DESIGN OF PROSTHETIC HAND TO IMPROVE THE LIFESTYLE OF PEDIATRIC PARTIAL HAND PATIENTS

Albert Raj.A[1], Ragavendra N[2], Rakesh P[3], Rakesh R[4] , Raaghul S[5]

[1] Professor
Department of Electronics and Communication Engineering
Sri Krishna College of Engineering & Technology, Coimbatore
albertraj@skcet.ac.in
[2]U.G Scholar
Department of Electronics and Communication Engineering
Sri Krishna College of Engineering and Technology, Coimbatore
19euec110@skcet.ac.in
[3]U.G Scholar
Department of Electronics and Communication Engineering
Sri Krishna College of Engineering and Technology, Coimbatore
19euec113@skcet.ac.in
[4]U.G Scholar
Department of Electronics and Communication Engineering
Sri Krishna College of Engineering and Technology, Coimbatore
19euec114@skcet.ac.in
[5]U.G Scholar
Department of Electronics and Communication Engineering
Sri Krishna College of Engineering and Technology, Coimbatore
19euec107@skcet.ac.in

ABSTRACT

In modern medicine, Prosthetic Hand plays an important role in helping the people who lost his/her hand due to some incident or accident. It also helps people who is unable to use his/her hand due to stroke. So, Prosthetic Hand helps out various people across the world. So with this thought in mind, we wanted to create an awareness among the students about the prosthetic hand hence we made this project. In this project we made a small working prototype of prosthetic hand using 3d printer. The prosthetic hand works due to the Arduino board which contains the VHDL code for working of the arm. Arm is powered by servo motors which controls the actuators and reflectors. In Modern Technology, the scope of Prosthetic Hand have improved a lot over the time. Artificial Intelligence plays a major role here in Prosthetic Hand. Technology has grown a lot in this field that when the user wears the prosthetic hand and can think of the work to be done by the hand and the hand will do the work.

Keyword: Prosthetics Scope, Existing Design, Realistic Constraints, Methodology, Design for usability, Myoelectric prosthesis.

INTRODUCTION

A prosthesis is a device that is designed to replace as much as possible the function or appearance of a missing limb or body part. It is a device that is intended to support, supplement or extend the function of an existing limb or body part. Functional prostheses can generally be divided into the following two categories: 1. Body Prosthesis – Cable Controlled 2. Externally Powered Prosthesis – Electrically Driven •Myoelectric Prosthesis •Switch Controlled Prosthesis. This design is for transracial patients (not partial arm); however, the hand design is still attractive. The fingers are attached using a Whipple tree adapter that allows for an adaptive grip (ie, bending the fingers around a non-uniform object). This is a proof-of-concept design found on the Thing verse that uses the spin came to obtain a number of different grips. Each grip corresponds to a set of cams of specific radii, placing the appropriate tension on each finger line to achieve the desired grip. This is one approach to switching grips on a mechanical prosthetic hand, albeit a bulky one.

DESIGN FOR USABILITY

A visually impaired person might have an problem of viewing and doing any job,in that case the prosthetic hand can be used. In addition, the tension screw heads are very small and can be difficult for the visually impaired to operate. We could solve this problem by enlarging the tension pin and screw complex so that they are easier to see and control.

Myoelectric Prosthetics:

In armed prosthetic devices, the main mechanism is myoelectric process, and the former device activates or stimulates a servomotor to initiate the mechanism of this electronic device. Electromyography is not a stimulus that stimulates a muscle or skin to obtain a signal need more energy , so we need artificial signals. So we implement the coding of such a process during the mechanism. This is the electromyography of this component. The part device activates the motor to move a person's finger or an injured part or stump by actuating the motor.

Fig.1 Arduino UNO Board

METHODOLOGY

In hand prosthetics, active flexion is limited to two or three joints controlled by a single motor drive simultaneously acting on the metacarpophalangeal joints of the thumb, index and middle fingers, while the remaining joints can only be flexed passively. unique. The idea will work and the mechanism will start to activate the electrodes successfully due to muscle stimulation of the interphalangeal joint. Humanoid robotics that must provide users with a wearable prosthetic arm. The goal of bio-mechatronics work is to develop an artificial hand that can be used as a functional replacement for natural and humanoid robotic applications. The unique artificial hand is designed to reproduce the sensorimotor abilities of the human hand. Unique commercially available prosthetic and multifunctional hand designs, such as the Otto Bock hand sensor, are far inferior to the gripping ability of a human hand. The requirements are consider the code to develop the devices from the outsource when a robotic arms are developing to initialize in this mechanism are natural appearance in devices, extensibility, compatibility, more efficient and consumption the energy, quietness, lightness and low power consumption.

