Computational Mathematics Seminar Series

Optimization of Flapping Based Locomotion

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Johnston Hall 338
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Abstract:
Locomotion at the macro-scale is important in biology and industrial applications, such as for understanding the fundamentals of flight to enable design of artificial locomotors. We present an analysis of a fluid-structure interaction problem that models a rigid flapping body at intermediate Reynolds number (in 2-D). In particular, we have an energy estimate and a schur-complement method for solving the coupled system, which is valid for all mass densities of the body (even zero). We also describe an optimal control problem for the time-dependent actuation profile that drives the forward motion of the body. The actuation consists of a vertical velocity control attached to a pivot point of an ellongated rigid body, which is allowed to rotate and is affected by a torsional spring; the spring acts as an elastic recoil. We then solve the time-dependent, PDE-constrained optimization problem (with appropriate constraints). Optimization results for certain parameter variations (relative mass density, spring constant, etc) will be shown. This work is joint with Michael Shelley at NYU.

Speaker's Bio:
Walker is an assistant professor jointly in the Mathematics Department and the Center for Computation & Technology (CCT) at Louisiana State University. He received his PhD from the University of Maryland, College Park, and his research interests include finite element methods and PDE-constrained optimization.

Refreshments will be served.
This lecture has a reception.

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