CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

The upper-limb movements are essential for the human basic activities, such as lifting object, typing word, writing and etc. Some of peoples have loss of physically ability like disables to carry out daily activities and leads to poor quality life, and injured person to perform basic upper-limb activities. To overcome this problem, the existing of robotic system have been develop to assist daily life motions and rehabilitation of physically fragile people. That why it needed Electromyography to study muscle movement through the inquiry of the electrical signal the muscles give off and it is also used to detect the muscle movement to find out the force, torque and angle from robot arm movement.

Besides, Surface Electromyography (SEMG) is the signal detected by an electrode on the surface of the skin. EMG amplitude is defined as the time varying standard deviation of the surface EMG. Surface EMG (SEMG) provides a measure of the muscular effort and also serves as an input to EMG to force models, myoelectric prosthesis, gait analysis, motion control studies, and other applications. During isometric contractions and muscle length in upper-limb the elbow angle must be considered as one of the factors on the maximum muscle force. For example, the data will generate the single curve, suggesting that joint angle or muscle length. It does not have a significant effect on the angle-EMG relationship of the upper-limb muscle during load carried. Simulations it useful insight about the kind of data that needed to be collected and the length of data to be controlled in experimental studies. Moreover, for
the angle measurement during this research, goniometer is used to calibrate and carried out several of angles. EMG amplitudes area a noisy signal and therefore, the impedance estimate could be noisy and it would be useful to know the accuracy of estimation in the presence of noise.

The study of this research was examined the effect of elbow joint position on angle and EMG amplitude and frequency, as well as the EMG angle relationship of the upper limb muscle during load carried.

1.1.1 ELECTROMYOGRAPHY (EMG) SIGNAL

In sarcolemma, there have a lipid bi-layer which contain certain ions move through the channels between the extra-cellular fluid and intra-cellular fluid. Besides, the sarcolemma also known as thin semi-permeable membrane that allowed some ions passed through the membrane wall. In intra-cellular fluid consist a high concentration of an organic (A-) anion and potassium (K+) ions. The potassium (K+) ions are small in size and make it can easily pass through the channels in the sarcolemma membrane as opposed to the organic (A-) anions that cannot pass through the membrane. Moreover, the extra-cellular fluid contain Chloride (Cl-) and Sodium (Na+) ions. Same case happen in intra-cellular fluid, Chloride (Cl-) has smaller in size compare to Sodium (Na+) ions so Cl- ions can pass through the membrane wall. In the between of the ions, there have some potential different occurs because of the concentration between outside and inside cell. That mean high concentration will flow to low concentration. In addition, the movement of Cl- and K+ ions creates a negative charge inside the membrane and a positive charge outside the membrane. Therefore, some chemical reaction occurs in membrane and the basic of surface electromyography (EMG) has related between the action potential of muscle fibers and the extra-cellular recording of those action potentials at the skin surface. For the stronger contraction require large number of motor units to be activated or recruited to contract, this activation motor unit is called motor unit recruitment.
1.2 PROBLEM STATEMENT

The electrical signal on upper limb muscle can be influenced by various external issues. For example, muscle contraction, relaxation, elbow joint angle, muscle force, and some other issues. By measuring and analyzing the surface electromyography (SEMG) signal, it is possible to find the muscle function of upper limb muscle during various movement condition. It is therefore important to understand how well the SEMG signals of upper limb muscles are working.

1.3 OBJECTIVES

- To determine the strongest electrical signal on upper limb muscle (Triceps, Biceps and forearm) by using EMG-Angle relationship.
- To understand the application on EMG related to angle relationship on upper limb muscle.
- To collect the data of exert force on protocol by using load carried.