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Research and Development in Biomedical Prosthetics

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ABSTRACT:-

In this report the sole data is based on innovation and development in biomedical prosthetics field. The current technology used for prosthetic includes 3D printing, device implants, digital design tools and more. There are several types of biomedical engineering, such as tissue, genetic, neural and stem cells, as well as chemical and clinical engineering for health care. Many electronic and magnetic method uses sensors in equipment such as Computed Tomography (CT) scans, Magnetic Resonance Imaging (MRI) scans, Electroencephalography (EEG). The notation of the idea is using sensors in body supporting equipment's or an attachment as prosthetics with the incorporation of AI that could get results in movement or functioning in any nonfunctioning body part as desired.

INTRODUCTION

General working concept is that in biomedical engineering the prosthetics mainly use for lost body part or non-functioning part as the working medium and to improve lifestyle and relived from physical and mental pain.

Now new technology and advancements, Enhancements in prosthetics have a sense of touch that can be added to Prosthetic hand so that new prosthetic hand can offer amputees an ability to "feel" grasping and manipulating objects and it's already being used at home, outside the laboratory setting for several months.

HISTORY AND INNOVATIONS

A team of biomedical engineers from Florida International University (FIU), Arizona State University, and Cochlear Corporation, has leveraged existing cochlear implant technology to create this Food and Drug

Administration investigational device. The work shows the viability of wirelessly enabled peripheral nerve stimulation to help restore critical function to people with upper limb amputations.

A wide variety of motorized prosthetic hands exist on the market today, but such devices do not provide wearers information about contact, force or grasp said Ranu Jung holds the Wallace H Coulter Eminent Scholar endowed chair in Biomedical Engineering at Florida International University where she is Professor and Head of the Department of Biomedical Engineering since 2011..

"Users are heavily reliant on the visual, looking at the hand and looking at objects as they try to grab or manipulate them while doing different everyday tasks," she said. "We wanted to create a technology that could fill those gaps, by providing sensory feedback to the residual limb to restore more function and improve quality of life." "When different electrodes were stimulated, the user felt sensation on different regions of the prosthetic hand—and many of these percepts were stable over several months," she said. "By changing the stimulation levels, those percepts helped the user gain greater control of hand opening and grasp force, performing better with the hand when the stimulation was on."

That user is Jason little, a real estate consultant who lost his arm in a traffic accident in 2011. Prior to this study, he preferred a prosthetic with a hook extension because of its durability. But he said that he has been impressed with what this system can offer. The sensations, he said, feel a little bit like "sticking your finger in a light socket," but that the sensory feedback provided by the system lines up very closely to where he would feel contact or pressure in a natural hand. It's a heady time to be involved in prosthetic technology and development one marked by quantum leaps in research and understanding how human bodies, and brains, work. Some of them are as follows

3D PRINTING

Prosthetics 3D printing is the use of 3D printers to design and create artificial, wearable body parts such as legs, hands, and arms. It is a relatively new method compared to the traditional method of production. The materials used in creating 3D printed prosthetics are accessible and lightweight, making the process suitable for producing prosthetics and providing a favorable alternative for patients worldwide. Prosthetics 3D printing is the use of additive manufacturing technologies rather than traditional subtractive manufacturing methods to create artificial body parts. These body parts may have been lost through traumatic events or congenital disorders (present at birth). In some cases, amputation surgery may be necessary when a victim's limb or limbs are affected severely by a disease that leads to its atrophy and decomposition (gangrene). In any case, 3D-printed prosthetics serve as a replacement for the missing limbs. Some figure representation are as follows

Figure 1. 3D Printed prosthetic Palm

Figure 2 Implementation model

Figure 3 Printed prosthetic Leg

SENSORY PROSTHETICS

So far, scientists can only offer a very basic sense of touch to people who use prosthetic limbs. The feedback is good enough to know when a foot has weight on it or a hand has encountered an object and weight distribution in it. The main goal should be to achieve the complete sensing moment and feeling in the given part of limb or in specific body part.

