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Master-Slave Synchronization of a Planar 2-DOF Model of Robotic Leg

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Abstract: In this paper, synchronization in the master-slave coupling scheme of two mechanical lower limbs, or legs, is numerically presented. In particular, we use the sliding mode control approach for trajectory tracking of the master's end-effector and, in addition, the slave's end-effector synchronizes with the master's end-effector. The synchronization studies reported in the literature have two main interesting results: phase synchronization and anti-phase synchronization. It is our perception that these two synchronization types appear in human movements such as jumping, sitting or standing (as phase movements), and walking, running or swimming (as anti-phase movements). This work pretends to replicate some of these movements in a prosthetic leg, where the prosthetic leg is the slave and the natural leg is the master. The contribution of this work is the use of the master-slave synchronization scheme, in conjunction with the sliding mode control method, conceived in the particular problem of people with an amputated leg. Simulation studies performed on two mechanical dynamical models of 2-DOF are presented to demonstrate the viability and performance of the proposed master-slave synchronization scheme.

Keywords: *synchronization; nonlinear control; position control; robotics; sliding mode control.*

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