DEKA's "Luke Arm"

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The need for prosthetics is ever growing. In the United States there are 6000 people on average who need upper extremity amputations every year. A large number of these are soldiers who have lost their arms in battle. DARPA (Defense Advanced Research Projects Agency) due to the increase in soldiers needing amputations, started the Revolutionizing Prosthetics Program. This program was started in 2005 to fund the development of two arms. The contract for this Program was $30.4 million and is to be completed in 2009. The Program is led by Johns Hopkins Applied Physics Laboratory. Johns Hopkins seeks a fully functional neurally controlled prosthetic arm using technology that is still experimental. A two-year $18.1 million contractin 2007 was awarded to DEKA Research and Development Corp. There contract was to give amputees an advances prosthesis which could be available immediately "for people who want to strap it on and go. DEKA was to make a noninvasive design. This is where the Luke Arm was born. Inspired by the arm Luke Skywalker has in Star Wars.

The Luke Arm had to be modular, lightweight, agile and controllable. The task was hard but timing was good. Microprocessors had become small enough and power consumption efficient it was possible to cram the control electronics, lithium batteries, motors and wiring into a package the size, shape and weight of a human arm.

Another task was to try to account for the 22 degrees of motion of the human arm. The Luke Arm has 18 degrees of motion, which was obtained by using rigid-to-flex circuit boards folded into origami-like shapes within the arm.

Since the arm had to be modular, DEKA made the Luke Arm look like a sophisticated vacuum cleaner attachments. Where all of the electronics needed for each section were contained within its section.

The arm had to be lightweight, titanium being know for its strength and lightweight characteristics was too heavy for the arm thus, most of the arm is constructed out of aluminum.
DARPA stipulated that the arm had to be noninvasive, but DEKA designed the arm to support any means of control.

The arm gives feedback to the user for grip pressure control. A tactor is a small vibrating motor about the size of a bite-size candy that's give a response to pressure. It allows the user to hold onto a paper cup without crushing it.

Depending on the degree of amputation, today's state of the art prosthetic arms can cost patients about $100,000 or more. DEKA's goal is to keep the cost of the Luke Arm as close to the $100,000 as possible.

Before the arm is commercialized the arm has to be approved by the FDA and this requires clinical testing not covered by DARPA.

The Luke Arm is he next step towards advanced robotic prosthetics.

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