

ReWalk Robotic Suit

Amanda Neves

Department of Electrical, Computer, and Biomedical Engineering

For those who suffer from complete paralysis, brain and spinal cord injuries, stroke, multiple sclerosis, cerebral palsy, and other diseases that result in walking impairments, there is little hope in ever walking again. With the invention of the ReWalk Robotic Suit, this simple human task is now possible. Created by engineer Amit Goffer, founder of Argo Medical Technologies Ltd. in Haifa, Israel, ReWalk enables patients with lower limb disabilities to independently perform ambulatory activities. The target market Goffer estimates, will mostly be the wheel-chair user community of the Western world. Goffer, a quadriplegic himself, has only partial use of his hands, but does not have enough function to use the ReWalk himself.

The suit consists of a light-weight wearable brace support suit, motorized joints, rechargeable batteries, and a variety of sensors as well as computer-based patient control system. It is worn around the legs, back, and chest, and fits closely to the body. It is put on in the morning and can be worn all day. The patient's stability during ambulation is provided by the use of crutches. In order to be eligible for this product, the user must have full use of their hands and shoulders, as well as a healthy cardiovascular system and bone density.

ReWalk is partially hidden under clothes and provides the user with initiated mobility. It was designed using SolidWorks 3D CAD software that was based on a rough prototype created by the inventor, Dr. Amit Goffer. The suit uses leveraging advanced motion sensors, DC motors at the joints, sophisticated robotic control algorithms, specially designed rechargeable batteries and composite materials, on-board computers, and real-time software. The intricate motion sensors measure the patient's shift in gravity and upper body movements.

The user wears a backpack device and braces around the legs and chooses the activity they wish to perform from a remote control located on the wrist. The signals are processed by the onboard computer system located in the

backpack which initiates and maintains walking in the desired direction at the appropriate speed. The intricate motion sensors located on the chest determine the torso's angle and measure the patient's shift in gravity and upper body movements. Thus, guiding the legs to move forward or backward while maintaining balance.

As of now ReWalk is not approved for use in the U.S., but has gone through clinical trials in the states at MossRehab in Philadelphia in the Spring of 2009. A preliminary trial was performed in Israel, analyzing the safety and performance of the suit as well as user satisfaction. The main user involved in these first clinical trials was 40 year old Radi Kauof, a paraplegic soldier from Israel who has been confined to a wheelchair for the past 20 years. Availability of this device for clinical use is dependent upon the FDA approval. It is believed that by late 2010, ReWalk will be available for commercial use and will cost around \$20,000 (similar to the price of a sophisticated wheelchair). It is unknown as of right now whether insurance will cover the cost.

Other robotic suits created by competing companies are not suitable for paralyzed people and will not offer the practical alternatives to wheelchairs in the future. The challenges with designing the ReWalk is that it was difficult to design something that imitates the human walk, make a product with a universal fit for a variety of user height and weight measurements, and create a product that is low-profile, contemporary, and user friendly.

Sources:

- <http://www.reuters.com/article/newsOne/idUSLP27939120080825?rpc=64&sp=true>
- <http://www.argomedtec.com/products.asp>
- <http://www.insidemossrehab.org/diseases-disorders/rewalk-faq/>
- <http://www.youtube.com/watch?v=gQRQs-N-ZIM>
- http://medgadget.com/archives/2008/03/rewalk_exoskeleton.html
- <http://www.einsteinnewsroom.com/index.php/Features/ReWalk-FAQs.html>
- http://www.israel21c.org/index.php?option=com_content&view=article&id=2128&catid=57:health&Itemid=63