

A Review of Mechanical 3D Printed Upper Limb Prosthesis

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Abstract

Conventional passive upper extremities used by amputee's lack in hand control and grasp meanwhile their advanced substitute are expensive, unaffordable and less realistic. In recent years, affordable, functional and customizable upper limb alternatives, made using 3D printing technology, have increased in demand. This article reviews the available technologies to fabricate 3D printed upper limb prosthesis, different levels of upper limb amputations and materials used for fabrications. This also gives an overview about the mechanisms used in 3D printed mechanical upper limb prosthesis and cost factors affecting the popularity of the prosthesis in detail. A main reason for 3D printing to be used in prosthesis fabrication is the convenience and the efficiency in the process of customizing prosthesis according to user's requirements. Acrylonitrile Butadiene Styrene (ABS) or Poly Lactic Acid (PLA) are considered as the most suitable material for 3D printing of prosthesis, focusing on the factors of cost and availability, toxicity, biodegradability and comfortability. Most of the affordable prosthetic arms are operated using string networks or using lever mechanisms which limits the functionalities of prosthetic arms due to its inability of fingers to operate independently. Therefore, moving on to an improved operating mechanism to facilitate independent motion of fingers is suggested as the future outlook for mechanical 3D printed upper limb prosthesis.

Keywords: extremities, 3D printing, grasp, mechanical, amputation, Acrylonitrile Butadiene Styrene (ABS), Poly Lactic Acid (PLA)