



PINCH AND GRIP CONTROL BY A NEURAL NETWORK MODELING THE CEREBRO-CEREBELLAR SYSTEM

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ABSTRACT—Many recent motor control studies such as the synthesis of robotic controllers have been inspired from biological systems. In this paper, a new neural network approach, inspired from neurophysiological theories, is proposed to control multidimensional redundant systems. The main goal of this approach is to perform pinch or grip movement by modeling the cerebro-cerebellar learning of visuomotor transformation. The approach is based on two theories of motor control, the Equilibrium Point theory of motor control and the differential neurocontroller theory, and two models of brain structures, the columnar organization of the cerebral cortex and the Marr-Albus-Ito theory of cerebellar learning. The convergence of the learning procedure was proved for human arm reaching movement. The novel approach is extended to model the human pinch movement, by including biomechanics and muscle properties of the human thumb and index.

Key Words: pinch, motor learning, neural network, cerebro-cerebellar interaction, plasticity.