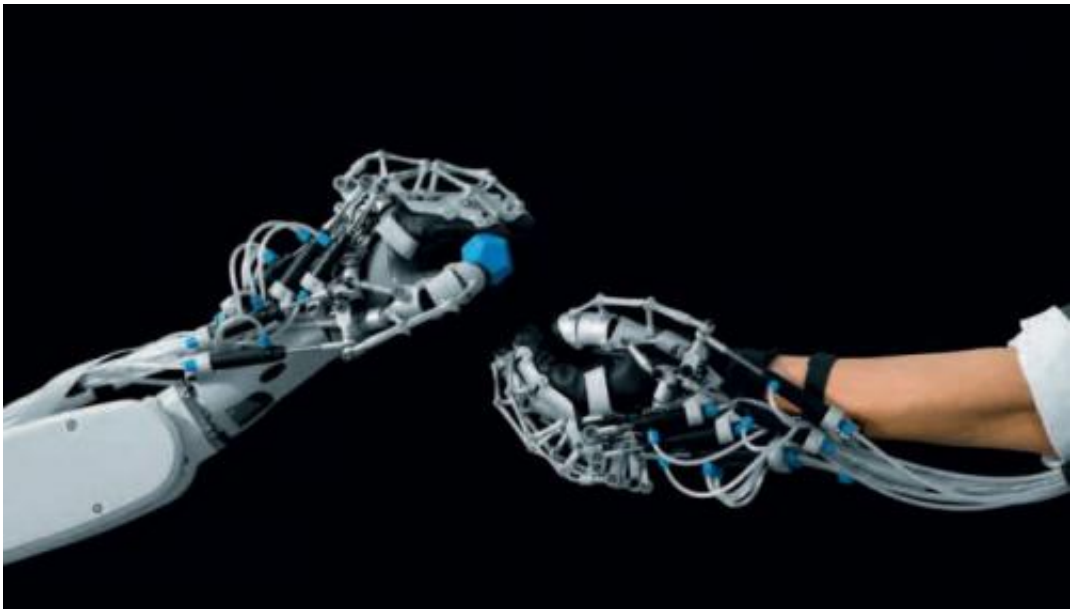
ExoHand: Glove for hand power is showcased at Hanover fair (w/ video)

April 25 2012, by Nancy Owano



(Phys.org) -- ExoHand, a glove designed to double the gripping power of the human hand, was a key attraction at this week's Hanover Trade Fair. So much for mechanical graspers or mechanical claws: one viewer who watched the demo said it was “un-nerving,” but the glove is designed to do quite the opposite than un-nerve. Once worn on the user’s hand, it provides enhanced dexterity in picking up difficult objects and provides power when needed too. The engineers responsible for ExoHand worked with the objectives to “enhance the strength and endurance of the human

hand" as well as to extend the hand's scope of action.

As a showcase "mechanical exoskeleton," all the joints and drive units are located outside the hand in the form of the exoskeleton.

Fingers can be moved and strength amplified in this device also described as an active manual orthosis with sensitive fingers. The operator's hand movements are registered and transmitted to the robotic hand in realtime.

The ExoHand uses pneumatic actuators on each finger to simulate the range of human finger movement. The actuators move the fingers so that they can be opened and closed. According to Festo, the company that designed ExoHand, nonlinear control algorithms were implemented on a CoDeSys-compliant controller for precise orientation of individual finger joints. (A "CoDeSys-compliant controller" registers and processes the positional and force parameters. It regulates the pressures in cylinders to ensure the correct finger positions and forces.) Further commenting on the design, Heinrich Frontzek, spokesman for Festo at the Hanover show, said that at the back of the glove is a power-booster built in; "That's done with little air cylinders that give power to every single finger through pressurized air that's blown into it. Through that, we can reach a doubling of the grip force."

This orthosis can be fitted over the human hand and also over an artificial hand made of silicone. The company foresees ExoGlove in remote-manipulation scenarios too, where handling items poses risks. In this instance, the user's motions would be emulated by the robotic hand away at a safe distance. As such, it would enable performance of tasks in hazardous areas—whether because of natural disasters, accidents, or within scientific labs.

Nonetheless, ExoHand is still only a proof of concept device. Festo,

which is a Germany-based engineering firm specializing in automation technologies, notes that ExoHand “offers an intriguing example of what the future of automation looks like.”

Looking into that future, Festo draws on experience in industrial training and education programs, and it recognizes an aging work population where retirement is taken in later years than before and where older workers in assembly line jobs could be helped through a device assisting them with tasks demanding endurance or strength or both. The “power amplifier,” as it is also called, might assist any workers in repetitive tasks that easily lead to fatigue. Rehabilitation for stroke patients has also been suggested as a possible application. If connected to a brain-computer interface, it may help stroke patients suffering from paralysis to get a connection between hand and brain.

According to Festo, the company has entered into a collaboration with the Tübingen University Hospital as part of the Bionic Learning Network. That network ties in Festo with universities, institutes and development companies working on technology and industrial applications.

More information: www.festo.com/cms/en_corp/12713.htm