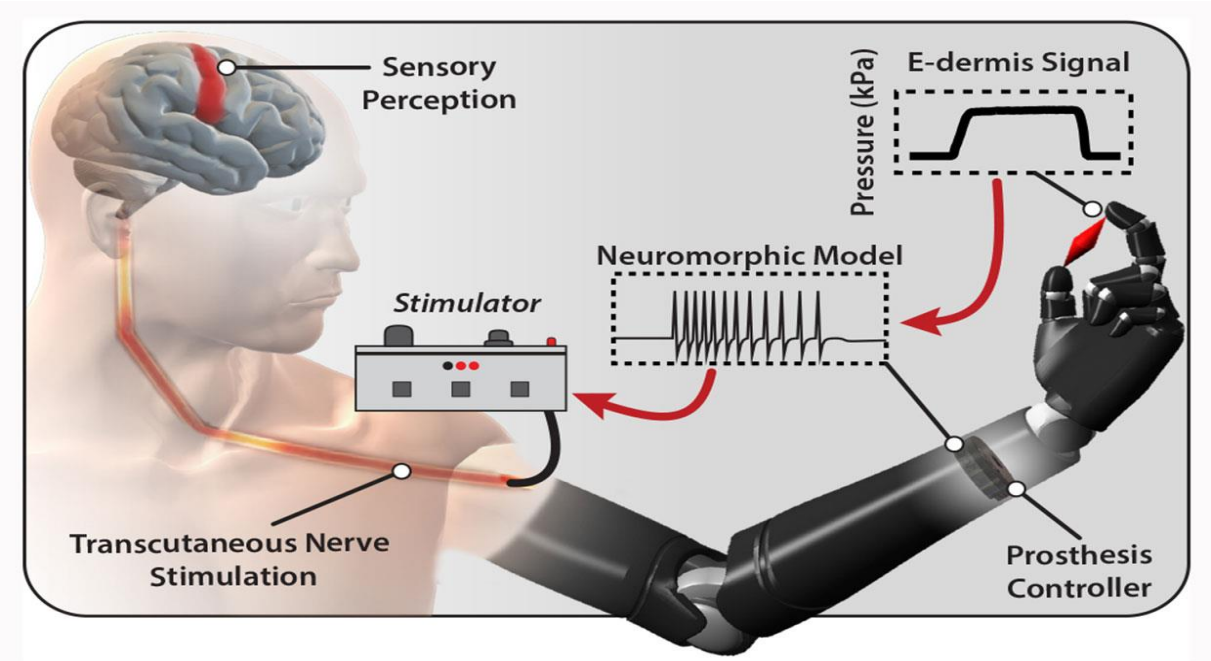

Fig.1 Stimulation Representation

Fig. 2 Sensory Feedback for Bionic Feet

As Shown In above Fig. representation, by use of multiple types of sensors the result of nonfunctioning body part or the actuatory feeling in that specific part can be retain or rebound.as the innovation and research progresses the outcome and the desired results or the future goals are become real with specific and required effort given it.

OBJECTIVE

The main objective of the biomedical prosthetics is to enable a person to help live healthy productive, independent, dignified lives and to participate in education and social life.

As for the future references, the goal should be to achieve more connection between prosthetic limb and brain sensory region as to achieve the more result from the prosthetic or even a nonfunctional part of body to get response as in required manner or even to upscale the expected results. In personal notation the innovation in sensory techniques should take a further leap in biomedical engineering by innovating and doing research in prosthetic field by putting the required amount of efforts to achieve the desired goals. Also the use of sensors in nonfunctioning body part the current scenario can be improved by means of research and development in that particular field as I personally think the use of sensors in nonfunctioning body part can be give more promising results as in expecting manner.
The common objective of prosthesis fitting include comfort, stability while standing and walking, and enabling performance of various daily activities.

CONCLUSION

The field of biomedical prosthetics has seen remarkable advancements over recent years, driven by technological innovations, interdisciplinary research, and a deepening understanding of biomechanics and human physiology. This study has explored several key areas of development, highlighting the integration of cutting-edge materials, enhanced design methodologies, and advanced control systems.

The research and development in biomedical prosthetics are not only enhancing the functional capabilities and comfort of prosthetic devices but also paving the way for groundbreaking innovations that could one day eliminate the distinction between natural and artificial limbs. The collaborative efforts across various scientific and engineering disciplines will continue to drive this field forward, promising a future where prosthetic technology fully restores the quality of life for individuals with limb loss.

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