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# Arnold's diffusion and formally gradient dynamics of the action functional

Sinisa Slijepcevic\*<sup>1</sup>

<sup>1</sup>University of Zagreb – Croatia

## Abstract

We prove existence of Arnold's diffusion in the well-known Arnold's example of a two and a half degrees of freedom Hamiltonian, for all values of the parameters; i.e. in the entire range from arbitrarily close to far from integrable. We introduce a new technique of considering formally gradient dynamics of the action functional. The approach relies on the emerging theory of extended gradient systems, including their asymptotics and stability, combined with a version of the Morse-Sard theorem, and geometric and variational information of the original equation. We compare the approach with some recent results on Arnold's diffusion with either geometric or variational approach.

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\*Speaker