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Editorial

Editorial for the Special Issue on Physical Diagnosis and Rehabilitation Technologies

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Recently, physical diagnosis and human motion analysis have become active research topics in bioelectronics, and they have a broad range of applications, such as pathology detection, rehabilitation, prosthesis design, biometric identification, and humanoid robotic locomotion. Clinical human motion analysis methods aim to provide an objective means of quantifying the severity of pathology. A set of pathology-related human motion disorders have been identified and can be used to support diagnosis and the development of new assistive and rehabilitation technologies. This Special Issue in *Electronics*, titled "Physical Diagnosis and Rehabilitation Technologies", compiles some of the recent research accomplishments in the field of robotics and sensors for human assistance. It consists of 10 papers, which cover rehabilitation robots, human–computer interaction, and sensor and data augmentation, including two review papers. These papers can be categorized into four groups as follows:

(1) Rehabilitation robot: Li et al. [1] proposed an upper-limb rehabilitation training system based on an fNIRS-BCI system. The paper mainly focuses on the analysis and research of the cerebral blood oxygen signal in the system, and gradually extends the analysis and recognition method of the movement intention by using the cerebral blood oxygen signal to implement the actual brain–computer interface system. Some crucial technologies and typical prototypes of active intelligent rehabilitation and assistance systems for gait training are introduced in [2]. The limitations, challenges, and future directions, in terms of gait measurement and intention recognition, gait rehabilitation evaluation, and gait training control strategies, are also discussed. Han et al. [3] reviewed rehabilitation exoskeletons in terms of the overall design, driving unit, intention perception, compliant control, and efficiency validation. They also discussed the complexity and coupling of the human–machine integration systems, and wanted to guide the design of lower-limb rehabilitation exoskeleton systems for elderly and disabled patients. Shi et al. [4] developed a control strategy based on torque estimation and made it responsible for the intention understanding and motion servo of this customized system. Gao et al. [5] provided a dual-armed robotic puncture scheme to assist surgeons. The system was divided into an ultrasound scanning arm and a puncture arm. The robotic arms were designed with a compliant positioning function and master–slave control function.

(2) Human–computer interaction: Based on the results of the users' spatial controllability, Wu et al. [6] proposed two interaction techniques (non-visual selection and a spatial gesture recognition technique for surgery) and four spatial partitioning strategies for human–computer interaction designers, which can improve the users' spatial controllability. To facilitate further developments in flexible display interactive technology, Yin et al. [7] introduced a FlexSheet that can simulate the deformation environment.

(3) Sensor: Han et al. [8] presented a wearable PFC oxygen saturation measurement system using dual-wavelength, functional, near-infrared spectroscopy. The system

was designed for user-friendly wearing, with the advantages of comfort, convenience, portability, and affordability. A novel solid–liquid mixture pressure-sensing module is proposed in [9]. A flexible film with unique liquid-filled structures greatly reduces the pulse measurement error caused by sensor misalignment. The device is expected to provide a new solution for continuous wearable BP monitoring.

(4) Data augmentation: An integrated modeling approach incorporating a war trauma severity scoring algorithm (WTSS) and deep neural networks (DNN) is proposed in [10]. The experimental results verified that the proposed approach surpassed the traditional manual generation methods, achieved a prediction accuracy of 84.43%, and realized large-scale and credible war-trauma data augmentation.

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