IJARSCT

ISSN (Online) 2581-9429

International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Impact Factor: 7.301

Volume 3, Issue 5, April 2023

Robotic Hand Control By Electromyography (EMG) For Handicaped Persons

Gunjal Yash Vijay, Bhirud Siddharth Shirish, Ghuge Pratik Deepak, Sangale Prasad Dattatray, Prof. Gaikwad S.V

Department of Electronics and Telecommunication

Amrutvahini Polytechnic, Sangamner, Maharashtra, India

Abstract: *The system proposed an advanced solution For Handicaped Persons To overcome the problems of "Handicaped Persons". Electromyography Technology Used. Proposed Of Project Each filament has its own unique characteristics, lending to different usages. While ABS is tougher and more flexible than PLA, due to the nature of the plastic, ABS requires a heated bed to prevent the outer layers from curling in or warping; this guarantees an even distribution of heat to both the outer and inner layers. PLA, however, does not require a heated bed and is more resistant to substances such as acetone, which dissolves ABS filament.*

Keywords: Handicaped Persons

I. INTRODUCTION

With 3D printed prosthetics gaining popularity with the advent of consumer level 3D printers, practical applications of these prosthetics have also been increasing. Online open source development has allowed for printable hand models to be downloaded for free within minutes from websites such as Thingiverse, a free, open source 3D modeling site. Contrary to traditional prosthetics, which often cost tens of thousands of dollars1 and are usually unaffordable to many, these alternatives provide a relatively inexpensive option to the public. This allows for less expensive, yet effective prosthetics to be available to modern consumers, with increased personalization for the user at a speed unachievable by conventional methods. Besides cost, another prevalent issue in high-level prosthetics is ease of control. The most common control system in use is electromyography, a medical technique in which electrical signals from the remaining muscles in an amputee's forearm are read by a device2 attached to the muscle and are mimicked by the prosthetic. While people without any functional forearm muscles, and even those with intact forearm muscles can use this approach, electromyography can be difficult to use and is often imprecise3.

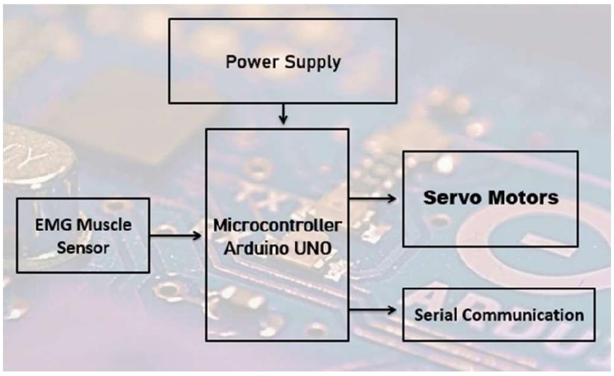
II. LITERATURE SURVEY

Robots eliminate dangerous jobs for humans because they are capable of working in hazardous environments. They can handle lifting heavy loads, toxic substances and repetitive tasks. This has helped companies to prevent many accidents, also saving time and money. There are 20 joints, and around these, there are metal parts that function as tendons, the New Scientist reported. These features give the robotic hand a similar range of motion to a human hand, enabling it to hold eggs, lift dumbbells, and handle tweezers To test the inflatable hand, the researchers enlisted two volunteers, each with upper-limb amputations. Once outfitted with the neuroprosthetic, the volunteers learned to use it by repeatedly contracting the muscles in their arm while imagining making five common grasps. After completing this 15-minute training, the volunteers were asked to perform a number of standardized tests to demonstrate manual strength and dexterity. These tasks included stacking checkers, turning pages, writing with a pen, lifting heavy balls, and picking up fragile objects like strawberries and bread. They repeated the same tests using a more rigid, commercially available bionic hand and found that the inflatable prosthetic was as good, or even better, at most tasks, compared to its rigid counterpart. One volunteer was also able to intuitively use the soft prosthetic in daily activities, for instance to eat food like crackers, cake, and apples, and to handle objects and tools, such as laptops, bottles, hammers, and pliers. This volunteer could also safely

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 5, April 2023

manipulate the squishy prosthetic, for instance to shake someone's hand, touch a flower, and pet a cat. In a particularly exciting exercise, the researchers blindfolded the volunteer and found he could discern which prosthetic finger they poked and brushed. He was also able to "feel" bottles of different sizes that were placed in the prosthetic hand, and lifted them in response.