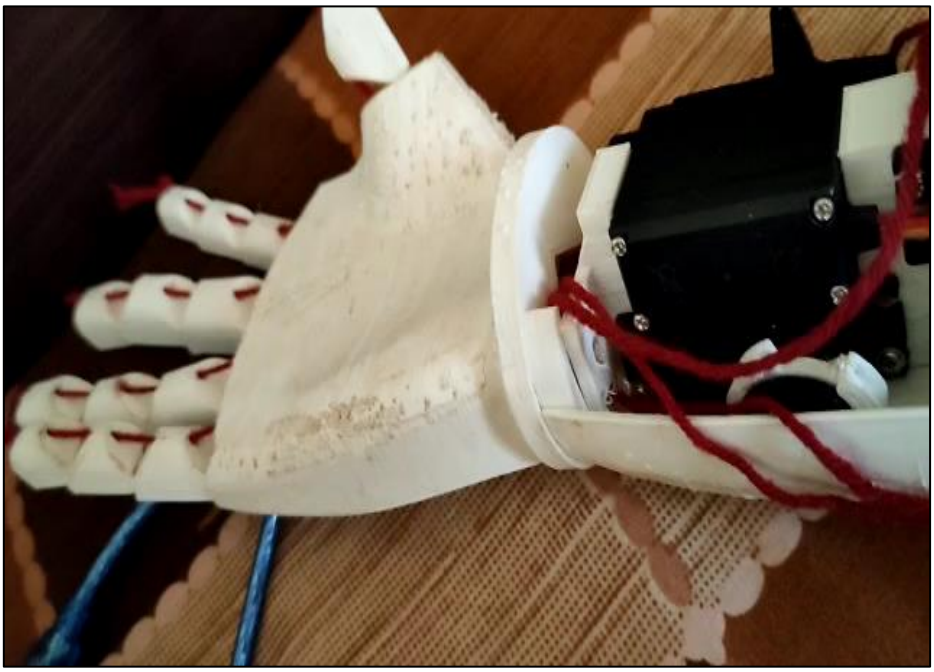

Fig.2 3D printed prosthetic hand

Upper limb prosthetic sockets are double-walled constructions, usually made of lightweight plastic or graphite composites. This option, a rigid inner sleeve is made to fit the patient's stump, and a second wall is add quick, calculated to have the equal phase length and opposite to a healthy limb. Devices are more comfortable and good functionality in mechanism are directly related to the placement of interior drawers. Another flexible approach to function is similar to the flexible insertion method sometimes used for fixed frames and lower extremity limbs.

Timing:

Project duration is limited by the lead designer course, which must be completed by early December 2017.Assembly of the prototype is limited to the point of ordering the parts and

should be considered when planning the project.3 Dimensional printed parts have a limited print length, but this is not a critical factor as two members of the group own a 3 Dimensional printer and making these parts doesn't take more than a few hours.

USB Cable:

Using a virtual Android emulator can often make your computer less efficient. So you can install and test the app on your Android phone via Universal Serial Bus.

Life Cycle:

Our projects are limited by the expected life cycle of the final product. This device is intended for children who grow up and need a new prosthesis about every 1 year or 18 months. To accommodate these limitations, the device must be easily extensible with Computer aided design software.

Legal:

A legal limitation of our project is that we cannot test the device on real patients without permission from doctors and regulatory agencies. You must test the device yourself.

PROCEDURE OF IMPLEMENTATION:

This page resembles a drawing of a human stump. Press the button to start the servo mechanism that receives the EMG signal. In fact, the interphalangeal joint stimulates the muscles to rotate an electric motor powered by an electric motor, but for this we use a demo model. The metacarpophalangeal joint, also called the first joint, is a large joint. On the hand with the bones of the fingers. The bones of the hand are merged. The metacarpophalangeal joint acts as a hinge joint and plays an important role in gripping and pinching. When arthritis affects the phalanx joints, the condition is called phalangeal arthritis. The Hero Arm is one of the most affordable modern bionic weapons on the market.

