conferenceseries.com JOINT EVENT
2nd International Conference on
Design and Production Engineering
&
International Conference on
Mechatronics, Automation and Smart Materials
November 13-14, 2017 Paris, France

J Appl Mech Eng 2017, 6:6(Suppl)
DOI: 10.4172/2168-9873-C1-015

Dual driven shoulder joint actuation design and control applied to a high-payload cooperative robotic device: Design and control

Ismail Bouhadda, Abdenbi Mohand-Ousaid, Gilles Bourbon, Patrice Le Moal and **France Philippe Lutz**
ITIA-CNR, Italy

Empowering humans is highly demanded in robotic research and practice. An ever-increasing range of applications (e.g., rehabilitation, military) is focusing on such important issue. Industries are one of the key users of such technology. Nowadays, many onerous tasks (e.g., lifting/installation of heavy components) are still manually made, implying non-ergonomic postures and musculoskeletal disorders. Indeed, robotics is fastly moving conceiving devices to improve the working conditions of humans, while increasing production flexibility and productivity. Since empowering devices require to satisfy both task performance and safety requirements, actuation plays a key role in their design. The contribution proposes a dual driven actuation (DDA) for the shoulder joint of a robotic system applied to a high-payload (i.e., 50 kg) cooperative robotic device empowering of humans in industrial tasks. The proposed actuation is a parallel system composed by (i) a serial elastic actuator (SEA) and by (ii) a standard direct actuator, decoupled by the compliant element of (i). The DDA defines a redundant actuation system since two motors are actuating a single joint capable to manage the energy flow by control, actively assisting the human operator during a cooperative task execution (i.e., limiting the human-exercised forces on the robotic system) and improving the transparency of the human-robot interaction. The proposed DDA has been applied in simulation, resulting in a compact and low-installed-power solution feasible to be applied in a limited-space scenario. A control strategy has been proposed to manage the mechanical energy flow while positioning the manipulator lifting a heavy component. A robot prototype is in the design phase within the H2020 CleanSky 2 EURECA project, aiming at assisting human operators installing heavy components in the aerospace industry.

loris.roveda@itia.cnr.it