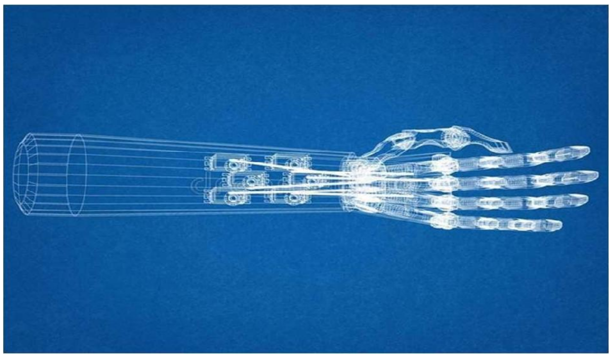
III. BLOCK DIAGRAM



Test Method

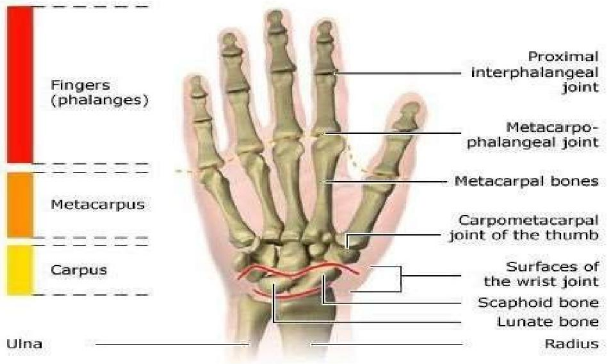
A robotic arm is a type of mechanical arm, usually programmable, with similar functions to a human arm; the arm may be the sum total of the mechanism or may be part of a more complex robot. The links of such a manipulator are connected by joints allowing either rotational motion (such as in an articulated robot) or translational (linear) displacement.[1][2] The links of the manipulator can be considered to form a kinematic chain. The terminus of the kinematic chain of the manipulator is called the end effector and it is analogous to the human hand. However, the term "robotic hand" as a synonym of the robotic arm is often proscribed. Robotic hands that appear and act like human hands are constructed in a way that makes them very similar to the real thing. In fact, most of these hands feature tendons (cables) and fingers that work together much like human hands do to open and close for the manipulation of objects

Design of the Prosthetic Controller



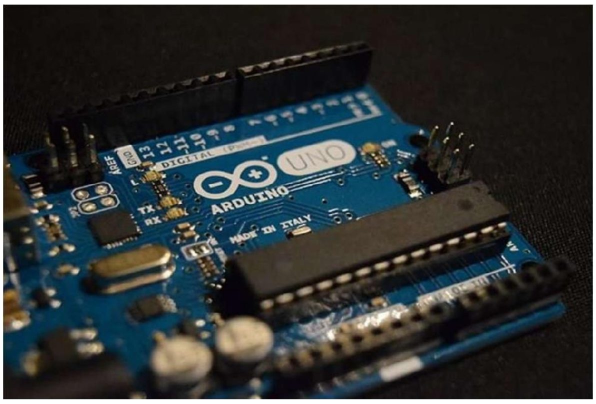
A team of Korean researchers recently published a paper in the journal Nature Communications showing one of the most advanced robotic hand models to date. The key lies not so much in its strength but in its gentleness. Of course, robots have been used in industrial plants since the mid-20th century. The first of these, called Unimate, was used in the automotive industry. This model was equipped with grippers and could lift heavyweights. But neither it nor its successors could hold a hen's egg without damaging it. The human hand is a highly complex system that contains over 30 intrinsic and extrinsic muscles with 27 bones which results in approximately 25 degrees of freedom. The human hand can perform complex and dexterous tasks with precision and force. (Institute for Quality and Efficiency in Health Care, 2010).

