

Evolution of Prosthetics

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Abstract—Over the past hundreds of years, the field of prosthetics has evolved immensely, and the most notable breakthroughs have been in the past century. As a result, there are various prosthetics available today, and they are constantly being improved. However, testing, cost, and ethics are a major factor in how far prosthetics could potentially go.

I. INTRODUCTION

PROSTHETICS are artificial devices that are used both externally or internally for replacing or restoring certain body parts. They help regain the lost functionality of the body part that is either missing or malfunctioning. The most common types of prosthetics today are the arm, leg, and more recently, the heart. While there are functional prosthetics today, when prosthetics were first invented, their functionality was simply to make movement easier for people who had lost an extremity, and solely that. This meant that for a leg that needed to be amputated, or that was lost in any way, there was initially no other prosthetic-like device that was put in its place. However, over the hundreds of years from when ‘prosthetics’ were first engineered this has changed. From the breakthroughs made by people like Sir James Syme and James Potts in the 1800s to the push from the wounded from the two World Wars, the field of prosthetics grew attention and is where it is today.

II. METHODS

While there were amputations that were necessary for reasons other than being wounded in combat, it really was not until World War II that the importance of having functional prosthetics escalated. When wounded soldiers from combat would return home, they looked for ways to live a normal life again. It was difficult for them to resume what they were doing as a result of amputations. It was at this point in time where the United States government decided to help fund development and research of prosthetics to design prosthetics that were functional so the soldiers could use them. From this point forwards, breakthroughs like the suction sock for above knee prosthetics and computerized prosthetics have paved the way for modern prosthetics today.

III. RESULTS

As a result, we now have three very common types of prosthesis available in the market. The first type of prosthesis is the cosmetic prosthesis(1). This type of prosthetic has low, passive functionality, and is generally used for upper limb amputations. The next type of prosthesis is the body-powered prosthesis(2). This type of prosthetic has a moderate level of functionality that is provided from muscles near the relative area of the prosthetic; it is generally used for upper limb amputations. The third type of prosthesis is the myoelectric prosthesis(3). This type of prosthetic is almost fully functional in comparison to the functionality provided by the lost limb. This type of prosthetic amplifies the electronic signals from

the residual limb, and then processes the signal to execute the intended function. Of these three types of prosthesis, the most expensive is the myoelectric, ranging from \$80,000-\$100,000, due to the expensive technology in the device.



IV. DISCUSSION

While breakthroughs and new technology help drive the field of prosthetics further, there are several notable issues that arise. The first major problem engineers and developers face is the relatively low amount of volunteers willing to test out new prototype designs. Prosthetics is a sensitive subject for most individuals and the majority do not feel comfortable testing out a prosthesis that is in the testing stage. The second major issue is the cost of the prosthesis. In order to have the most functional prosthetic on the market, it costs well above \$80,000. While some insurance companies may cover this, others consider it a “luxury” expense and will not. There are also other expenses down the road, like check-ups and maintenance of the prosthetic that also add up. One of the goals of current biomedical engineers working on prosthetics is to try and develop a more affordable prosthetic. The last major issue with prosthetics involves an ongoing controversy in relation to ethics: Where is the line drawn between humans and machine?

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