

Artificial Prosthetic Hand- An Aid for Physically Challenged People

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Abstract— We use our hands without even thinking twice that how much we need it in our day to day life. Hands play a major role in our life and make the hand makes us losing a major chunk of life. It is very pathetic to see any of our close ones to lose a hand and suffer due to it. This is where modern artificial hands play a significant role – they are advanced and highly sophisticated. Along with the advancements the cost also increases for it. On the other hand bionic and mionic hands uses the muscular action which becomes complex to use by people. This motivated us to think about an alternate solution for the complexities which are prevailing in current scenario. The main objective of the researchers is to be useful and affordable for people who lost their hand or born without the hand. The efficacy of the product will enable it to be used in industries to even handle volatile objects .A flex sensor used in making the glove, will be able to convert the bending changes into varying resistance. This feature will enable researchers to use the action of active human hand and copy its actions and replicate it in the prosthetic hand. This varying resistance gives commands to servomotor using microcontroller.

Key words: Prosthetic hand, Prototype, Flex sensor, Servo motor, Arduino Microcontroller, Varying resistance, Glove, Artificial hand

I. INTRODUCTION

A human hand is a very complex grasping tool which handles object of different sizes and shapes. Many research works have taken to develop an artificial robot hands with similar capabilities of a human hand. Human hands play vital roles in making human lives easy and cosy. We have been using our hands since we were in our mother's womb. It is used for non-verbal communication, to make gesture, to do some work and in every basic activity.

But when one loose the use of hands or if someone was born without hands the whole life becomes questionable to them. So, in order to overcome this issue researchers came up with the idea of PROSTHETIC HAND. This Bionic Hand is not only useful for people who lost their hands but it also helps people in heavy industry works to handle volatile works and objects.

To test the working of it, flex sensors were attached on each of the gripper's fingertips to analyse and measure the pressure force between body and external surfaces. By attaching the sensors to gripper's fingertips, the analysis of force distribution applied on the fingertips can be evaluated and checked. The first level test conducted on Flex sensor has determined the suitability of the sensor on detecting small forces.

In the second level of testing Flex sensors were attached on the back of the Glove to detect finger bending activity of human. The Glove with the sensors attached to it identifies and incorporates finger flexibilities and bending motions of fingers. The variable resistance of flex sensor is

plotted as a graph through the bending motions and for this analog signal detection Arduino microcontroller is connected to read the sensor. Then, the analogue signal is transmitted to the A/D converter in the microcontroller side for data processing. This data which is collected will be used to control servo motors which moves the artificial prosthetic hand. Prosthetic hand will move according to the bending motion of flex sensor attached on the Glove. Preliminary tests were done to examine and confirm the features of a flex sensor before getting connected on the Glove. The objective of the work is to make the artificial hand imitate the glove and control the same by human operator.

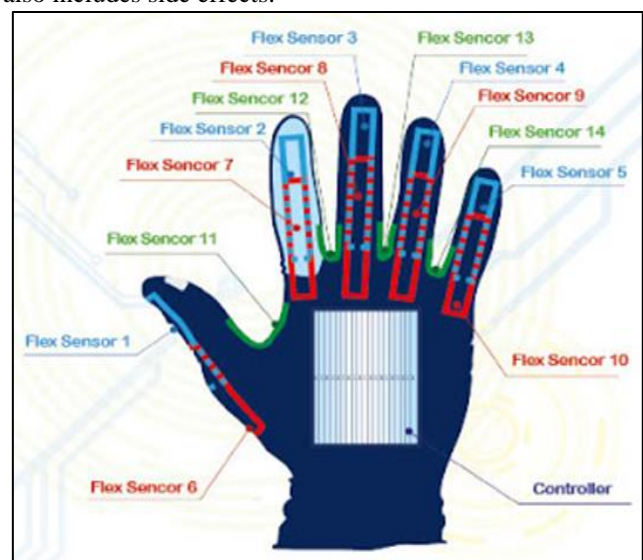
II. OBJECTIVE

- 1) To be useful for person who lost their hands (or) born without hands.
- 2) To be mainly used in industries to handle volatile objects

III. STRUCTURE OF THE SYSTEM

A. Existing System

The existing system, that is the bionic and mionic hands are very costly which can't be afforded by most of the people. These systems also expect either high power batteries which might harm the subject or the physical work of the subject which will be tiresome. Along with this the side effects of having suffocated sockets are also noticeable. Therefore, it is clear that the existing system is expensive, complicated and also includes side effects.