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 5, April 2023



Arduino Uno

The Arduino UNO is the best board to get started with electronics and coding. If this is your first experience tinkering with the platform, the UNO is the most robust board you can start playing with. The UNO is the most used and documented board of the whole Arduino family. Arduino UNO is a microcontroller board based on the **ATmega328P**. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to- DC adapter or battery to get started. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.



EMG Sensor

If you are wandering to make a device that is used to detect measure electrical activity on muscle.then you will need sensors, So, you can buy them at a reasonable price.

The Advance Technologies EMG Muscle Sensor V3.0 With Cable And Electrodes will measure the filtered and rectified electrical activity of a muscle outputting 0-Vs Volts depending on the amount of activity in the selected muscle, where Vs signifies the voltage of the power source. Powersupply voltage: min. +-3.5V.

This Muscle Sensor v3 from Advancer Technologies measures, filters, rectifies, and amplifies the electrical activity of a muscle and produces an analog output signal that can easily be read by a microcontroller, enabling novel, muscle-controlled interfaces for your project

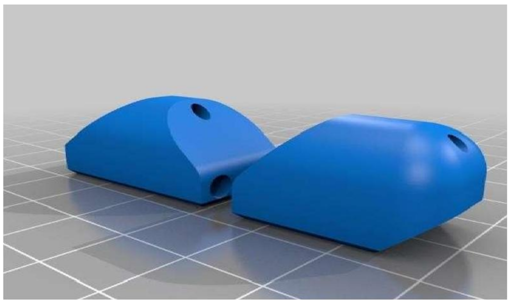
IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 5, April 2023

MG90S Servo Motor

The MG90S Micro Servo is a 13g servo motor that is great for applications in low -cost robotics and automation. The MG90S can be powered directly from any 5.0V Arduino board, and can be controlled using the servo library included in most Arduino IDEs.

3D Printed Robotic Hand

This is a fully 3D Printed and actuated robotic hand and arm which can be applied to a multitude of use cases like as a prosthetic hand, or just a third 'hand.' It is also fully actuated using 5 servo motors for controlling each individual fingers.



Jumper wire

A jumper wire is an electric wire that connects remote electric circuits used for printed circuit boards. By attaching a jumper wire on the circuit, it can be short- circuited and short-cut (jump) to the electric circuit.

IJARSCT

ISSN (Online) 2581-9429

International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Impact Factor: 7.301

Volume 3, Issue 5, April 2023

IV. WORKING & OPERATION

This simple human-like hand uses multiple motors with one long tendon roped through the fingers to close and relax the hand, and move the fingers independently. This technology combined with exponentially improving AI systems is allowing for an increasing array of uses for the robot hands.

The laws are as follows: "(1) **a robot may not injure a human being or, through inaction, allow a human being to come to harm**; (2) a robot must obey the orders given it by human beings except where such orders would conflict with the First Law; (3) a robot must protect its own existence as long as such protection does

power delivery

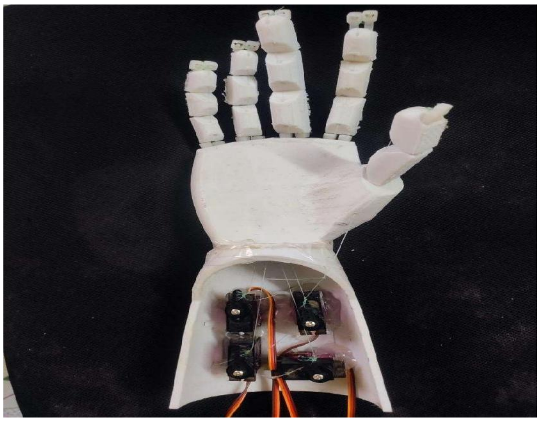
The operating voltage ranges of the components are displayed in the table below.

