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Cambered Undulating Fin for Heading Control. GONZALO GARCIA, MOHAMMAD UDDIN, OSCAR CURET, Florida Atlantic University — Some aquatic organisms use undulating membranes for forward swimming as well as to generate remarkable directional maneuvers. However, the control of the fin to produce similar swimming characteristics in underwater robotics remains a challenge. In this work, we explore the maneuver control of a robotic underwater vessel in different flow conditions with an arbitrary fin kinematics producing different wave shapes. The propulsion of the robotic vessel consists of a single undulating fin running along the length of the robot, which controls both forward motion and directional maneuvers. We tested the physical model in a water channel with different incoming flow. In addition, the robotic system was tested in pool to follow a predefined trajectory. During a trajectory following the robot is controlled to follow the path by the actuation of two states, i.e. the forward speed and the heading. These states are controlled by the adjustment of the amplitude of oscillation of the undulating fin, and the deflection of the totality of the rays in a curved way, as opposed to the linear offset rotation of only a subset of the rays of the fin. In contrast with this thrust vectoring approach, we found that adjusting the camber of the undulating fin produces a net yawing torque capable of changing the heading of the robot during motion. Preliminary results also show that the control scheme is robust for different flow conditions.

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