



Hydraulic integration technology for lower limb active Prosthetics

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Abstract:

Prosthetic devices are nowadays one of the most important branches of biorobotics. The goal of giving back to amputees the possibility to carry out daily activities on their own represents a fascinating challenge for both medical and engineering researchers alike. A lower prosthetic device replaces a lost lower human body part and acts as a real lower limb replacement for people with lower extremity amputation. One of the important research points is the actuation of prosthetics. Hydraulic actuation normally ensures high power to weight ratio, absence of mechanical couplings between the motor and the load, steady intermitted torques, high force controllability, shock and vibration absorption, the ability to adapt in uneven locomotion environments in addition to the possibility to apply compliance at its end effector. However, the usage of hydraulics requires a hydraulic power pack for torque generation in addition to cumbersome heavy hydraulic piping for power transmission.

A new technology is discussed in this research, in which hydraulic integrated pathways are machined in the mechanism body parts to ensure the passage of hydraulic fluid to actuators, more like blood in human arteries. In this way, weight optimization, and faster dynamic responses are gained for the prosthesis in addition to minimum external hydraulic leakage. More optimization is gained through combining the hydraulic actuators with lightweight materials, for example, carbon-fiber-reinforced plastic (CFRP), so that maximum high load-to-weight ratio is achieved. An integrated hydraulic prosthetic device is introduced and controlled. In this prototype, the design parameters, material, friction parameters and leakage parameters are observed, analyzed and discussed.

Biography:

Abd El Rahman Farhan has completed his Bachelor degree at the age of 24 years from Faculty of Engineering Ain Shams University. Currently, he is working as a Robotics Teaching Assistant at Mechatronics Department, Ain Shams.



Publication of speakers:

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