INTERNATIONAL RESEARCH JOURNAL OF ENGINEERING AND MANAGEMENT STUDIES (IRJEMS)
VOLUME: 03 ISSUE: 05 | MAY -2019 ISSN: 2395-0126

Low Cost Prosthetic Arm

Shetty Karan[1],ShaikhFarooque[2],NaikSuhel[3], Mane Tejas[4]

Department Of COMPUTER ENGNIEERING
Pillai HOC college of Engineering and Technology,Rasayani,
Regard – 410207, India

Abstract -

Prosthesis play an important role in lives of the amputee. It is concluded that it turn on their social integration and reduction of their abilities due to such disability. Due to this there is a need of Low cost Prosthesis. As the cost of prosthesis is high and as well as the economy of such technology in market is short . Due to this it become difficult for poor amputee. Low cost prosthetic arm is developed for trans-radial amputee and it is controlled by Emg . The mechanical structure of arm is developed on AutoCAD fusion 360 and entirely it is 3D printed while the electronics are based on the Arduinonano, Emg sensor are used for sending command to Arduino . The overall manufacturing process was completed through the readily available technology .

Keywords—EMG, Bionic, Prosthetic, and Transradial.

I. INTRODUCTION

A Prosthesis is an artificial limb (an artificial substitute) that replace missing leg or arms due to disease, accident or congenital defects. A prosthetic hand should be designed according to the person's functional need and appearance. For example, a person may need a prosthesis, but it need to choose between a functional device, a body-powered device, a myoelectric device, or an activity specific device. The person's future goals may help them choose between one or more devices as well as depend on their economic capabilities .

In our project we made myoelectric prosthesis. "Myo-electric" is an electric properties of muscle. A myoelectric-controlled prosthesis is an artificial limb that control with the help of electrical signal generated by our muscle. Myoelectric Prosthetic hand mainly consist of actuator connected to robotic fingers which is controlled by microcontroller via EMG sensor. It consist of various grip pattern for the user to perform day to day activities. Economy of the prosthetic hand is too short and even manufacturing cost of this device is very high. This makes it unavailable for poor amputees. Our goal is to create a low cost prosthetic hand just by changing hardware component and design.

Background

Artificial arms or prostheses, are intended to restore a degree of normal function to amputees. Mechanical devices and peg leg that allows amputee to walk and to use hand since ancient time. Surgical procedure for amputation was not recommended on 600 B.C .During middle age armourer created first prostheses, using heavy iron to make limb that amputee hardly control. AmbroiseParé in the 1500s invented articulated joint, but amputee could not flex at will . Artificial hands of that time were not exceptionally functional. D. W. Dorrance was an amputee who invented a terminal device for himself in 1909. Dorrance, lost his right arm in an accident, was disappointed with the prosthetic arms then available. Until his invention, prosthesis consisted of a a heavy steel frame and leather socket, and a heavy cosmetic hand in a glove, or a passive hook incapable of prehension. Dorrance invented a split hook that could be opened with a strap across the back and closed by rubber bands and it was anchored to the opposite shoulder of him. Dorrance terminal device (the hook) is still considered to be a major advancement for amputees because it restored their abilities to some extent. Modified hooks are still used in present, though they might be hidden because of realistic-looking skin.

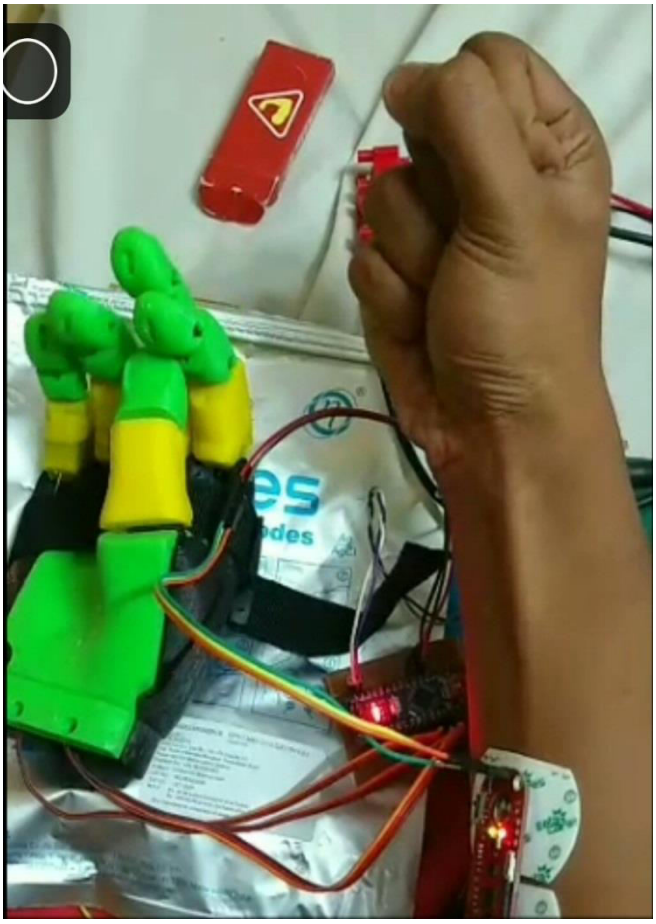
II. RELEVANCE

Survey of amputee indicate increased articulation and functionality and simultaneous control of multiple joint among the top prosthesis functional improvement over the extremity amputees . Since prostheses using microprocessor control and a variety of sensing modalities provide more device intelligence, relative to body-powered devices. To develop such enhanced functionality, researchers need to develop the special arm prosthesis hardware. Testing of controllers and sensors in virtual environments can be very effective in early stages of development, but virtual testing cannot replace physical testing. Specifically, an arm prosthesis is a highly interactive and advance device nowadays, in terms of its physical interaction and control of the person using it and even with its environment. Such

interaction and the ability of a user to control a device feature or component in the absence of an intact Emg control system. As such, although intermediate assessments offer value with respect to initial or partial validation of design features or control strategies, researchers are unable to fully assess the functional value of newly-developed approaches without experimental implementation in prosthesis hardware on amputee users. Ideally, researchers would be able to open architecture versions for commercially-available prosthesis hardware to develop and assess new features and/or control strategies, or investigate functional trade-offs between functional efficiency and device complexity.

