sEMG Sensor-Based Human Lower Limb Activity Recognition Using Machine **Learning Algorithms**

actions on the basis of datasets acquired via sensors such as ... View more

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Abstract



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Abstract:

Human lower limb activity recognition focuses on determining the activities of a person by monitoring their actions on the basis of datasets acquired via sensors such as accelerometers, gyroscopes, surface electromyography (sEMG), etc. sEMG is a computer-aided approach that incorporates useful information regarding movements of limbs and is also used for analyzing and recording the electrical activity generated by skeletal muscles. This paper demonstrates the analysis of the sEMG sensor-based dataset obtained from different muscles of 22 subjects performing activities such as walking, sitting, and standing. Out of these subjects, 11 seemed normal and the rest exhibited abnormalities. As a consequence of unprocessed data, discrete wavelet transform is applied to denoise the signal. Further, the overlapping windowing approach is used to execute the signal's segmentation, followed by the procedure of feature extraction, which is carried out by extracting five-time domain features. Several machine learning models, such as random forest, gradient boosting, k-nearest neighbors, support vector machine using radial basis function, and the polynomial kernel were implemented. The results show that random forest, having cross-validation of 5-fold, achieved the best accuracy for normal (85.68%) and abnormal subjects (83.96%) in determining human activity.

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Contents

I. Introduction

To determine the activities performed by human beings, human lower limb activity recognition plays a crucial role in various distinct applications. It includes elderly people's monitoring, healthcare, security surveillance, etc. [1]–[4]. The potential of a server can be used to spot security threats to recognize the activity of a human lower limb from video surveillance. It pays attention to the assortment of someone's actions via a series of observances recorded through sensors [5]. At present, pain in the knee is a common problem that attacks the self-sufficiency of people of different age groups. According to the observations, in the age group of 18-64 one in every three people has Sign in to Continue Reading the problem of arthritis or joint symptoms. It can be caused by underlying conditions like knee osteoarthritis or an injury. These types of knee problems can also be determined with the help of human activity recognition. Nowadays, the bulk of people sustains several devices that detect their activities, with the growth of internet of things (IoT). These devices can be a smartwatch, smartphone, pulsometer, etc. Also, along with real feedback processors, observe the motion of aged citizens, instant adverse effects, and wellness problems that can be permitted before time, and in advance, can be reduced.

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