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Universal parabolic regularization of the gradient catastrophes for the Burgers-Hopf equation and Jordan systems

Non-standard parabolic regularization of gradient catastrophes for the Burgers-Hopf equation and integrable hydrodynamic-type systems with the most degenerate Jordan blocks is proposed. It is based on the analysis of the generic and all higher order gradient catastrophes and their step by step regularization by embedding the Burgers-Hopf equation and Jordan systems into integrable multi-component parabolic systems of quasi-linear PDEs with the most degenerate Jordan blocks. Probabilistic realization of such procedure is discussed. The complete regularization is achieved by embedding into infinite Jordan chain. It is shown that the Burgers equation, Korteweg-de Vries equation and other regularized PDEs are particular reductions of the Jordan chain.