Dynamic Modelling of an Anthropomimetic Robot in Contact Tasks

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References:

Abstract:
Considerations of energy efficiency and safe human-robot interaction have led to an increase in the exploitation of compliance in robotics, and much of this work has been inspired by biological systems. As a consequence, new analytical tools are now required in order to enable the dynamic analysis of these novel compliant robots, especially in their interactions with the environment. This paper extends the ‘Flier’ approach to show how it could be applied to the dynamic analysis of contact tasks involving a highly compliant biologically inspired robot – in this case an anthropomimetic robot, a humanoid with a human-like skeleton and artificial muscles, in which the joints are actuated by DC motors acting via compliant tendon transmissions. First, a computer-based model of the robot’s dynamics is developed. Various constraints are then introduced to describe the contacts (including impacts) with the ground, and with objects in the environment. Simulation results are presented for two types of interactions with the external world: a grasping task and the case of the robot moving on a mobile base.

Keywords:
anthropomimetic robotics, robot contact dynamics, compliant systems, agonist–antagonist drives, computer-based models