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Optimal control and Hamilton-Jacobi-Bellman equations: Numerical methods and Applications

hp-version DGFEM for Hamilton-Jacobi-Bellman equations with Cordes coefficients

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Abstract: We will present theoretical and computational aspects of the hp-version DGFEM for fully nonlinear second-order elliptic and parabolic Hamilton–Jacobi–Bellman equations with Cordes coefficients, which is joint work with Endre Sli. The discretisation of the PDE is motivated by a continuous analysis based on the Cordes condition, which establishes well-posedness in the class of strong solutions. We will see that the numerical method is consistent and stable, with error bounds that are optimal in the mesh size, and suboptimal in the polynomial degrees, as standard for hp-version DGFEM. Numerical experiments on problems with strongly anisotropic diffusion coefficients study the performance of the schemes,with exponential convergence under hp-refinement, and show their efficient discrete solution by a combination of a semismooth Newton method with nonoverlapping domain decomposition preconditioners.