Geometric optimal control for microorganisms

Jérémy Rouot
Inria Sophia Antipolis, France

Bernard Bonnard
Université de Bourgogne, France

Piernicola Bettiol
Université de Bretagne Occidentale, France

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In this talk we make a geometry analysis of the optimal strokes associated to the swimming problem at low Reynolds number, minimizing the mechanical energy, using the Purcell Three-link swimmer [1] and a simplified symmetric swimmer introduced by Takagi [2]. The mathematical framework is sub-Riemannian geometry and we discuss in both cases the nilpotent approximation associated to strokes with small amplitudes.
More global results are presented combining geometric and numerical analysis to understand the role of abnormal curves and to analyze the second-order optimality conditions related to global optimality.

Références

[1] E. M. Purcell, *Am. J. Phys. Life at low Reynolds number*, 1977.

[2] D. Takagi, *Phys. Rev. E 92. Swimming with stiff legs at low Reynolds number*, 2015.