

# THE ADVANCED PROSTHETIC HAND USING ELECTROMYOGRAPHY

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**Abstract**— This paper illustrates the equipment used in development of fully functional prosthetic hand. The main objective of this project is to develop a feasible cost prosthetic hand for the person with amputee and to provide a much easier approach towards real-life daily function. It is a new approach toward the traditional immovable wooden or metal prosthetic hand which was just a mere replacement of hand. The advanced prosthetic hand is a combination of engineering and medical science, which allows us to perform swift functions. The process of measuring muscle activity in terms of electrical potential is known as electromyography, it is the key factor in the development of this project. For the detection of electrical potential, myoware muscle sensor is used, whose electrodes picks up the analog voltage pass it on the the ATMEGA328p Arduino. The replica of human hand is made for the purpose of demonstration, which is controlled by Arduino. The Arduino C programming language is used for programming the Arduino.

**IndexTerms**—Electromyography,Arduino,Electrodes.

## I. INTRODUCTION

Prosthetic hand is the replacement of actual hand or limb, which may have lost in disease, accident or congenital condition. It is expected to fulfil the requirement of missing part but restoring the normal function in daily life.

In earlier decades, wooden or metallic prosthetic hand was very common, with the advancement in technology modern prosthetic hand came into existence. The advanced prosthetic hand uses the process of electromyography to record and process the muscle activity of the body via Electrical potential. This electric potential on further processing passes on to the Arduino which forms the movement in hand.

"Hand motion recognition from single channel surface EMG using wavelet filter & Artificial Neural Network has explained about the the strength of the muscle contraction can be easily measured by the muscle activity extracted at the skin surface. [1]

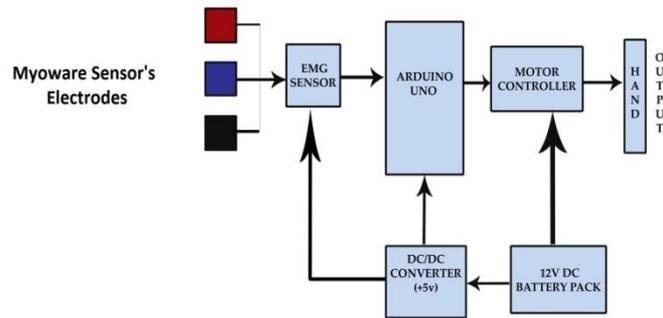
"Development of Electromyography Signal Signature for Forearm Muscle" has explained about the establishment of sEMG signal signature of female and male subjects for forearm muscles such as extensor carpi radialis etc, based on movements such as wrist extension and flexion, hand open and close and forearm supination and pronation. [2]

"Bio-Signal controlled prosthetic hand." has Explained about the employment of myoelectric signal to control grasping operation by a Prosthetic hand. A method for using sensory feedback in the control architecture to manipulate grasping operations is presented. [3]

"Design and Development of EMG controlled Prosthetic Limb." Has explained about that the, EMG signal is successfully extracted from the subject and the acquired EMG signal had two parts relaxation phase and contraction phase.[4]

## II. OBJECTIVES

- a. This paper is intended to manifest the technology used in Prosthetic hand which are different from the one's used traditionally.
- b. This Prosthetic hand is equipped with a controller that enables the automatic fist formation of the hand form supination to pronation.
- c. The objective of the proposed Prosthetic hand is to provide a newer generation of Prosthetic hand which is capable performing the function which was not possible for the traditional prosthetic hand. In this project 'Arduino 382p' has been used as Controller.
- d. Whenever the hand contracts the electrode of the myoware muscle sensor picks up the electrical pulse and sends it to the controller which on processing rotates the motor for the fist formation.
- e. When the hand relax the electrode of the myoware muscle sensor picks up the electrical pulse and sends it to the controller which on processing rotates the motor for the standard hand formation.

