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The Graph Geometric Control Condition

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We introduce a novel concept called the Graph Geometric Control Condition (GGCC). It turns out to be a simple, geometric rewriting of many of the frameworks in which the controllability of PDEs on graphs has been studied. We prove that (GGCC) is a necessary and sufficient condition for the exact controllability of the wave equation on metric graphs with internal controls and Dirichlet boundary conditions. We then investigate the internal exact controllability of the wave equation with mixed boundary conditions and the one of the Schrödinger equation, as well as the internal null-controllability of the heat equation. We show that (GGCC) provides a sufficient condition for the controllability of these equations and we provide explicit examples proving that (GGCC) is not necessary in these cases.

Joint work with Kaïs Ammari, Alessandro Duca and Romain Joly.

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