Imaging Techniques for Dense 3D reconstruction of Swimming Aquatic Life using Multi-view Stereo DAVID DAILY, JILLIAN KISER, SARAH MCQUEEN, Naval Undersea Warfare Center — Understanding the movement characteristics of how various species of fish swim is an important step to uncovering how they propel themselves through the water. Previous methods have focused on profile capture methods or sparse 3D manual feature point tracking. This research uses an array of 30 cameras to automatically track hundreds of points on a fish as they swim in 3D using multi-view stereo. Blacktip sharks, sting rays, puffer fish, turtles and more were imaged in collaboration with the National Aquarium in Baltimore, Maryland using the multi-view stereo technique. The processes for data collection, camera synchronization, feature point extraction, 3D reconstruction, 3D alignment, biological considerations, and lessons learned will be presented. Preliminary results of the 3D reconstructions will be shown and future research into mathematically characterizing various bio-locomotive maneuvers will be discussed.

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