Guest editorial

Special issue on cloud robotics and automation for intelligent manufacturing

Cloud robotics and automation invoke the cloud computing, cloud storage and distributed sensors on robots connected via networks to enable these robots not limited to the onboard computing and memory resources but to share the information with various robots and agents based on the technology of cloud computing, deep learning, big data, etc. Capabilities of online recognition, data processing, learning and adaptive abilities to the dynamic environment of every robot linked to the cloud will be enhanced through the cloud centers. The recent research in this field has been a hot topic in both industry and academia, leading to fast growth in a variety of related research topics, such as human–robot interactions, unmanned aerial vehicle (UAV), multi-robot systems and so forth. This special issue will concentrate on the fast-developing cloud robotics technologies and their industrial applications, to present some recent technical progress on theoretical innovations and application perspectives.

After a strict process of peer review, a total of 15 final high-quality submissions have been accepted and published, around the topic of "Cloud Robotics and Automation for Intelligent Manufacturing" in this special issue. These accepted manuscripts have made significant contributions to the fundamental theoretical studies and design of multi-robot motion planning, sensor fusion perception and other technique about cloud computing. It is expected that these contributions will promote further progress in many industrial applications.

In the field of multi-robot motion planning, "Quadrotor Navigation in Dynamic Environments with Deep Reinforcement Learning" proposes a distributed training architecture based on deep reinforcement learning to navigate UAVs in dynamics environments. It enables data to share among multiple agents, accelerates the speed of policy iteration and increases the efficiency of the training process in reinforcement learning. In "Iterative Learning Control for a Distributed Cloud Robot with Payload Delivery", the authors propose an adaptive iterative learning tracking control scheme for the BIT-6NAZA cloud robot system to cope with the problem of high precision trajectory tracking and payload transportation simultaneously.

For the research of sensor fusion-perception, an efficient mobile robot indoor localization method is proposed in the paper "An EKF based Multiple Data Fusion for Mobile Robot Indoor Localization" through fusing different dimensional information such as IMU, odometer and laser radar. The authors of the paper "Collaborative Processing and Data Optimization of Environmental Perception Technologies for Autonomous Vehicles" investigate a multi-sensor environmental perception collaborative method to address the problem of different data acquisition frequency during data fusion. In "Fast Tag Identification for Mobile RFID Robots in Manufacturing Environments", a novel anti-collision protocol is proposed to improve the identification efficiency in terms of UHF band passive and active RFID applications for mobile RFID robots.

With respect to other cloud computing techniques and applications, various challenging problems have been investigated such as cloud robotic tasks learning in "Dynamic movement primitives based cloud robotic skill learning for point and non-point obstacle avoidance", grasping task by multi-robot cooperation in "Cloud Robotic Grasping of Gaussian Mixture Model based on Point Cloud Projection under Occlusion" and regrasp motion planning in "Planning to Repose Long and Heavy Objects Considering a Combination of Regrasp and Constrained Drooping" and cloud platform in "Exoskeleton Cloud-Brain Platform and Its Application in Safety Assessment". Moreover, there are six other papers presenting cloud-related automations about manipulator, aero-dynamic pendulum, tele-operation, autonomous-vehicle control with various environment conditions and etc., as the theme expansion of the topic.

The above mentioned papers contribute to the state-of-the-art progresses in cloud robotics research and industrial applications, although they could not cover all the recent advances of related technologies. It is expected that this issue will enrich knowledge in the intelligent robotic community and further expand to more industrial applications. In addition, the guest editorial team would like to thank the authors, who selected this special issue to publish their most recent research outcomes. Last, but not the least, our appreciation is also extended to the anonymous reviewers for their support and insightful comments.

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