Quantitative geometric control in kinetic theory

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Control theory, in PDE analysis, was initially developed for hyperbolic and parabolic problems (such as propagation of waves and diffusion of heat). The celebrated geometric control condition of Bardos, Lebeau, and Rauch (1992) is a necessary and sufficient condition for wave observability and exact controllability. However, many fundamental physical equations combine a transport hyperbolic term with a partially diffusive/dissipative one: kinetic theory in particular presents such structure. We present a recent work with F. Hérau, H. Hutridurga and H. Dietert where we prove quantitative estimates of exponential stabilization for such equations, under a geometric control condition reminiscent of control theory of wave equations. The proof relies on a new approach to hypocoercivity based on trajectories and quantitative divergence inequalities.



In honor of Claude Bardos's 85th birthday