Diffusive Hamilton-Jacobi equations with super-quadratic growth

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Abstract: We discuss several phenomena which occur in the behavior of second order Hamilton-Jacobi equations with first order terms having super-quadratic growth in the gradient. This is a regime where solutions may be continuous but with a gradient blow up; in this case second order equations exhibit many properties which are similar to first order problems, such as loss of boundary conditions and appearance of singularities. Recent results, obtained in collaboration with Philippe Souplet, describe the qualitative behavior of the evolution problem and the blow-up of smooth solutions. This includes blow-up rates, blow-up profiles, life after blow-up, loss (and recovery !) of boundary conditions.