Special Issue on Sensing in Medical Robots
Preface

Medical robots are presently actively studied worldwide, only a few decades after their introduction. Sensors are key components in robots and can improve robot performance. Sensing of biological information could improve the compatibility of such robots with patients and clinicians. Thus, sensing technology can foster the development of new medical robotic systems. This special issue focuses on the state-of-the-art of sensing technology including force, position, and vision sensors; sensing of biological signals; applications of sensors; and sensor fusion in medical robots in various fields including those of surgery, rehabilitation, and training.

Eleven research papers are included in this special issue. The first two papers focus on navigation and assist in surgical procedures using imaging data, with the first paper reporting on projection mapping with high-speed CCD camera for brain surgical navigation and the second paper on machine-learning-based images for automation of hemostasis. The third and fourth papers present the use of electromyograms to detect the activity of muscles. In the fifth paper, a method to quantify the heaviness of a paralyzed wrist is proposed and a robot for bilateral training of stroke patients is presented. The sixth and seventh papers present the use of biological signals to control a drone and a camera holder robot. The sixth paper presents a hybrid multicontrol system that simultaneously uses electroencephalography (EEG) and electrooculography (EOG) signals to control the drone. The seventh paper describes the use of facial detection points to control the camera holder robot. From the eighth to eleventh papers, the use of soft actuators to control medical and training robots is presented. The eighth and ninth papers show robots developed for minimally invasive surgery. The backdrivability of pneumatic actuators is effectively used to control the robots. The last two papers focus on eye surgery and training using pneumatically driven soft actuators.

Indeed, from the papers in this special issue, we find that soft robotics and machine learning are the hot topics in medical robotics.

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