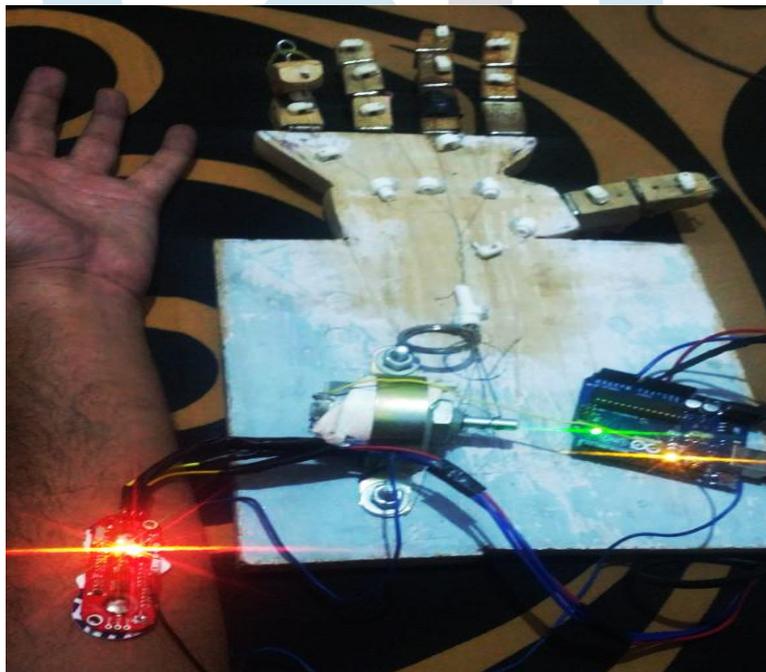


**Fig:-1 Block Diagram of the Advanced Prosthetic hand Using Electromyography.**

### III. METHODOLOGY

#### Block diagram description

THE ADVANCED PROSTHETIC HAND USING ELECTROMYOGRAPHY is a Arduino cum Myoware muscle sensor based device. The Prosthetic hand eliminates the non usefulness of the the traditional non movable hand. This Prosthetic hand is equipped with myoware muscle sensor which works on the principle of Electromyography which is a process of studying the electrical activity of muscle tissue, over it's representation on a visual display (or) audible display signal, using electrodes attached to the muscle. In this project Myoware muscle sensor's electrode picks up the electrical signal of the muscle tissue on contraction and relaxation and sends it to the microcontroller Atmega 328p, which is on standby with the program codes for this project. On contraction of the muscle tissue the microcontroller send the signal for the first formation via rotating the DC motor voa motor driving IC L293D, were as on relaxation of muscle tissue an another signal is send via same channel for the relaxation of the hand. We have a power supply of 12vDc which on process to 5vDc and supplied to Arduino uno via DC/DC converter and 12vDc to motor controller.



**Fig :-2 Image Of Proposed Prototype**

### IV. RESULT

An example of how embedded technology is used in application, specifically in the field of medical is presented in this paper.

1. It is working on arduino. Its a robotic Prosthetic hand with motor and battery attached to it.
2. If the muscle contracts, electrical signal is picked up by the electrode and passed to microcontroller,

which on further processing sends the signal to the motor driver L293d to control the motor for the fist formation.

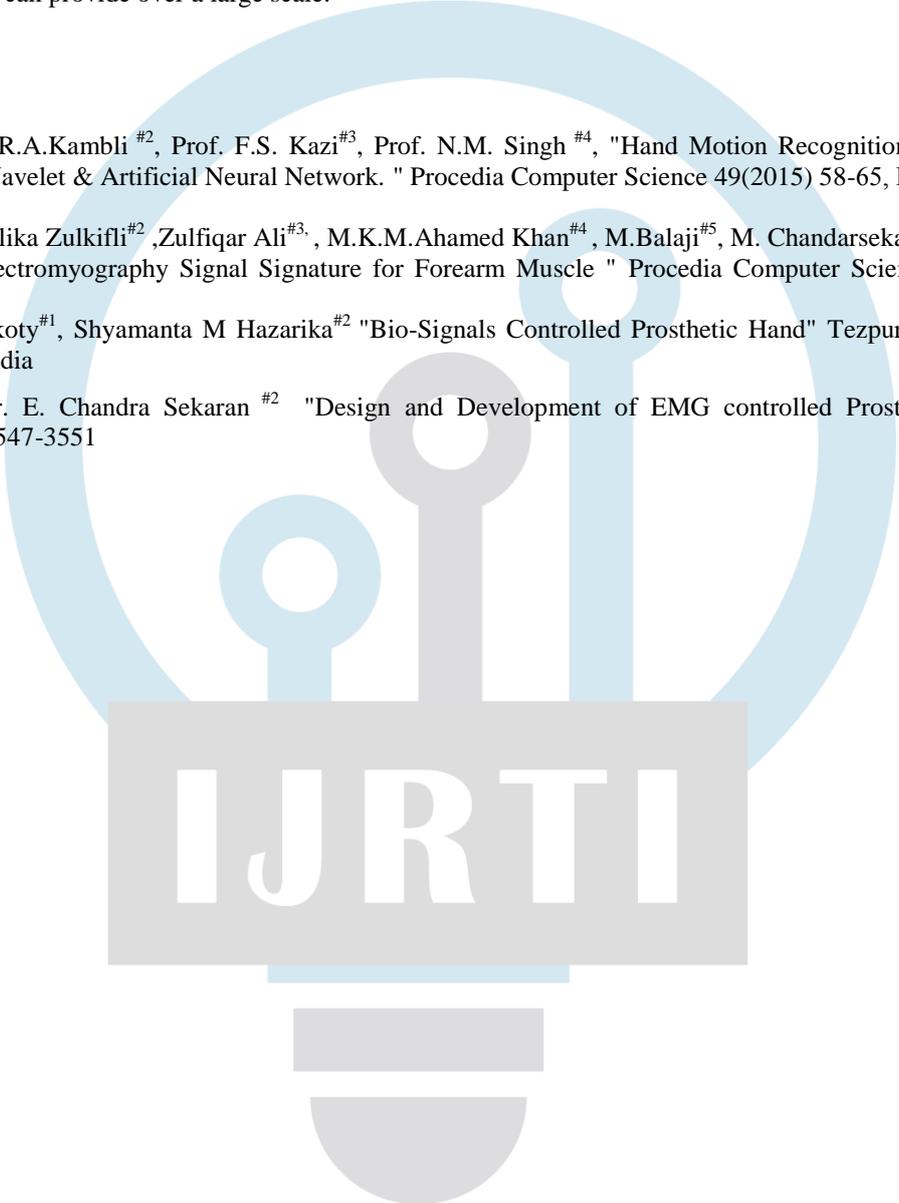
3. If the muscle Relaxes, a different electrical signal is picked up by the electrode and passed to microcontroller, which on further processing sends the signal to the motor driver L293d to control the motor for the relax hand formation.

## V. CONCLUSION

The Advanced prosthetic hand using electromyography that is framework presented in this paper is in fact a final year project. A general conclusion that can be said about such engineering projects is that they are presenting students to an open horizon of developments. Here we studied the generation of raw Emg signals, processed it via myoware muscle sensor to make it compatible for microcontroller, which was installed with a program written in Arduino C language for the formation of different movement in the prosthetic hand Such as fist formation and relax hand formation. This projects can only represent a smaller part of what the modern technology can provide over a large scale.

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