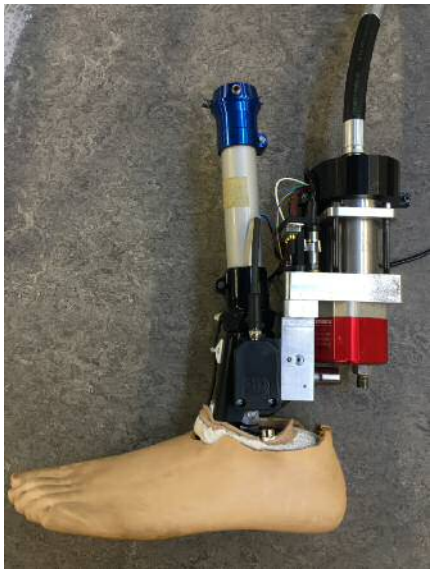
The Centre for Power Transmission and Motion Control

UNIVERSITY OF BATH

Research Project

ACTUATION AND CONTROL OF LOWER LIMB PROSTHESES



Motivation

Most commercially available below-knee prostheses have an elastic biomimetic foot and a bumper at the ankle joint to store or release energy during walking. These passive prostheses can support body weight and absorb vibration, but cannot assist amputees for ramp climbing, or stair ascent and descent. The development of a powered lower limb prosthesis is hampered by the volume and weight limitations. Electro-hydrostatic actuation is suitable for this application because of its high power density, and also the ability to switch between passive and active modes.

Objective

The aim of this project is to develop a powered lower limb prosthesis using an EHA to enhance current passive devices. The new prosthesis is required to provide sufficient power into the joint at the right time within the restriction of volume, weight, noise and energy resource capacity. In the passive phase of the gait cycle, the actuation should not require consumption of energy just to provide damping and support.

Amputee Test

A compact powered ankle prosthesis prototype has been completed and tested with amputees. According to the amputee's feedback and the test results, the compact powered ankle prosthesis can operate passively with controllable damping in the majority of the gait cycle and then provide sufficient power at the correct time point (toe push-off) to effectively assist walking.

Future work

Additive manufacture method can be applied to further minimize the size and the weight of the prosthesis. Future works also include intelligent control of the ankle prosthesis and the development of a more detailed simulation model.

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