robotics

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Editorial

Special Issue on Advances in Industrial Robotics and Intelligent Systems

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Robotics and intelligent systems are intricately connected, each exploring their respective capabilities and moving towards a common goal. In industry, it is common to see robotic systems aided by machine learning and vice versa in applications including robot navigation, grasping, human–robot interaction/collaboration, safety and team management, among others. Achievements targeting the industrial domain can be directly applied in robotic systems operating in other domains. While significant advances have been made in the last few years, industrial robotics and intelligent systems face several scientific and technological challenges related to their integration with other systems, interaction with humans, safety, flexibility, reconfigurability and autonomy. These challenges are especially relevant for robots operating in unstructured industrial environments and sharing a workspace with human coworkers and other robots.

This Special Issue presents recent research and technological achievements in the field of advanced intelligent robotic systems. The contributions included cover the coordination of multiple robots navigating a factory floor, path planning strategies, human–robot interaction, robot redundancy and kinematics, system integration, grasping and manipulation.

Mobile multi-robot systems able to operate on a factory floor have recently emerged. This scenario brings several challenges, such as the coordination of the robots, path planning and the robots' behavior in reacting to communication faults [1]. An interesting study presents a time-based algorithm able to dynamically control a fleet of Autonomously Guided Vehicles (AGVs) in an automatic warehouse, integrating a routing algorithm based on the A* heuristic search to generate collision-free paths and a scheduling module to improve the routing results [2]. Since robots share the working space with humans, the authors explored and evaluated humans' perception of different autonomous mobile robots' courtesy behaviors at industrial facilities, particularly at crossing areas [3]. Localization and state estimation are key in developing autonomous mobile robots. In [4], a slip-aware localization framework for mobile robots experiencing wheel slip is proposed, which fuses infrastructure-aided visual tracking data and proprioceptive sensory data from a skid-steer mobile robot to enhance accuracy. In another study, a team of mobile manipulators within a compact planar workspace with obstacles is proposed to achieve autonomous object transportation [5].

Recent advances in dynamic programming redundancy resolution, applied to generic kinematic structures, are reported in [6]. In this study, a novel Robot Operating System (ROS) architecture is proposed and demonstrated on a 7-DOF robot. In [7], a method of calculating forward kinematics using a recursive algorithm that builds a 3D computational model from the configuration of a human-inspired mobile manipulator is presented. Path planning is studied in [8], addressing a complex trajectory evaluation of robotic arm trajectories containing only robot states defined in the joint space without any time parametrization

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(velocities or accelerations). In [9], a bin-picking solution that uses simulation to create bin-picking environments in which a procedural generation method builds entangled tubes is proposed. A new hyperloop transportation system design is proposed in [10]. The study elaborates on the design and integration of propulsion components for a linear motion system, providing high-speed transportation means for passengers and freights by utilizing linear synchronous motors.

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