THE CONSORTIUM

CYBER*LEG*s

The CYBERnetic LowEr-Limb CoGnitive Ortho-prosthesis

PROJECT COORDINATION

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PROJECT FIGURES

GRANT AGREEMENT N°
FP7-ICT-287894
STARTING
February 1, 2012
DURATION
36 months
COST
3,5 M€ (2,5 M€ EU contribution)

CONTACTS

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MOTIVATION

► Lower-limb loss is a potentially disabling condition affecting the health and well-being of persons worldwide.

► The main factor influencing the amount of lower-limb amputation is peripheral vascular disease, which is in most of the cases caused by diabetes mellitus.

► Lower-limb amputation can be performed at several levels (e.g. foot-level, calf-level, thigh-level). However, the most challenging amputation level for the amputee is the thigh-level (namely transfemoral amputation).

► Persons living with transfemoral limb loss face distinct challenges: they need more metabolic energy and cognitive effort to perform any locomotion-related task and their locomotion is less stable.

► Energetic, cognitive and stability challenges are not fully overcome by any artificial passive or active transfemoral prosthesis in the current state of the art.
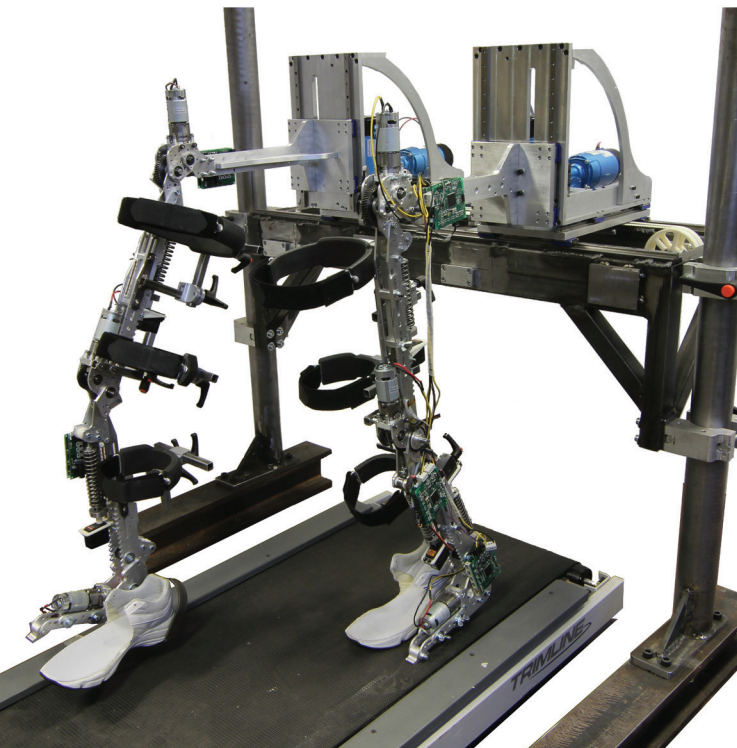
THE GOAL

The scientific and technological global goal of the CYBERLEGs project is the development of an artificial cognitive system for dysvascular trans-femoral amputees' lowerlimb functional replacement and assistance in activities of daily living.

CYBERLEGs will allow the amputee to walk back and forward, go up and down stairs, and move from sit-to-stand and stand-to-sit with a minimum cognitive and energetic effort.

SCIENTIFIC & TECHNOLOGICAL CHALLENGES

► To design and develop a powered, wearable, energy-efficient lower-limb ortho-prosthesis with tuneable passive compliant joints allowing passive energy transfer from knee to ankle joint.

► To develop a model based on motor primitives capturing human behaviour while executing locomotion-related tasks.

► To transpose the primitive-based model into a controller for CYBERLEGs, expected to work in symbiosis with the human user and make the control simple and intuitive.

► To develop a multi-sensory fusion algorithm for extracting the amputee motor intention from a multi-modal sensory system.

► To investigate a strategy for recognizing and preventing the incipient fall of the amputee.

► To develop a feedback strategy to augment the perception of CYBERLEGs as a part of the amputee's body.

► To perform a comparative study in a real-life scenario in which CYBERLEGs performance is evaluated against other state-of-art solutions.

EXPECTED RESULTS

CYBERLEGs will be a cognitive robotic system constituted of an active artificial leg for the functional replacement of the amputated limb and a wearable active orthosis for assisting the contralateral limb, i.e. the ortho-prosthesis.

CYBERLEGs wants to research ways of cognitive control, motivated and validated trough the ortho-prosthesis scenario, of a multi-degree-of-freedom system with both lower-limb replacing and assistive capabilities.

CYBERLEGs will develop know-how on how human can interface a semi-autonomous robotic device which supports the amputee in executing locomotion-related tasks (e.g. walking, stairs climbing), including transients (e.g. start, stop, sit-to-stand, etc…), in a real-life unstructured environment.