"OVERVIEW OF PROSTHETIC ARM USING 3-D PRINTING TECHNOLOGY AND CONTROL SYSTEM"

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ABSTRACT

Aimed at improving the quality of life for amputees, this project investigates the design of a prosthetic arm to mimic its human counterpart. In particular it examines alternative mechanisms to data acquisition and transmission. This paper provides the basis for the development of a prosthetic limb that operates as a part of the human body's neural network. As opposed to a conventional prosthesis that only provides motion of the extremity, this design aims to lay the foundations for incorporation of added sensory feedback into the nervous system so as to provide the tactile sensations experienced by a human arm. The transform of the input signals to the required output location is done with traditional coordinate reference systems.

The physical structure of the hand has been modelled such that it can be easily assembled. It has been simplified such that it only has six of the twenty degrees of freedom while retaining some of the important motions of the human hand. A two-finger model has been constructed. This model exhibits the full range of motion required to grip an object with some degree of force. A virtual reality model package has been developed in visual basic to control the model in such a manner that it is able to demonstrate the potential of the project.

Keyword: *-EMG sensor, Atmega16, 3D printer, servo motor driver*

1.INTRODUCTION

The objective of this research work was to design and construct a prosthesis that will be strong and reliable, while still offering control on the forceexerted. The design had to account for mechanical and electrical design reliability and size. These goals were targeted by using EMG in the electrical control system and a linear motion approach in themochamical system. The signals recorded by the input is obtained from forearm muscle, measured using surface electrodes. This system provides the advantage of being less fatiguing than traditional input devices. These Myoelectric signals (MES) can be read by Myoelectrodes and amplified to measure a muscle's naturally generated electricity. After processing via designed processing units, these signals can be designated to control a particular degree of freedom in the prosthesis.

Many researchers are working in the development of prosthetic devices to aid the physically challenged people in their routine activities. Active prosthetics devices provide functionality in addition to structural support in place of missing limbs. Myoelectric orelectromyogram (EMG) signals that may be acquired using suitable sensors from the human body are widely used in actuating prosthetic devices by intelligently recognizing the intended limb motion of the person. EMG signals may be captured either from the surface of the skin using surface electrodes or from the muscles.

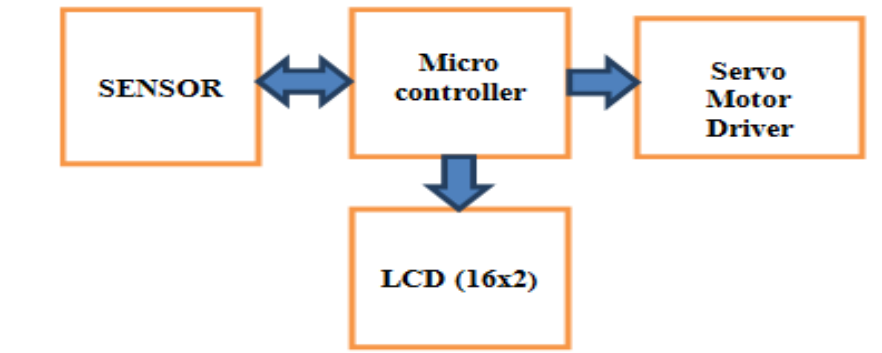
2.LITERATURE SURVEY

[1] Fabrication of Low Cost Prosthetic Arm with Foamed Fingers Vivek Parasa1, Dr. A Gopichand2, N V S Shankar3, K Hanumantha Rao4 International Journal of Engineering Research & Science (IJOER) ISSN: [2395-6992] [Vol-2, Issue-10, October- 2016] The current work is aimed at overcoming these difficulties by the use of EPE foamed fingers which are driven actuated by a tendon by the gesture of palm while the foam provides the necessary spring back. CAD models are prepared using proe while 3D printing is used for fabricating most of the arm.

[2] Design of Myoelectric Prosthetic Arm Chandrashekhar P. Shinde International Journal Of Advanced Science, Engineering And Technology. Issn 2319-5924vol 1, Issue 1, 2012, Proposed system implementation a one-dimensional virtual object to investigate differences in efferent control between the proximal and distal muscles of the upper limbs. Restricted movement was allowed while recording EMG signals from elbow or wrist flexors/extensors during isometric contractions. The signals recorded by the surface electrodes are sufficient to control the movements of a virtual prosthesis. The presented method offers great potential for the development of future hand prostheses .

[3]Control Of Hand Prostheses Using Peripheral Information Silvestro Micera, *Senior Member, Ieee,* Jacopo Carpaneto, And Stanisa Raspopovic Ieee Reviews In Biomedical Engineering, Vol. 3, 2010 Several efforts have been carried out to enhance dexterous hand prosthesis control by impaired individuals. Choosing which voluntary signal to use for control purposes is a critical element to achieve this goal. This review presents and discusses the recent results achieved by using electromyographic signals, recorded either with surface (sEMG) or intramuscular (iEMG) electrodes, and electroneurographic (ENG) signals. The potential benefits and shortcomings of the different approaches are described with a particular attention to the definition of all the steps required to achieve an effective hand prosthesis control in the different cases. Finally, a possible roadmap in the field is also presented.

3.BLOCK DIAGRAM



4 WORKING

It is clear from the fig. block diagram that the sensor attached with the microcontroller will send the analog signal which will be further processed by the microcontroller for servo motor control whereas the LCD is used to display the real time status of the Servo angle movement.

5. COMPONENT USED

5.1 Hardware components

1. ATMega16 Microcontroller
2. Motor driver

3. Voltage regulator
4. 3 d printing module
5. Mechanical accessories
6. Dc battery
7. Lcd (16x2)
8. Sensor

5.2 Software components

1. AVR Studio
2. PCB Artist
3. Win AVR

6. LANGUAGE USED

1 . Embedded C

7. APPLICATION

- It is versatility in use, it replacement of human hand with artificial arm
- It is handle many grip functions
- It is looks and moves almost like real hand
- Prosthetic application system can also be built for different element of body.

8.CONCLUSION

The project demonstrated the potential of the hands design as well as providing insight into improvements of the design. With the basis of the theoretical model completed and the mechanics functioning smoothly the initial step in the process of manufacturing a prosthetic arm that is attached to the body's network has been completed.

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