*Technology*

# MIND OVER MATTER

## Robotic exoskeleton renews hope, mobility for paralysis patients

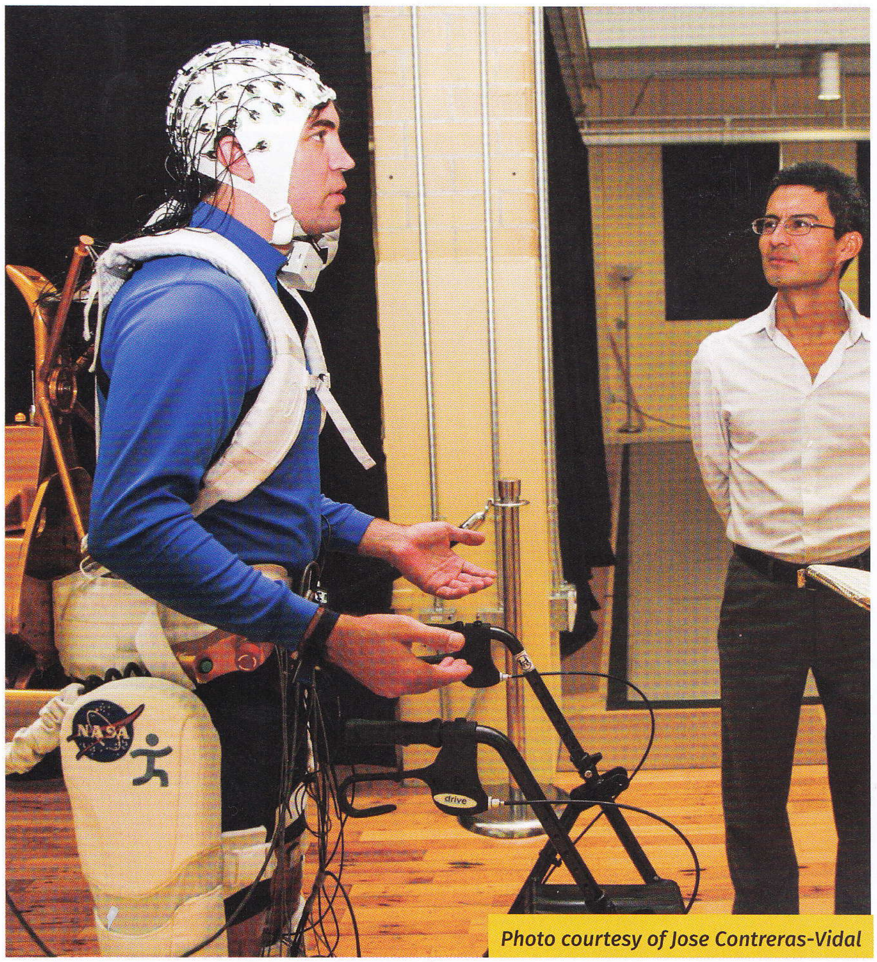


*Photo courtesy of Jose Contreras-Vidal*

Jose Contreras-Vidal, a professor and researcher at UH, is working with Houston Methodist Hospital to create a Brain Machine Interface system that will listen to the "neuro-symphony of movement" to direct a robotic exoskeleton to move the lower body of patients suffering from paralysis or spinal injury.

Contreras-Vidal believes the human brain is like a symphony with individual neurons firing and working in unison.

"There are 50 to 100 or more players, and each player has a function in the orchestra," he says. "You have the conductor, you have the violinist, the cello and all those. And you can listen to one of them only, and you can recognize the music. But you listen to all of them and it's more rich."

Dr. Robert Grossman, a neurosurgeon at Methodist and a UH adjunct professor, is working in collaboration with Contreras-Vidal by providing his expertise and clinic work to test the technology on volunteers.

"Dr. Grossman is a renowned expert on spinal injury and also he runs a national network for spinal cord injury clinical trials, so he knows how to conduct clinical research," Contreras-Vidal says. "He knows about the problems caused by disability in the body and the brain. And I'm coming from the engineering side of things, so it was a very natural synergy."

The robotic exoskeleton, which "looks sort of like Transformers," as Grossman puts it, can provide paralyzed patients an opportunity to walk.

"(The patients) can be fitted into this sort of suit, and the motors will bend the legs at the joints, so they can walk with the suit supporting them," Grossman says.

The robot is controlled by the brain through a cap that has 64 electrodes and is placed non-intrusively—without surgery—on a patient's scalp. The Brain Machine Interface then interprets the brain waves and translates them into commands for the machine.

"So if you can imagine, you think about walking forward, we take those brain patterns that relate to walking, and we can use those signals to control the robot," Contreras-Vidal says.

But it isn't just about being able to walk again. The BMI with the exoskeleton has the potential to allow patients to prevent secondary conditions caused by immobility, like skin sores or cardiovascular problems, and will provide a better quality of life. However, the technology will not provide any permanent benefit for the patient's spinal damage.

Other scientists have experimented with invasive, or surgical, technology that would do the same thing as Contreras-Vidal's, but he says that would pose a greater risk to the patient and not work as well because the invasive procedure would not allow the technology to interpret as much brain activity as non-invasively.

In three years, Contreras-Vidal expects to have finished developing the BMI and predicts that a version of it and the exoskeleton could be in clinics helping paraplegics around the world within the decade.

"The outcome at the end of this study is to provide evidence of the benefits of this technology, which is so the clinics can adopt it," he says.

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