Component	Voltage
Arduino Uno	5V (6V – 20V via barrel jack)
MG996R Servo Motor	4.8V – 6V
AD8232 Bio-potential amplifier	3.3V (via Arduino)

Here, Arduino Uno is powered through the USB cable connected to the Laptop. EMG amplifiers arepowered via the 3.3V output of the Arduino. Servo motors require power delivery directly from a power source. Even though Servo motors can handle voltages up to 6V, Arduino maximum input voltage is 12V (11.75-12.25).

So, it was decided to operate servo motors at 5V to reduce unnecessary complexity from additional power converters. For the prosthetic arm to be portable, the whole system was powered via a 7.4V 1500mAh rechargeable lithium-polymer battery. Battery voltage was controlled to 5V using a high-power (300W) DCDC adjustable buck converter. Buck converter enables the precise control of voltage which is required by sensitive electronic components in the system

V. RESULT



5.1 Scope of project

Robotic hands that appear and act like human hands are constructed in a way that makes them very similar to the real thing. In fact, most of these hands feature tendons (cables) and fingers that work together much like human hands do to open and close for the manipulation of objects Robotics is a branch of engineering that involves the conception, design, manufacture and operation of robots. The objective of the robotics field is to create intelligent machines that can assist humans in a variety of ways. Robotics can take on a number of forms.

A basic typical robot has a movable physical structure, a motor of some sort, a sensor system, a power supply and a computer "brain" that controls all of these elements. Essentially, robots are human-made versions of animal life — they are machines that replicate human and animal behavior.

IJARSCT

ISSN (Online) 2581-9429

International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Impact Factor: 7.301

Volume 3, Issue 5, April 2023

They are equipped with speed and force limiters to allow safe operation around humans. The advantages of industrial robots are a faster operating rate, higher load capacity, accuracy and repeatability, improved workplace safety, better product quality, lower operating cost, and a more compact workspace.

VI. ACKNOWLEDGMENTS

Perfect and precious guidance, hard work, dedication and full encouragement are needed to complete a project successfully. In the life of every student illumination of project work is like engraving a diamond.

We take this opportunity on the successful completion of our project to thank all the staff for their valuable guidance, for devoting their precious time, sharing their knowledge and their co-operation throughout all course of development our projectand the academic year of education.

We owe a deep guidance to our project **Prof. Gaikwad S.V (Project Guide)** whose valuable guidance, which has been a key factor in the successful completion of our project.Also we owe a deep guidance to our project **Prof. Borhade G. L (Project Co-ordinator)**has been a key factor in the successful completion of our project.

A remarkable and unspeakable person in our life **Prof. Kulkarni B. L (HOD of E&TC)** Department whom we have a gratitude and respected for developing entrepreneurship qualities and sharing his knowledge and lifetime experience to make our future glorious. Also our special thanks to **Prof. V. B. DHUMAL (Principal)** & management staff whose assistance is also an important part in completion of our project. Lastly we take opportunity to thank one and all who directly or indirectly have helped us in the successful completion of our project.

VII. CONCLUSION

It realizes the real-time interaction between human and robotic arm, which proves the feasibility of using surface electromyography signals to control the robotic armand control external equipment for other physiological electrical signals in the future. EMG signals can be used to determine how strongly a muscle of interest is activated during different types of movements or under varying resistive loads

REFERENCES

[1]. Prof Dighe Y.N (Senior lecturer of electronic & telecommunication amrutvahini polytechnicsangamner).

[2]. Prof Borade G.L (Senior lecturer of electronic & telecommunication amrutvahini polytechnicsangamner).

[3]. Prof Gaikwad S.V (Senior lecturer of electronic & telecommunication amrutvahinipolytechnicsangamner). Websites : https://www.roboticskanti.com/post/how-to- make-robot-hand-moving-using-muscle-at-your-homehttps://youtu.be/2WuHfe1zOG