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Different Techniques for Electromyogram Signal Processing

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Abstract: Electromyography (EMG) is one of the wide areas in the medical field, to analyze the biological signals for detecting the movements of muscles. The major studies based on to recorded electrical signal which helps to diagnose the conditions of muscle disorders. Further, EMG is used for prosthesis control, rehabilitation for clinical diagnosis and the electrical signals are generated to control and activate the myoelectric artificial prosthetic arm.However, this paper will provide the comprehensive review on EMG signals based on different datasets and the overall components and methods are discussed for future approaches.

Keywords: *Electromyography (EMG)*

I. INTRODUCTION

Electromyography (EMG) is a device which is widely used to measure and record the electrical activity of muscles. This recorded electrical signal is called as an electromyogram which helps to diagnose the conditions of muscle disorders. The time duration testing of EMG testingis approximately 30 to 90 minutes that depends on the study of muscles. This leads to analyze the abnormalities of neuromuscular disease. However, EMG is used for prosthesis control, rehabilitation and also for clinical diagnosis [1]. The electrical signals are generated in EMG which helps to control and activate the myoelectric artificial prosthetic arm, and then the electrodes are placed in the arm muscles through the surface of the skin. The types of electrodes are surface electrode, needle electrode and fine wire electrode.The electrical activity of the muscle should concern the clinical examination in EMG and the clinical abnormalities of chronic denervationof a normal muscle are detected as shown in fig. 1[2]. However, the main issues are concluded during the measurement of EMG signals:

• The intensity and timing of muscle contraction, which is to determine any segments of the muscles in the area of electrode is active.
• The placement of electrode from the measure muscles area and the electrode must be placed in the belly regions of muscles
• The designed properties of muscle and electrodes are combined with two types of electrodes which can be further divided into two categories they are invasive and noninvasive electrodes [1].

Besides, this paper represents the review of EMG signals which is based on different datasets then the overall components and methods are discussed for future approaches.

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II. REVIEW ON ELECTROMYOGRAM (EMG)

Joan Lobo-peter, peter N koorenet.al, suggests the EMG signal or force signals which are used as inputs for admittance based controller by using the samples of adult DMD patients (male). This design is used to analyze the interface, which is more suitable for control the wearable devices for activate the arm support [1]. Joan Lobo-prat, mariskajanssen, et.al, proposes the movements with force based control for three male adults with DMD in the age of (21-22 years). This study presents feasibility and performance evaluation of EMG signals [2]. For muscle detection, the ultrasound image acquisition was proposed to predetermine the force. Then, the features of input images are sieving through edge detection parameters over a training dataset and the system performance are extended by muscle groups [3].

