Meeting: 1006, Lubbock, Texas, SS 11A, Special Session on Future Directions in Mathematical Systems and Control Theory

1006-93-92 **Lawrence Schovanec*** (schov@math.ttu.edu), Department of Mathematics and Statistics, Texas Tech University, Lubbock, TX 79409, and **Alan Barhorst**. *A neuro-muscular-elstod-dynamic model of the human arm.*

The primary objective of this work is to relate neurological control and modeling of musculotendon dynamics to the resulting stress and strain in skeletal structures. A simplified neuro-muscular elastodynamic model of the human arm is developed which incorporates structural deflections in the equations of motion through the use of elasto-dynamic modeling techniques based on a hybrid parameter method. In particular, the modeling of articulated elastic segments coupled to the muscle dynamics is accomplished using a nonholonomic hybrid parameter projection method. A set of field and boundary equations for the elastic effects and ordinary differential equations for the angular coordinates are provided by this method. These equations are minimal in the sense that the dynamics are projected on the constraint-free manifold of the generalized speed space and thus require no algebraic side conditions.

As a demonstration of the method, two models of the upper extremity are created, both utilizing neural feedback and feedforward control. A comparison of the models show the sensitivity of skeletal structure to changes in neurological control, thereby validating the necessity of the model. (Received February 08, 2005)