WORKSHOP ON GRAND CHALLENGE COMPETITION TO PREDICT IN VIVO KNEE LOADS

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Knowledge of muscle forces during gait is necessary to characterize muscle coordination and function as well as joint and soft-tissue loading. Since direct measurement of muscle forces during gait is not feasible, musculoskeletal modeling and simulation have become the primary scientific approach for developing estimates. However, due to the muscle redundancy problem, these estimates remain largely unvalidated, especially for a complex joint such as the knee. Since model validation is a prerequisite for model utilization in a clinical environment, thorough quantitative evaluation of in vivo muscle force estimates during gait is a critical need for the biomechanics community.

This workshop will present a Grand Challenge competition to be held in a special session at the 2010 ASME Summer Bioengineering Conference. The goal of the competition is to advance the entire field of musculoskeletal modeling by critically evaluating muscle force estimates at the knee during gait using data collected from a patient with a force-measuring knee implant. Since muscle forces are the primary determinants of joint contact forces, correctly predicted muscle forces should result in correctly predicted contact forces. Competitors will be given access to tibial contact force, motion capture, ground reaction, EMG, muscle strength, fluoroscopic, and CT data. Tibial contact force data will be provided for some gait trials to assist competitors with musculoskeletal model development but withheld for other gait trials to permit quantitative evaluation of "blinded" muscle and contact force predictions.

The workshop will present the motivation for the competition, an overview of the instrumented knee implant design and accuracy, a description of the available experimental data, a summary of muscle and contact force estimates generated thus far, the logistics of the competition, and possible plans for additional competitions in subsequent years. A question and answer time will be held at the end to address questions from workshop participants.