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Editorial

Human-Robot Interaction

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Human-robot interaction plays an essentially important role in deployment of robotics systems in our daily life such as manufacturing, medicine, and domestic services. Traditional robotic systems, especially industrial robots, are mostly caged and isolated from humans to perform simple and repetitive tasks in well-structured environments. To expand the application scopes of robotics systems, i.e., to bring robots out of cages, we have to investigate various human-robot interaction technologies from robot designs, sensing, and controls to human-robot interfaces, to ensure the safety and efficiency of human-robot collaboration. In recent years, in academia and industry, human-robot interaction has attracted a significant number of attentions. Many collaborative robots have been developed and deployed in real applications such as assembly, warehouses, and home services. Some new human-robot interaction models and algorithms have also been developed to resolve the emerging issues in human-robot collaboration.

This special issue contains original research articles to address problems in both conventional and emerging human-robot interaction fields.

The paper "A Control Architecture of Robot-Assisted Intervention for Children with Autism Spectrum Disorders" by Y. Feng et al. presents a robot-assisted control architecture, referred to as CARAI, to improve the autonomy of the robots in interacting with children with autism (ASD). The CARAI has been developed based on a famous cognitive architecture called Adaptive Character of Thought-Rational (ACT-R) and some traditional intervention protocols for children with autism (DTT and DIR/Floortime). Following the perception-cognition-action model, the CARAI comprises several modules and submodules with special functions. Besides the presented details of the proposed control architecture, the authors have tested the performance of the CARAI on two participants with ASD using a NAO humanoid robot. Their robot-assisted training session was divided into the four following phases: initialization, arousing the child's interest, training, and finishing session. Even with the small number of their participants, the authors mentioned that using the CARAI can reduce the burden on clinical psychologists.

The paper "Hobbit: Providing Fall Detection and Prevention for the Elderly in the Real World" by M. Bajones et al. presents the second prototypical implementation of the Hobbit robot, a socially assistive service robot. It is designed especially for fall detection and prevention, providing various tasks, such as picking up objects from the floor, patrolling through the fat, and employing reminder functionalities, and it could support multimodal interaction for different impairment levels. The robot did autonomous operation of 371 days during field trials in Austria, Greece, and Sweden while interacting with 18 elderly users (aged 75 years and older) over multiple weeks. It shows that Hobbit's adaptive approach towards the user increasingly eased the interaction between the users and Hobbit. Lessons learned from the studies are also provided regarding the need for adaptive behavior coordination, support during emergency situations, and clear communication of robotic actions and their consequences.

The paper "Allocating Multiple Types of Tasks to Heterogeneous Agents Based on the Theory of Comparative Advantage" by T. Morisawa et al. presents a method to allocate multiple tasks with uncertainty to heterogeneous robots using the theory of comparative advantage to maximize the benefit of specialization in human-robot teams. Simulation and experiments show that the method is effective in reducing the total task-execution time and dealing with uncertainty in task-execution time, uncertainty in the increasing number of tasks during task-execution, and uncertainty agents who are disobedient to allocation orders, compared with existing methods.

The paper "Hands-Free Maneuvers of Robotic Vehicles via Human Intentions Understanding Using Wearable Sensing" by W. Wang et al. presents wearable-sensing-based hands-free maneuver intention understanding approach to assist the human to naturally operate a robotic vehicle without physical contact. It is based on wearable electromyography (EMG) sensors and inertial measurement unit (IMU) to recognize the human maneuver intentions and then transfer the intentions to the controls of a robotic vehicle. Experimental results on a robotic vehicle illustrate the effectiveness of the proposed approach. It provides a new way for humans to interact with future autonomous vehicles without steering wheels and throttle and brake pedals.

The paper "Older Adults' Perceptions of Supporting Factors of Trust in a Robot Care Provider" by R. E. Stuck and W. A. Rogers studies what older adults would need to trust robot care providers in home-care context. It explores what older adults, who currently receive assistance from caregivers, perceive as supporting trust in robot care providers within four common home-care tasks: bathing, transferring, medication assistance, and household tasks. The results demonstrate that the older adult-robot care provider context has unique dimensions related to trust that should be considered when designing robots for home-care tasks.

