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Propagating waves in bounded elastic media: a transition from standing wave motion to anguilliform kinematics

Ramananarivo, Sophie, sophie.ramananarivo@gmail.com, Nyu; Thiria, Benjamin, ESPCI, France; Godoy-Diana, Ramiro, ESPCI, United States

ABSTRACT

Waves propagating in confined geometries usually evolve into spatially stationary patterns, built from the interference between the waves that have been reflected upon hitting the boundaries. However, a recent study on bio-locomotion [1] has reported that traveling wave kinematics can naturally emerge in a forced elastic rod, even with boundary conditions involving significant reflections. It has been shown that this particular behavior is observed only in the presence of strong damping. Based on those observations, we aim at giving a quantitative description of the mechanism involved to prevent the built-up of standing waves and establish traveling fish-like kinematics (that optimizes the global swimming efficiency). The question is discussed here in the framework of hand-made artificial swimmers as an example of practical application.

REFERENCE

- [1] Ramananarivo, S., Godoy-Diana, R., Thiria, B. Passive elastic mechanism to mimic fish-muscle action in anguilliform swimming. *Journal of the Royal Society Interface*. 2013, 10(88), 20130667.