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Lemelson-MIT National Collegiate Student Prize Competition "Cure it!" Winner

David Sengeh, MIT (Cambridge, MA)
\$15,000 Lemelson-MIT "Cure it!" Graduate Winner
Next-generation wearable mechanical interfaces for amputees

The Challenge: There are an estimated two million amputees in the United States¹ with an estimated global amputee population of ten million²; many of these people have comfort and mobility issues with their prostheses. Advances in prosthetics abound, however the prosthetic socket or interface often dictates usability. The current state-of-the-art socket solutions are often uncomfortable, leading to pressure sores, deep tissue injury, and other secondary challenges.



The Solution: David Sengeh is designing and building next-generation prosthetic interfaces using quantitative patient-specific data in a reliable, cost effective and repeatable way. His process uses advances in magnetic resonance imaging, computer-aided design and manufacturing to create 3D printed, customized prosthetic interfaces that better match the contours of the human body, reducing pressure on the body and improving comfort and mobility. The anatomy of the remaining limb is used to design a socket interface with structural integrity based on human data. The recent addition of carbon fiber made Sengeh's 3D printed sockets more structural, while allowing for the intended prosthetic to conform to bony structures in the residual limb. Sengeh has also worked with low-level laser therapy practitioners to design a custom product to treat patients who have pressure sores on their residual limbs.

Application and Commercialization: Sengeh's hope is that the tools and processes he creates will bring low-cost and highly functional prosthetic sockets to patients all over the world. His invention has been tested by veterans and other amputee patients. This invention could also lead to industry advances, from streamlining production, to reducing costs, and most importantly enabling prosthetics to fit more patients. His design has implications beyond prosthetics to all mechanical interfaces including braces and orthotics. There is a patent-pending application for this technology, and Sengeh is focused on launching a prosthetic socket and interface design company within the next few years.

¹ <http://www.amputee-coalition.org/limb-loss-resource-center/resources-by-topic/limb-loss-statistics/limb-loss-statistics/index.html>

² <http://www.stanford.edu/class/engr110/2011/LeBlanc-03a.pdf>