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**Non-invasive 3D geometry extraction of a Sea lion foreflipper** CHEN FRIEDMAN, MARTHA WATSON, George Washington University, PAMELA ZHANG, Holton Arms school, MEGAN LEFTWICH, George Washington University — We are interested in underwater propulsion that leaves little traceable wake structure while producing high levels of thrust. A potential biological model is the California sea lion, a highly maneuverable aquatic mammal that produces thrust primarily with its foreflippers without a characteristic flapping frequency. The foreflippers are used for thrust, stability, and control during swimming motions. Recently, the flipper's kinematics during the thrust phase was extracted using 2D video tracking. This work extends the tracking ability to 3D using a non-invasive Direct Linear Transformation technique employed on non-research sea lions. marker-less flipper tracking is carried out manually for complete dorsal-ventral flipper motions. Two cameras are used (3840 $\times$ 2160 pixels resolution), calibrated in space using a calibration target inserted into the sea lion habitat, and synchronized in time using a simple light flash. The repeatability and objectivity of the tracked data is assessed by having two people tracking the same clap and comparing the results. The number of points required to track a flipper with sufficient detail is also discussed. Changes in the flipper pitch angle during the clap, an important feature for fluid dynamics modeling, will also be presented.

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