BrainKorea FOUR 21 Mechanical Eng. SEMINAR

Biosignal Applications: EMG, ENG, and EEG

SPEAKER Ph.D. Junuk Chu (Daegu Research Center)

DATE Wednesday, MAY. 29, 2024 (5:00p.m.-)

CONTACT Prof. Geunbae Lim (279-2186)

PLACE Auditorium 1st floor at POSCO International Center

In the field of rehabilitation engineering, various biosignals are used for man-machine interfaces, and recently, much attention has been focused on peripheral nerve interfaces due to their easy accessibility and high reliability.
In this talk, we will introduce a peripheral nerve electrode-based neuro-prosthesis technology that is being developed to restore motor function in people with disabilities. As specific examples, we will discuss a functional neuromuscular stimulation system for walking assistance in paraplegics and a peripheral nerve interface for robotic prosthetic hand control in upper limb amputees. The importance of neural signal detection and feedback control in functional neuromuscular stimulation systems will be explained. We introduce a cuff electrode system developed to restore motor function in stroke and spinal cord injury patients, and show that feedback control can be used to control the ankle joint to a desired angle in animal experiments. In peripheral nerve interfaces for robotic prosthetic hand control, we introduce motion artifact suppression and action potential detection/classification

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algorithms, and investigate the real-time decoding structure of multichannel peripheral nerve signals for motion intention classification. Through monkey experiments, it is shown that it is possible to recognize grasping motion from peripheral nerve signals and control robot prosthesis in real time.
We introduce a robotic prosthetic hand system and a brain plasticity evaluation and enhancement system as applications using EMG and EEG. The robotic prosthetic hand for forearm amputees weighs 0.6 kg, has 8 degrees of freedom (DoFs) and 70 N of grasping force, and can recognize and perform 8 hand motions required in daily life based on EMG-based motion intention recognition technology. We introduce a 64-channel wireless EEG measurement system and a stroke severity evaluation technology based on gait EEG analysis. In addition, a virtual reality mirror therapy system based on visuo-tactile feedback shows that it can improve brain plasticity in patients with nerve damage and amputation.