

Mina V2: Lower body exoskeleton for paraplegic mobility.

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Current exoskeleton technology for assisting people with paralysis is slow, unstable, and bulky. These devices lack the degrees of freedom necessary to complete everyday tasks, resulting in a limited impact on the quality of life for those who use a wheelchair. The exoskeletons are controlled by the pilot from a variety of different interfaces, and all require the use of the pilot to provide the balance with crutches or walkers. Our project, Mina v2, is pushing the boundaries of what is currently possible in modern exoskeletons; from flat ground walking to climbing stairs, our device is able to help patients' complete tasks that would be otherwise impossible.

The Mina v2 with the pilot Mark Daniel was Team IHMC's entry to the Powered Exoskeleton competition in the 2016 Cybathlon, a competition designed to push the development of new exoskeleton technologies for people with paraplegia. Mina v2 is a prototype exoskeleton with six powered degrees of freedom, an actuator at the hip, knee and ankle for sagittal plane actuation. The device includes an actuated ankle joint, a feature not present in most other powered exoskeletons. This allows our pilot to "toe-off" when walking and during other highly taxing exercises. The use of ankle actuation throughout all the tasks in the competition allowed us to take longer strides when walking, as well as providing torque for the ramp and stairs. With the addition of a powered ankle joint, Team IHMC was able to place 2nd in the 2016 Cybathlon. Without powered ankle plantar

flexion, true dynamic walking in an exoskeleton is much more difficult. Additionally, the inclusion of powered ankles enables the development of sagittal plane balancing strategies that lead toward solutions in which the exoskeleton can perform the entire balance task. The Mina v2 represents a major step forward in exoskeleton research, enabling further development not possible otherwise.

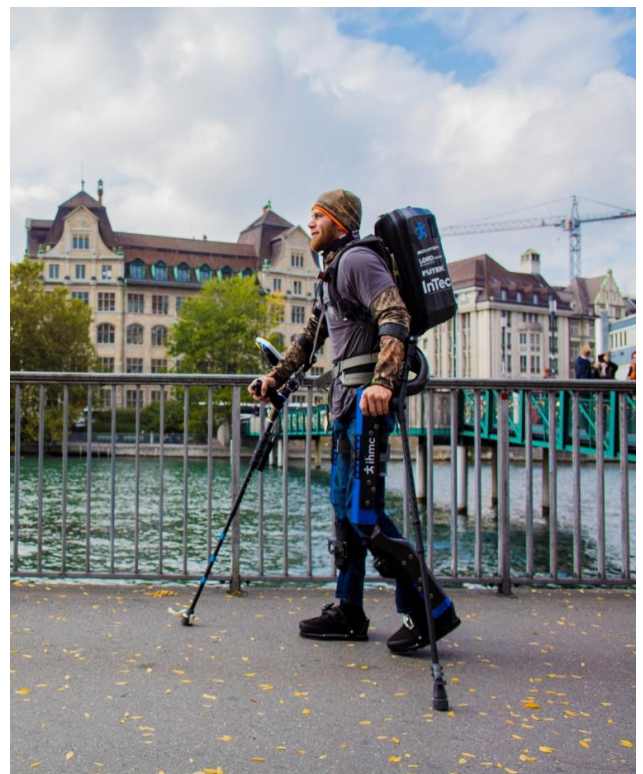


Figure 1: Pilot Mark Daniels walking along the Limmat river in Zurich Switzerland.