A Study of Kinematics Modeling and the Computational Optimization of the Human Underwater Undulatory Kick by Comparison of Swimmers and Body Orientations[1] XIAORAN ZHU, Western Albemarle High School, GENG LIU, YAN REN, HAIBO DONG, University of Virginia, FLOW SIMULATION RESEARCH GROUP TEAM — Underwater Undulatory Swimming (UUS), better known as the underwater dolphin kick, is the most important technique in competitive swimming. Faster than three of the four strokes in swimming, UUS is permitted in the 15m after dives and turns. In this study, we compared the UUS of a college-level swimmer and a younger swimmer. 3D human models were built and reconstructed using stereo-videos for identifying key components of undulatory kick kinematics with respect to strongly flexing joints. A gradient-based optimizer and an immersed boundary method based CFD solver was then used to study the hydrodynamic performance of each swimmer. Optimal settings of current kinematic models will help us to understand the efficiency of the observed undulatory kick mechanisms and further improvements of the human UUS strategy.

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