Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Robotic penguin-like propulsor with novel spherical joint BASSEM SUDKI, MICHEL LAURIA, FLAVIO NOCA, University of Applied Sciences - hepia - Geneva, Switzerland — We have designed and manufactured an innovative spherical joint mechanism with three actuated degrees of freedom, aimed at mimicking a penguin shoulder and enabling a potential propulsion technology with high efficiency and maneuverability. In addition, the mechanism might also lead to propellers with directional thrusting capability. A parallel architecture was chosen for this type of mechanism in order to ensure rigidity as well high actuation frequencies and amplitudes. Indeed, as the motors are fixed, inertial forces are lower than for a serial robot. The resulting spherical parallel mechanism (SPM) with coaxial shafts was designed and manufactured with the following specifications: fixed center of rotation (spherical joint); working frequency of 2.5 Hz under charge; unlimited rotation about main axis; and arbitrary motion within a cone of 60 degrees. The equations for the inverse kinematics of the mechanism have been established and can yield the trajectories of each actuator for any desired motion applied to the oar or blade. The technology will be illustrated with preliminary experiments in a hydrodynamic channel at the University of Applied Sciences - hepia - Switzerland.

Flavio Noca
University of Applied Sciences - hepia - Geneva, Switzerland

Date submitted: 30 Jul 2013 Electronic form version 1.4