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Taylor expansions of the value function associated with stabilization problems

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Abstract: We propose to approximate the value function of a nonlinear stabilization problem with a Taylor expansion around the equilibrium point. For such problems, it can be shown that the second-order derivative of the value function is the solution to an algebraic Riccati equation and that all derivatives of order greater or equal to 3 are solutions to well-posed linear equations. Some theoretical and numerical results for the resulting feedback laws will be presented for a control problem of the Fokker-Planck equation.

Orateur: PFEIFFER, Laurent (Inria & CMAP, École polytechnique, IPP)