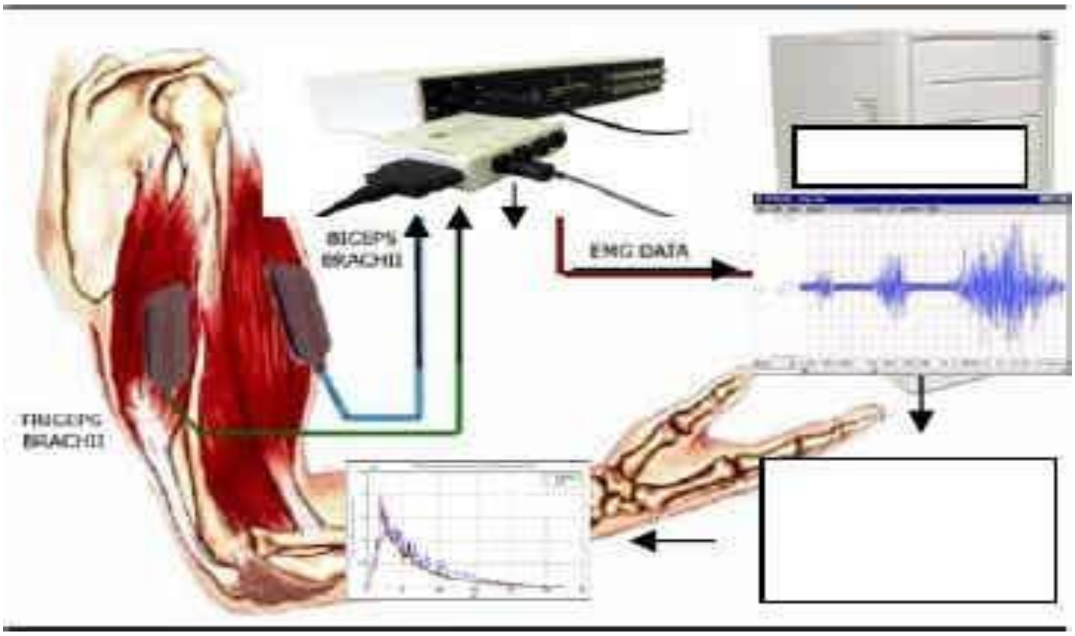

Fig.1 Block diagram of EMG Signal

Yinxue Wang, Luca Bello, YueWang,et.al, suggests the machine learning approaches topredict age at LoA based on clinical measures of muscular strength and motor function using CINRG dataset.It is a multivariate model topredict the age at LoA for DMD patients based onclinical outcomes [4]. Further, the inconspicuous and simple planar active arm used to support the adults with DMD which can be controlled within the force or EMG based interfaces [5]

Sathyavikasini K, Vijaya et.al, proposes mutated gene sequences of fifty five genes for disease identification, positional cloning, disease gene datasets, feature extraction and training dataset [6]. UvaisQidwai, AejazZahidet.al, suggests the detecting muscular movements from facial muscles especially eyebrow movement muscles using children with SMA datasets. This system is to enable the children to use computer system and other control systems [7].

Anne J. Pigula, Jim S. Wu et.al, contributes the ultrasound videos of muscle compression under known pressures in the biceps and quadriceps of 23 boys with DMD within 20 age-matched healthy controls, clinical data and demographics. It can be performed in a few minutes, and requires minimal

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action from the patient. Kostas Nizamis, Joan Lobo-Pratet.al, conducted the device in a 2-D horizontal tracing using EMG-based control interface to detect the user's movements [9]. Further, Global cardiac function and presence of fibrosis, but changes in these measures are late manifestations using the datasets of boys with DMD and associated with cardiomyopathies. It involves cardiac movement in DMD for improving patient careand aiding the evaluation of emerging therapies [10].

Lev R, Seliktar D, proposes the Cell delivery systems in muscle injuries and ailments, including their mild processing conditions. It uses the patients datasets includes muscular dystrophies and muscle injuries. Themuscular dystrophies is the therapeutic repair of muscle injuriesand muscle wasting diseases [11]. However the Software designed for use with the device computed several variables to qualify and quantify muscular activity in the non-ambulant subjects [12].

Peter N. Kooren, Joan Lobo-Prat et.al, contributes the assist people with DMD for the performance of ADL. The pilot evaluation was carried outwith one healthy subject (27 years-old) performing ADL. To test the functional performance of bandwidth, efficiency, joint sppedand end position [13].Per hilton-brown, erikstalberg, et.al, Scanning EMG to study the distribution of activity within the motor unit. They used patients datasets with muscular dystrophy to find the unchanged mean length are compared with normal length [14].

Further, the analyses are taken from different patients with genetic diseases. This problem is handled for non-synonymous single nucleotidevariants (SNVs) that capture only missense and nonsense mutations. Then the outcome of trained model reports that the prediction accuracy of86% in multi-class SVM with the RBFkernel [15]. David Sala, Thomas J. cunninghamet.al, proposes boosting muscle stem cells to treat muscular dystrophy and aging muscles for patients with muscular dystrophy [16]. The Predicting muscular dystrophy with sequence based features for point mutation for patients affected with genetic diseases caused by the deformity in the inherited genes. The resultant shows the prediction accuracy of 100% by estimating using 10-fold cross validation [17].

III. CONCLUSION

Electromyography (EMG) is a device which is widely used to measure and record the electrical activity of muscles. This article represents the comprehensive review on EMG signals. It is based on different algorithms using real time datasets interms of bandwidth, efficiency and system performance. Finally, the overall components and methods are discussed for future approaches.

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