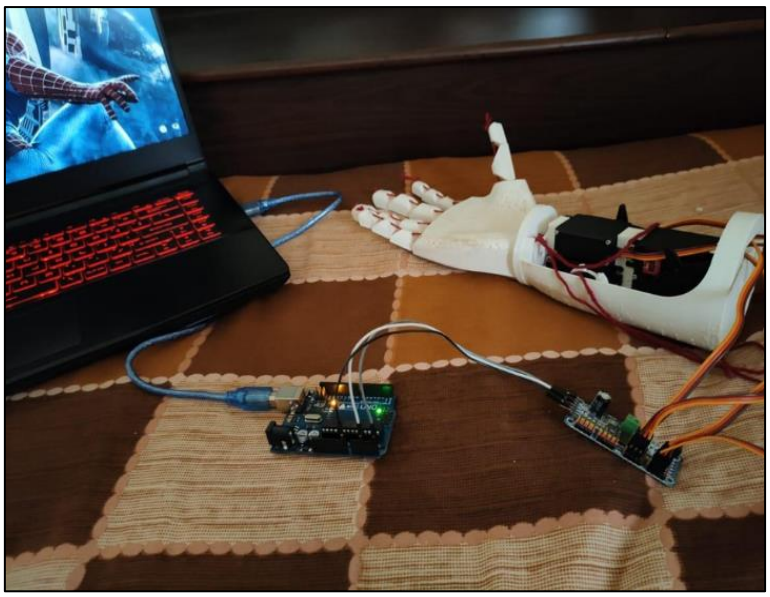

Fig.3 Connection of the prosthetic hand with Arduino uno board and servo motor and laptop

Implement VHDL encoding to excite a servo start signal to actuate a battery powered motor for Non-Arduino related functions.

CONCLUSION:

Our device can therefore help replace damaged body parts such as limbs and fingers. controlled. Myoelectric devices use signals from muscles through electromyography using human stumps. The signals are picked up by electrodes on the surface of the skin and activate battery-powered motors that power the prosthetic components. The app would be allowed for doctors to keep patient records, and new legislation should be passed to mandate the use of the app. Therefore, proper server maintenance and new features will revolutionize medical history.

REFERENCES:

[1]. National Amputee Statistical Database (NASDAB). The amputee statistical database for the United Kingdom 2006/2007.Published; 2009.
[2]. Jones JW, Gruber SA, Barker JH, Breidenbach WC. Successful hand transplantation. One-year follow-up. Louisville hand transplant team. N Engl J Med 2000; 343:468e73.
[3]A.A. Raj & M. Suganthi (2008) Hardware Implementation of an Efficient Internet Protocol Routing Filter Design, International Journal of Computers and Applications, 30:2, 124-128, DOI: 10.1080/1206212X.2008. 11441890
[4] Daphne, R. R., & amp; Raj, A. A. (2012). A Drowsiness Detection Architecture Using Feature Extraction Methodology. Procedia engineering, 38, 959-963.
[5] Gnana, Jebadas D., and Raj A. Albert. "An image processing framework for white matter segmentation in suspected Alzheimer's disease." Biomedical Research (0970-938X) 28.6 (2017).
[6] Jesi, P. Maria and Raj, A. Albert. 'A Neoteric Approach for Preserving Infrastructure and Nodes Mobility through Weight Based Clustering and Distributed Scheduling'. 1 Jan. 2019 : 3345 –3356.
[7] Bommy, B., and A. Albert Raj. "A low cost image de-noising implementation using low area CSLA for impulse noise removal." Journal of Circuits, Systems and Computers 27.04 (2018): 1850060.
[8] A. A. raj and J. Vijila, "Design of Indoor Air Quality Monitoring System to Ensure a Healthy Universe, " 2020 International Conference on Smart Electronics and Communication (ICOSEC),
[9] Raj, A. A., Judson, D., & Beno, A. (2021). Efficient construction of successive cancellation decoding of polar codes using logistic regression algorithm. Journal of Physics: Conference Series, 1998(1) doi: https://doi.org/10.1088/1742-6596/1998/1/012010
[10] A. R. Rincy, S. S, Y. K, J. Sree and A. Raj A, " Logistic Regression Based Conveyor Control for Material Handling Process,& quot; 2021 Second International Conference on Electronics and Sustainable Communication Systems (ICESC), 2021, pp. 116-120, doi: 10.1109/ICESC51422.2021.9532980.2020, pp. 1123-1127, doi: 10.1109/ICOSEC49089.2020.9215297.

[11]. Marg Reiter R, Branda Cher G, Ninkovich M, Seurer W, Kerecz A, Schnee Berger S. A double-hand transplant can be worth the effort! Transplantation 2002; 74:85e90.
[12]. Branda Cher G, Ninkovich M, Poskanzer H, Gable M, Hussle H, Rieger M, et al. The Innsbruck hand transplant program: update at 8 years after the first transplant. Transplant Proc 2009; 41:491e4.
[13]. Alliin S, Eckel E, Markham H, Brewer BR. Recent trends in the development and evaluation of assistive robotic manipulation devices. Phys Med Rehab Clin N Am 2010; 21:59e77.
[14]. Hamilton A. Time's best inventions of 2008. Time Magazine;2008.