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On periodic solutions for reductions of Benney chain

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Abstract

We study periodic solutions for a quasi-linear system of PDEs, which is the so called dispersionless Lax reduction of the Benney moments chain. It is a very well known problem for a quasi-linear systems to find smooth solutions or to establish their finite time lifespan. I will show how the quasi linear system is related to a question of integrability of a classical Hamiltonian system of the form $H = p^2/2 + u(q, t)$ and will explain how Lax analysis can be performed for it. The main result states that the only periodic solutions of the 3 by 3 reduction of the Benney are of the form of traveling waves. I will relate this result to classical conjecture by Birkhoff on integrable billiards. 1