III. EXISTING SYSTEM

Prosthetics have a fascinating and long history but current developments in prosthetics are rapidly gaining pace . From mind-controlled limbs to ones made from 3d printer and current developments are as varied as it depends on the amputees who wield them.Current developments of prosthetic hands include decoding and translating the messages from your brain,Emg, pulse and other sensor modules to move removable robotic prosthetics, as well as it also feed information back to the nervous system to actually 'feel' with it . The future of prosthesis is both exciting and gruesome in equal measures with the inevitable outcome making them fully integrated into your body.



IV. PROBLEM STATEMENT

Designing a Prosthetic palm that is reliable, enable tasks like clamping of cups, lifting a minimum weight of 250gm and is user friendly while being cost effective and durable. The human body is amazing each part of the body has a specific function, yet when combined with all the other parts working together as a magnificent machine. Just as with other machines, when parts of the machine/body break down, some human parts can be transferred from one person to another; some human parts can be replaced with man-made parts; and when some human parts no longer work, and the body cannot be 'repaired', it will stop working altogether. One of the most important parts of the human body is the hand. The hand movements help the body perform such actions as pushing, pulling and/or grasping objects; feeding one's self, writing, etc. The hand is structured to handle objects of different sizes, shapes, and weight. It is covered by skin with nerve endings to sense the external world through touch. Use of the arms and hands assists in balancing the person's body in space, either while being still, as on a tightrope, or while moving, as in running.

V. Proposed System

- Our Prosthetic hand usually focus on modification of hardware component and design.
- This help to decrease the cost of myoelectric prosthetic by 60 percent.
- Normally Prosthetic hand is made with custom parts, actuator and custom PCB.
- Our project is made with servo motor, arduino and 3d printed custom parts.
- This will gradually decrease the cost of production.

VI. HARDWARE METHODOLOGY

- To obtain specific gesture or a movement pattern microcontroller is used to control arm.
- Servo motor are connected to fingers with nylon cables which act as a muscle or tendons of arm.
- Prosthesis Hand is control by EMG sensor (Myoware Muscle Sensor).
- Software for building prosthetic arm computer aid are used for designing, coding and also for simulation are as follows.
- Arduino Ide is used for coding micro controller.
- AutoCAD Fusion is used for designing the model.
- Cura is program used to display model while 3D printing.

VII. SYSTEM ARCHITECTURE

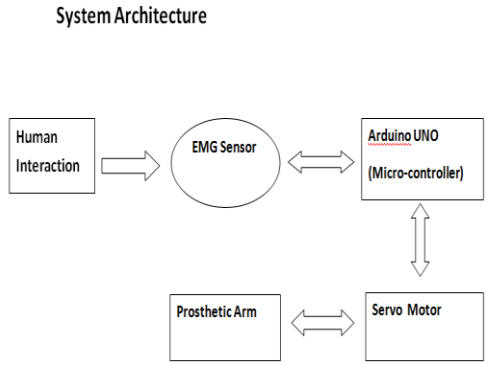


Fig. 4.2: System Architecture

VIII. CONCLUSION

- We've observed that most of the amputees could not afford a prosthetic hand which is available in the market because of its price.
- We lower the cost of the product so consumer could easily afford it. For that reason, we also lower maintenance cost.
- Lastly, we wanted to improve the cosmetics of the prosthetic arm. Therefore, we hide visible mechanics and strings so it would look more appealing.

IX. REFERENCES

[1] Kenneth R. Lyons, Student Member, IEEE, and Sanjay S. Joshi Senior Member, IEEE This article has been accepted for publication in a future issue of this journal, but has not been fully edited. Content may change prior to final publication. Citation information: DOI 10.1109/TNSRE.2018.2807360, IEEE.

[2] Design and FunctionalEvaluation of a Dexterous Myoelectric Hand Prosthesis with Biomimetic Tactile Sensor Ting Zhang, Member, IEEE, Li Jiang, and Hong Liu, Senior Member, IEEE DOI 10.1109/TNSRE.2018.2844807, IEEE.

[3] C. Piazza, M.G. Catalano, S.B. Godfrey, M. Rossi, G. Grioli, M. Bianchi, K. Zhao, and A. Bicchi The SoftHand Pro-H: A Hybrid Body-Controlled, Electrically Powered Hand Prosthesis for Daily Living and Working. Digital Object Identifier. 10.1109/MRA.2017.2751662Date of publication: 15 November 2017.

[4] Design of a Myoelectric Transhumeral Prosthesis Daniel A. Bennett, Member, IEEE, Jason Mitchell, Don Truex, and Michael Goldfarb, Member,IEEE DOI 10.1109/TMECH.2016.2552999, IEEE/ASME.