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Modeling and control of ferromagnetic nanowires

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In this talk, we investigate the problem of modeling and controlling finite-length ferromagnetic nanowire, in which the evolution of the magnetization vector is governed by the Landau-Lifshitz equation. We first provide a description of all steady-states of this equation and study their local stability properties. In particular, a quantization property in terms of a certain energy will be highlighted. Then we address the problem of controlling and stabilizing steady-states by means of an external magnetic field induced by a solenoid rolling around the nanowire. We prove that, for a generic placement of the solenoid, one can steer approximately the system from any steady-state to any other one, provided that they have the same energy level. The proof of this result rests upon the investigation of local exponential stabilization properties of the Landau-Lifshitz equation with a feedback control.

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