B. Proposed System

Our prototype makes use of simple low power batteries along with the simple movement of the fingers of the subject's healthy hand

C. Methodology

A flex sensor will be able to convert the bending changes into varying resistance. By using this feature, we will be able to use the action of the active human hand and copy its activity and replicate it in the prosthetic hand.

This model is split into two units, flex sensor and servo motor. The actions of the proper human hand and its fingers are taken by the flex sensor and transmit it as varying resistance to the micro controller. Then the micro controller gives the commands to the servo motors which pull the strings to make the prosthetic hand function. Flex sensors and servomotors are the major components of the project controlled by microcontroller (Ardiuno UNO ie., ATMEGA 328).

The bending motion of the glove and its varying resistance is mapped with the help of arduino microcontroller and the first stage of the test showed a progressive development in making the prosthetic hand into a working model. These analogue values are converted into digital values using an analogue to digital converter and replicated using servo motors in prosthetic hand.

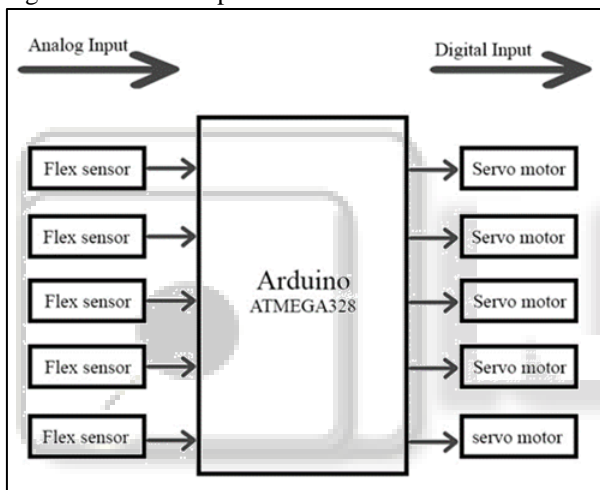


Fig. 2: Block diagram of the proposed system

IV. ADVANTAGES

A. Comforts Physically Challenged

This would be very much useful for the subjects who lost one of their hand in some accident and also helps the subjects who are born without one hand and do their day to day activity.

B. Industrial Appliance

It will be helpful in handling volatile objects and substances which will harm the humans when directly exposed towards them.

C. Cost Efficient

This prosthetic hand which is built with simple components will be working same as the other costly bionic and myonic hand at very low cost.

V. EXPECTED RESULT

A working Prototype for Physically challenged people which will be able to copy the actions of the unharmed hand of the subject and interpret it with the help of servo motors.

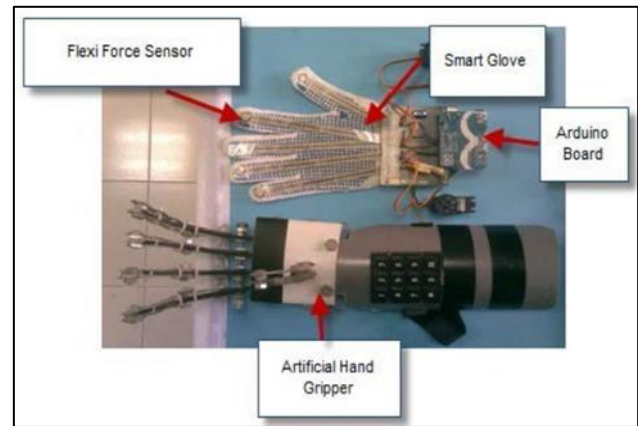


Fig. 3: Name To Be specified

VI. APPLICATIONS

- This prototype helps the physically challenged people to use the amputated natural hand.
- It is also useful in industries which handle harmful substances to avoid direct exposure of human hand

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