

Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Cyber-physical experiments on the efficiency of swimming protocols¹ NATHANIEL WEI, DANIEL FLORYAN, TYLER VAN BUREN, Princeton University, ALEXANDER SMITS, Princeton University and Monash University — We present results from experiments on a biologically inspired cyber-physical system, composed of a two-dimensional heaving and pitching rigid airfoil attached to a six component load cell, mounted to a traverse that can move along a water channel. A feedback controller, influenced by the apparatus of Mackowski and Williamson (J. Fluid Struct., 2011), introduces the effects of a fictional drag force specified by a virtual body profile and drives the traverse accordingly. Free-swimming protocols using the force-feedback system are compared with similar motions on a motionless traverse. The propulsive efficiency of burst-and-coast kinematics is also considered. Of particular interest are (1) the implementation of the cyber-physical control system with respect to the accessible experimental parameter space, (2) the impact of force-based streamwise actuation on experimental data, and (3) the effects of burst-and-coast motions on propulsive efficiency.

¹The work was supported by the Office of Naval Research (ONR) under MURI Grant N00014-14-1-0533.

Nathaniel Wei
Princeton University

Date submitted: 01 Aug 2016

Electronic form version 1.4