The paper "Stabilization of Teleoperation Systems with Communication Delays: An IMC Approach" by Y. Li investigates an IMC-based control design for linear teleoperation system with communication delays. It is shown that the stability with the IMC approach is guaranteed delay-independently and the passivity assumption for external forces is removed for the proposed design of teleoperation systems. Simulations on a single-DOF linear teleoperation system show that the stability is guaranteed when the designed controller is applied and satisfying tracking performance can be achieved if the parameters are chosen suitably.

Conflicts of Interest

The editors declare that they have no conflicts of interest regarding the publication of this special issue.

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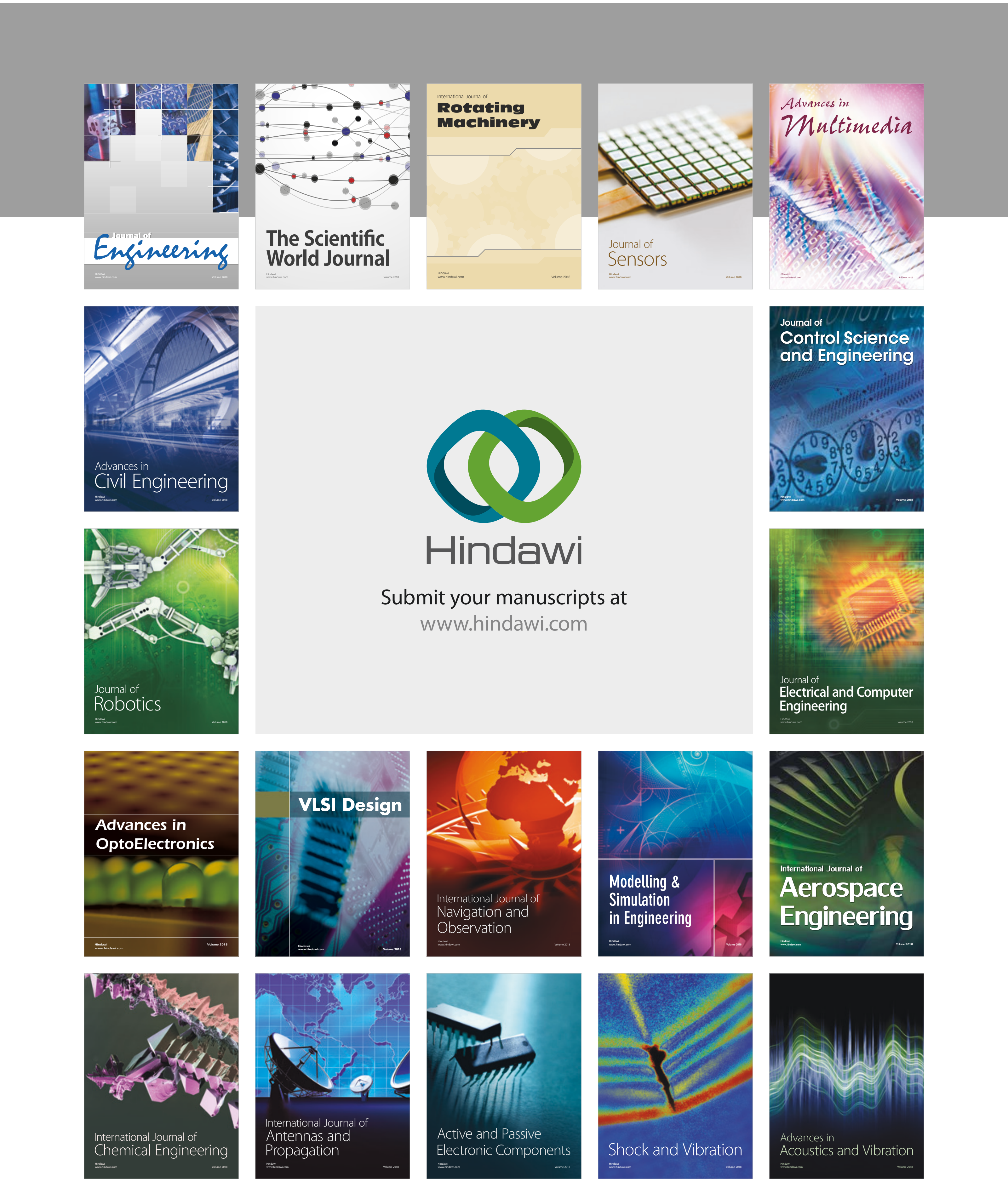

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