Sadman

Hugh Herr heads the biomechatronics group at the MIT Media Lab in Cambridge. When Hugh Herr lost both of his legs — from just below the knees on down — in a rock-climbing accident at age 17, he feared he’d never walk again.

Hugh Herr might have had the means to overcome his impairment with the resources he had, but such is not the case for everyone in the world.

There’s the blind woman who learned to see with her ears, experimental science that can regrow fingertips, and even early stages of technology for deaf-mutes to communicate through a form of telepathy.

In this era of technologies, researchers are constantly working to find newer solutions to available problems, such a problem is the mass optimization of bionics. More advanced and sophisticated systems are out of bounds for the mass people, and systems have to maintain tradeoffs depending on the field of application. Faster robotic systems are inherently less powerful, and powerful systems are slower. But the main problem we face in third world countries is that the price of these prosthetic systems are mostly out of reach for the general people, and they are to use low end equipment or no equipment at all.

Sayeed

The aim of our project is to overcome those cost limits and make the technology available to the average people.

In our approach, we have focused on newer control systems and mechanisms than available on the prosthetics market, and using more available and affordable components to meet the demands.

Most of the prosthetic equipment available offer control technology based on invasive methods such as surgical implants, tissue integration, and non-invasive methods such as muscle signal sensing, brainwave control and gesture control. Invasive techniques offer the risk of infections, and non-invasive technologies have limitations regarding maneuverability and available degrees of freedom. Not to mention the high cost of these technologies.

In our approach, we have merged brainwave and gesture control for controlling our prosthetic system, and used readily available materials for the limb itself.

The brainwave controller simply consists of instrumentation amplifier, notch filters, gain stages, high pass and low pass filters. The sensor that we have bought for our project was priced at a hundred dollars. The module that we have designed would merely cost around 20 dollars, about one fifth of the device from neurosky. The more advanced sensors are priced around a thousand dollars, a huge price level for the humanitarian needs we intend to satisfy.

Input 🡺Instrumentation Amplifier 🡺 50Hz Notch Filter🡺 5 Hz high pass filter 🡺 30 Hz low pass filter 🡺 Gain stage 🡺 50Hz Notch filter 🡺 Microcontroller

Gesture control is to be included with the mindwave controller. We are working on a headset that will include cameras to detect eye movement with computer vision, and depending on what the patient is looking at, his arms can reach out for that object or destination. Because of dependency on eye movement and mindwave, the patient can easily learn to control the arm and apply it in his daily needs.

The arm design contains linear actuators, giving it a less costly build. Linear actuators make the arm somewhat slower, but more accurate in movement, and can be easily used for manipulating heavy objects that ordinary prosthetics cannot provide. The open construction also enables the user to add features suiting to his own needs.

Bionic man can be a revolutionary approach to applied prosthetics, because of the affordability and user friendliness we can provide, it will add great comfort to the lives of physically handicapped people. This process is feasible in third world countries as well as the developed nations where rehabilitation of the physically impaired is a burning question. As Stephen Hawking said, “However difficult life may seem, there is always something you can do and succeed at. It matters that you just don’t give up.” And it is our hope that bionic man will just be that fire of hope to the people for whom overcoming the disabilities might be next step to success.