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Editorial

Special Issue on "Assistive Robotics"

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The technology behind robotics has rapidly advanced to a level enabling humans and robots to interact in everyday aspects of life. Nevertheless, it remains a challenge to design and develop these interactions to accommodate people of varying abilities [1]. Assistive Robotics is a branch of robotics that addresses the research challenges inherent in providing sensory and perception abilities and performing actions that are beneficial to the elderly and physically-challenged people [2,3]. This Special Issue presents recent research advances in the field of Assistive Robotics that can empower people to perform various tasks they could not otherwise, to be more independent, and to improve their overall quality of life. Robots for the visually impaired, telepresence robots for physical impairments, social robots for cognitive impairments, and wearable robots are some of the areas of research that were welcomed in this special issue.

After the careful and thorough review, this special issue consists of four papers advancing the state of the art in different aspects of assistive robotic technologies, such as personalizing robot assistants, controlling prosthetic devices, and investigating the meaning of "assistance" in a social-technological context. In [4], the authors proposed a data-driven Interactive Reinforcement Learning (IRL) framework that combines task performance and task engagement with the goal of achieving efficient personalization of socially-assistive robots, specifically focusing on coaching and training assistants. Their objective is to monitor how engaged users are with their tasks so that the robots provide personalized training strategies and maximize training outcomes. They integrated human-generated feedback to obtain task engagement, which will be used for adjusting task parameters and difficulty level as demonstrated through their experimental results. The authors of [5] studied the problem of sensorization in dexterous control of prosthetic devices. Specifically, they focused on how regression models can be used to predict movement activation at various levels (wrist, hand, and single finger) from the tactile sensors. They analyzed different Gaussian Process regression kernels on the combination of surface electromyography (sEMG) and tactile myography (TMG) using data from real human experimental subjects, and concluded that the regressed sensor data is effective in proportional control and the detection of prosthetic device activation. In similar research, Castellini et al. [6] presented a solution for myocontrol in prosthetic devices using Tactile Myography (TMG). They proposed a tactile bracelet that accommodates different shapes of forearm or residual limb of amputees to measure TMG signals; these measurements are then used to classify differential activation of the wrist or fingers. The authors applied this solution to experimental data from healthy human subjects and amputee human subjects and found that the results from both group are comparable regarding classification accuracy. This work complements the work in [5]; both push the boundaries of experimental research in prosthetic device control and activation. Krings and Weinberger in [7] discuss the role and function of assistance in assistive robotics technologies for inpatient care solutions and debate the terms in the context of socio-technical systems. With the exemplar of an empirical study using inpatient care for patients with dementia, the authors reveal the functional character of such assistance systems. They conclude that further studies and theoretical analysis are needed to well-establish the social and functional aspects of assistance within the community of scientists and technologists. Although these four papers in the special issue represent only a fraction of the recent advances in assistive robotics, they push the boundaries of what the research community is already working on and will continue to explore further.

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