Abstract

Motor neuron and musculoskeletal diseases are the most frequently inherited muscular disorders. Motor neuron diseases are mostly found among people within 35-70 years of age, which selectively affect the motor neurons. Amyotrophic lateral sclerosis (ALS) is the most common variant of motor neuron diseases that progressively degenerates the motor cells in the brain and spinal cord, so that the muscles no longer receive signals to move. As a result, the body becomes paralyzed, which means that the muscles no longer work. On the other hand, one of the most common musculoskeletal diseases is myopathy which causes the weakness of the muscles. Muscle cramps, tautness and spasm are also associated with myopathy. One of the possible ways to investigate the indispensable features of the ALS and myopathy diseases independently in individuals is to analyze the electromyography (EMG) signals that are basically
electrical signals originated from the muscles. In this paper, a classification scheme is developed to distinguish the ALS or myopathy affected signals from the normal ones based on some time and frequency domain operations, such as autocorrelation, zero crossing rate and Fourier transform. It is found that the proposed time and frequency domain features extracted from the EMG signals exhibit distinguishable characteristics for the case of ALS and myopathic diseases. For the purpose of classification, K-nearest neighborhood classifier is employed in a leave-one out cross validation technique. In order to show the classification performance, an EMG database consisted of 6 normal subjects aged 21-37 years, 6 ALS patients aged 35-67 years, and 6 myopathic patients aged 19-63 years is considered. From the experimentation on this database, it is found that the proposed method is capable of distinctly separating the ALS and myopathic patients based on the respective EMG signals.

References


Index Terms

Computer Science

Keywords

Amyotrophic Lateral Sclerosis (als)  Autocorrelation  Electromyography (emg)  Feature Extraction

Fourier Transform

Knn Classifier

Myopathy

Zero Crossing Rate