Advancement in medical robotics and surgery.

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Editorial

This Special Issue, Guest Edited by Guest Editor Dr. Wendong Wang (Assistant professor, Northwestern Polytechnical University, China). In response to a broad interest among representatives of science, medicine and engineering, the research workers, designers, and users of robots will be invited to submit their recent research results.

With unmatched precision and the ability to work without fatigue, medical robots are obviously one of the most useful applications of robotic technology. Nowadays, with the progress made in electronic science and engineering, medical robots are used more often. The applications of medical robotics may be of a plenty sort, and their benefits to each of the associated contexts can be analyzed from several perspectives. These robots are widely used in various medical practices, including difficult surgical procedures, rehabilitation training and have completely revolutionized the speed and efficiency of health care services in several parts of the world. Nowadays, robots come in many forms and can be used in many ways to help people with disabilities.

Surgical robot was developed to overcome the limitations of traditional surgical procedures for minimally-invasive surgeries (MIS) and to enhance the capabilities of surgeons performing open surgeries. In the case of enhanced open surgery, autonomous instruments (in familiar configurations) replace traditional steel tools, performing certain actions (such as rib spreading) with much smoother, feedback-controlled motions than the human hand. The main object of such smart instruments is to reduce or eliminate the tissue trauma traditionally associated with open surgeries without requiring more than a few minutes' training on the part of surgeons.

Rehabilitation robot is more frequently used for the physical therapy of people with weakness in the upper and the lower limb, which is the most common type of stroke-induced disability. Rehabilitation robots can provide customized, prolonged, intensive, and repetitive training sessions for patients with neurological impairments. In most cases, the robotic exoskeletons must be aligned with the human joints and provide natural arm movements. Different types of actuation, degrees of freedom (DOFs), and control strategies have been utilized for the development of these rehabilitation robots. To study the status of rehabilitation robot technology, they are divided into two categories. One of them is auxiliary and replacement robots and another is training and therapeutic robots. The fixed and mobile robots, intelligent artificial limbs and supporting tools of the auxiliary and replacement robot are introduced in detail. Their characteristics of light structure and fast response are elaborated and research status and existing problems with settings are indicated, then the function of rehabilitation robots is pointed out.

The main purpose of this special issue is collecting and disseminating advanced research results in the field of medical robots and surgery. The issue focuses on the great advances that have been made in both experimental research and numerical modeling to facilitate improvement of health and surgery, and to enhance and provide faster and cost-effective diagnostics as well as to optimize treatment options. The topics include, but are not limited to mechanical design, control system, algorithms, modeling and simulation of medical robots, the novel robotic application in surgeries and rehabilitation.

Original research papers are solicited in any aspect of advancement of surgical and rehabilitation robot.

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