Study of Electromyography Sensor Attachment Locations for Designing of Smart-fitness Clothing

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Abstract

With the recent development of wearable technology and the untact society's advent due to COVID-19, various home fitness activities were being activated. To reflect the needs of consumers, smart fitness clothing has been researched and developed. Among them, the development of clothing that checks each muscle's status and activity based on the EMG (Electromyography) signals is slow because there are limitations in various engineering and clothing aspects. When the EMG sensors are attached to the inside of the clothing, the sensor may not be correct in contact with the skin due to the body movements (joints and muscles), and thus accurate measurement may not be performed. The purpose of this study is to determine the optimal sensor position for each muscle group by attaching several sensors to each muscle, then analyzing the signals. EMG electrodes were attached to 9 muscles (two in the upper arm, one in the chest, one in the abdomen, two in the back, two in the thigh, and one in the calf) in the body, and EMG data were analyzed to find the best sensor attachment position. The amplitude, noise, and SNR (Signal to Noise Ratio) of EMG signals were measured when performing an exercise to activate each muscle. As a result, it was possible to confirm the optimal EMG sensing position for each muscle. It is expected that more accurate high-quality signals could be obtained in consideration of physical characteristics when developing smart fitness clothing.

Keywords
Smart Fitness Clothing, Electromyography (EMG), Muscle Location, Design Guidelines

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