CHAPTER 1

INTRODUCTION

1.1 PROJECT BACKGROUND

For the last 40 to 70 years before, the analysis of Electromyography (EMG) signal has been widely used in order to gain or provide a full understanding of the muscle function (signal). EMG can be clarified into two different kinds which are surface EMG and intramuscular EMG (needle and fine wire). Surface EMG (sEMG) signals are a class of bio-signals that described the electrical activity of the neuromuscular system. This sEMG also can be described as a graphic record of micro-voltage presence in the muscle, whether in static or active contraction which can be sensed or measured by the sensors placed upon the skin. The electromyographic activity is captured through the surface electrodes that represent the overall activity or signal during muscle contraction.

Muscles are responsible for generating the required force any movement either simple or aggressive one; carried by it respective contracting mechanisms. In addition, muscle can slowly or gradually enter into the state of fatigue in a continuous contracting process. Fatigue is referred as a feeling of tiredness or exhaustion or a need to rest that can be caused by the lack of energy or repetitive work. Hence, muscle
fatigue is defined as a reduction in the force generating capacity of a muscle due to the previous activity.

The advantages of EMG are it’s a non-invasive, simple operation and easy to accept for the patients. The biological signals recorded for sEMG through the electrode surface reflects the status of the nerve and the muscle. Hence, EMG is an effective way to do the studies of muscle fatigue. Furthermore, the typical benefits of EMG are the EMG enables to directly look into the muscle, computing or surveying the muscular performance, and analysis the data to improve sport activities. Next, EMG also helps in decision making both before and after surgery and helps patients to signal and train their muscle.

The experts have found that the analysis conducted based on fatigue during repetitive work, EMG signal appears in a phenomenon where the amplitude of EMG signal increase while power spectrum moves towards low frequency. Mostly, this effect caused by changes in the nerve conduction velocity. The results show that this particular method can carry on the evaluation or analysis of muscle fatigue.

In this project, the small electric current, or signal which comes from active muscles is detected by sensors is placed on the skin directly above the muscles. The pattern of the signal is seen on a computer and is analysed by using Mat Lab; a software programming. The data then will be undergoing the filtering step in order to remove any noise or obstacles during the EMG process.

1.2 PROBLEM STATEMENT

Muscle fatigue of the upper limb muscles follow most recurrently due to repetitive movements in our day-to-day activities. The powerful use of muscles might cause a decline (electromyography signal) in performance. Surface electromyographic (sEMG) is a well-known and acceptable measuring technique to analyse the muscle fatigue during repetitive work. In the last four decades, it has become quite common to evaluate local muscle fatigue by means of sEMG signal processing, however the exact signal performance based on electrode placement sites, different anthropometric parameters and elbow angle movements are still a matter of discussion.
1.3 OBJECTIVE

The objective of this project is to;

1. Detect muscle fatigue in EMG using amplitude analysis (increasing amplitude value).
2. Identify muscle fatigue by decreasing value in the frequency components of the EMG signal.
3. Analyse the EMG signal with root mean square (RMS) value from different protocols (filtering, sampling etc).

1.4 PROJECT SCOPE

During this project, there are many related issues that should be heavily addressed in order to achieve the main objectives of the project. The listed project’s scope below is used as a guideline alongside the project progress;

1. Clinical
2. Sport activities
3. Ergonomics
4. Human kinesiology
5. Biomedical physiology