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Wave number effect on the neuromechanical phase characteristics of fish undulatory locomotion JIALEI SONG, YANG DING, Beijing Computational Science Research Center, YONG ZHONG, RUXU DU, The Chinese University of Hong Kong — For animals with undulatory locomotion, it has been discovered that "neuromechical phase lags" (NPL) is commonly utilized. That is, the wave of the muscle activation propagates faster than the wave of body bending, leading to an advancing phase of activation relative to the curvature forward the tail. Even though several multi parameter neuromechanical models have reproduced this phenomenon, but due to the simplification of the model, the origin of the NPL is difficult to identify. By incorporating accurate hydrodynamic and inertial effect, we tried to build a model of high fidelity to describe the dynamics of undulatory fish swimming. The hydrodynamic torque is obtained by the accurate DNS simulation. Meanwhile, the inertial torque is introduced by incorporating the reasonable density distribution and detailed undulatory motion. In our study, we studied cases with three different wave numbers on the fish body, with the swimming pattern ranges from anguiliform to carangiform. The results show different muscle actuation patterns with different wave number on body. This study might provide a beneficial guidance on the future fish-like robot design.

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