vision-based sensors. Research activity on positioning per- formance enhancement in known environments, using lidar-based sensors. Re- search activity on mobile manipulator redundancy-aware motion planning aimed at positioning improvement. Planning and control of multiple mobile manipula- tors for cooperative scenarios.
Industrial robotics	 Research activity on calibration methods for robotic arms, Kalman filtering aided, through vision-based sensors. Research activity on motion planning optimization, for multi-robot systems, and workpiece optimization.
Computer vision	Research activity on visual servoing for mobile manipulators, image feature ex- traction for reference generation in robotic position control loops. Research ac- tivity on pose estimation of known objects with computer vision algorithms.
Machine learning	 Research activity on the usage of ML to improve the positioning performance of articulated kinematic chains Research activity on Gaussian processes aided motion planning of redundant mobile manipulators. Research activity on performing laser-scanner registration using RNN based networks.

- 2021–ongoing LAMPO Ø, LAMPO project objective is the analysis and improvement of industrial processes for the production of stabilizers (both horizontal and vertical) in composite (composite with polymer matrix and long fiber), since current processes rely on limited automation or no automation at all. In particular, stabilizers are big airfoils meant for stabilizing the flight of the aircraft and have been for a long time one of the primary businesses for Leonardo, with application on parts production for aircrafts such as AMX, ATR, Boeing 787, Airbus A220. Tasks personally performed My role is to design and control two mobile manipulators for the transportation of semi-rigid carbon fiber bulky objects.
 - Artistic custom project Ø, design of multiple custom mobile platforms for a mobile artistic installation. Tasks personally performed Design and deployment of heavy mobile robots, control systems, and sensors architecture based on embedded devices. Design of navigation algorithm based on the line following principle, using computer vision and dead reckoning, in order to compose shapes using multiple mobile robots synchronously. Design of the ROS based distributed control architecture, state machine, and application. Design of the web-based interface for control, logging, surveying, and maintenance of the mobile robots.
 - **Eureca S**, The EURECA project framework is dedicated to innovating the assembly 2017-2020 of aircraft interiors using advanced human- robot collaborative solutions. A pool of devices/frameworks will be deployed for teaming up with human operators in a humancentered assistive environment. Tasks personally performed Design and realization of autonomous mobile platforms for the transportation of custom robotic carts and heavy objects. Design and realization of customized autonomous robotic carts for the recognition, handling, and assembly of aircraft's internal sidewalls and hat-racks. Design and test of navigation, mapping, and localization algorithms for mobile platforms in dynamic scenarios on multiple floors, with tailored navigation algorithms for narrow passages. Design of custom lidar-based algorithms, based on point cloud registration, for precise positioning of mobile robots in custom positions for known environments. Design of computer vision-based algorithms for object pose estimation, correct grasping positioning of heavy and bulky objects, and correct installation. Deploying of control algorithms, sensors, and devices on embedded systems. Design and deployment of devices for real-time humanrobot collaboration during the assembly procedure for inspection and failure management. Design of the distributed ROS-based control architecture, scheduler, state machine, and network for multiple robots and systems.
 - 2018-2022 Sharework 🚱, The SHAREWORK's project main objective is to endow an industrial work environment of the necessary "intelligence" and methods for the effective adoption of Human-Robot Collaboration (HRC) without fences, providing a system capable of understanding the environment and human actions through knowledge and sensors, future state predictions and with the ability to make a robot act accordingly while human safety is guaranteed and the human-related barriers are overcome. Tasks personally performed Design, test, and verification of human-aware motion planning algorithms based on safety distance from humans and online dynamic re-planning. Design of vision-based algorithms for trajectory generation and grasping of industrial objects.

Role in international research projects (continued)

- 2017-2021 **Made4lo ?**, deployment and installation of a custom robotic solution for direct energy deposition based additive manufacturing. **Tasks personally performed** Design and deployment of sensors network, devices and computation architecture for the planning, control and surveillance of the manufacturing process. Design of robotic motion planning for additive manufacturing, including slicing of 3d objects and path optimization. Design of kinematic calibration procedures and tests to calibrate the kinematic robot parameters and assess its performance. Design of a vision-based algorithm for the identification of the molten pool temperature using deep learning. Design of a real-time control loop for the position control and correction of the robot, based on computer vision reference.
- **Evolaser** Ø, deployment and installation of a multi-robot cell for the autonomous laser cut of pipes. **Tasks personally performed** Design and test of calibration algorithms for kinematic parameters, tools geometry, and cell geometry. Design of motion planners tailored to a redundant kinematic robot for laser cutting. Design of optimization algorithms to optimize the work-piece positioning, based on the cutting trajectory, in a multi-robot cell. Design of a real-time, Ethercat-based controller for the control of the cutting power and correction during path edges and irregularities.

