Stretching the truth about Object Dynamics

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The effortless ease with which we move and interact with objects in our environment masks the true complexity of the control processes involved. In order to manipulate an object skillfully, the brain must learn its dynamics, specifying the mapping between applied force and motion. Further difficulty arises, in part, from the necessity to use complex objects and to move between multiple postures, many of which are unstable. How this mapping changes with object complexity and postural instability is a fundamental issue in sensorimotor control. In this talk I will present results showing that object dynamics can be flexibly represented in different coordinate frames by the brain, depending on object complexity. This suggests that with experience, the representation of the dynamics of a manipulated object may shift from a coordinate frame tied to the arm towards one linked to the object. I will also show recent results suggesting that the brain maintains flexible representations of novel object dynamics in different postural configurations with varying stability requirements. The additional effort required to maintain such flexible representations would be economical because such a representation allows for object use regardless of object orientation in the hand, whole-body posture, and instability in the environment.