Abstract Submitted
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Hamiltonian Dynamics of a Forced Two-Degree-of-Freedom Arm with Viscoelastic Muscles Executing Planned Motions[1] SAYAN PATRA, GREG OJAKANGAS, ANDREW CHASE, ANISH CHAKRABARTI, DALTON SIVILS, EVAN JOHNSON, KIEFER BARRETT, MASON NORTH, PRESTON JULIAN, None — In order to improve our understanding of how the brain controls the human arm both in the presence and absence of gravity, we have developed a two-degree-of-freedom robotic arm which is driven by six servo-actuated viscoelastic muscles. The computer-controlled servos mimic the contractive action of the sarcomeres in actual muscles, sections of elastic tubing represent the elastic behavior of actual muscles, while the behavior of tendons is represented by inelastic strings. The servos receive instructions to move from the visual C++ platform in the computer and the actual motion of the arm is recorded with optical encoders built into each joint axis. This experiment is a purely feed-forward system, and our goal is to determine whether our equations of motion, formulated using Hamiltonian dynamics, when numerically integrated, will predict the observed motion of the arm within experimental uncertainties. Our research was selected as one of 12 teams chosen nationwide as part of NASA Grant Us Space Reduced Gravity Program, to fly and perform experiments aboard NASA's Weightless Wonder aircraft in Summer 2011.

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