Research Publications

Journal Articles

- **Mutti**, **S.**, Pedrocchi, N., & Dimauro, G. (2023). Precise positioning of autonomous mobile robots through a fine-tuned rnn. *Authorea-Preprint*.
- Franceschi, P., **Mutti**, **S.**, Ottogalli, K., Rosquete, D., Borro, D., & Pedrocchi, N. (2022). A framework for cyber-physical production system management and digital twin feedback monitoring for fast failure recovery. *International Journal of Computer Integrated Manufacturing*, *35*(6), 619–632.
- Franceschi, P., **Mutti**, **S.**, & Pedrocchi. (2021). Optimal design of robotic work-cell through hierarchical manipulability maximization (on review). *Robotics and Computer-Integrated Manufacturing*.
- Mutti, S., Nicola, G., Beschi, M., Pedrocchi, N., & Tosatti, L. M. (2021). Towards optimal task positioning in multi-robot cells, using nested meta-heuristic swarm algorithms. *Robotics and Computer-Integrated Manufacturing*, *71*, 102131.
- **Mutti**, **S.**, & Pedrocchi, N. (2021a). Improved tracking and docking of industrial mobile robots through ukf vision-based kinematics calibration. *IEEE Access*, *9*, 127664–127671.
- Beschi, M., **Mutti**, **S.**, Nicola, G., Faroni, M., Magnoni, P., Villagrossi, E., & Pedrocchi, N. (2019). Optimal robot motion planning of redundant robots in machining and additive manufacturing applications. *Electronics*, *8*(12), 1437.

Conference Proceedings

- **Mutti**, **S**., & Dimauro, G. (2023). Distributed lidar based control for cooperative transportation with multiple autonomous mobile robots. In *2023 ieee international conference on industrial technology(icit)*. IEEE.
 - Mutti, S., Renò, V., Nitti, M., Dimauro, G., & Pedrocchi, N. (2022). Cloud-based visually aided mobile manipulator kinematic parameters calibration. In *Image analysis and processing. iciap 2022 workshops: Iciap international workshops, lecce, italy, may 23–27, 2022, revised selected papers, part i* (pp. 258–268). Springer.

Mutti, **S.**, & Pedrocchi, N. (2021b). Ukf vision-based mobile platform kinematic parameters calibration. In *Multimodal sensing and artificial intelligence: Technologies and applications ii* (Vol. 11785, pp. 204–215). SPIE.



Magdalena, A., Demir, A. G., Anilli, M., Tamborini, D., **Mutti**, **S.**, Tosatti, L. M., ... Barbara, P. (2019). Design and pathway programming of freeform thin-walled geometries produced by laser metal deposition. In *Lim 2019—lasers in manufacturing* (pp. 1–10).

⁶ Nicola, G., Pedrocchi, N., **Mutti**, **S.**, Magnoni, P., & Beschi, M. (2018). Optimal task positioning in multi-robot cells, using nested meta-heuristic swarm algorithms. (Vol. 72, pp. 386–391). Elsevier.

7 **Mutti**, **S.**, Falsone, A., Margellos, K., & Prandini, M. (2017). A proximal minimization based distributed approach to power control in wireless networks: Performance and comparative analysis. In *2017 ieee 56th annual conference on decision and control (cdc)* (pp. 3513–3518). IEEE.

Books and Chapters

Andrea, C., Colombo, D., Motta, M., Guaglione, F., Stefano, M., Nicola, P., ... Furlan, V. et al. (2022). Integrated robot motion and process control for manufacturing reshaping. In *Proceedings of i-rim 2022* (pp. 1–4).

Avvalendomi delle disposizioni di cui agli artt. 46 e 47 del DPR 445/2000 dichiaro sotto la mia responsabilità che quanto sopra riportato risulta essere vero e dichiaro inoltre di essere consapevole delle sanzioni penali ed amministrative, ai sensi degli artt. 75 e 76 del citato DPR 445/200, in caso di dichiarazioni mendaci e di formazione od uso di atti falsi. Autorizzo il trattamento dei dati personali contenuti nel mio curriculum vitae in base agli artt. 13 e 14 del GDPR - Regolamento UE 2016/679.