

■ Lavi Karp

ORT Braude College, Karmiel, Israel, email: karp@braude.ac.il

Well-posedness of coupled first and second order hyperbolic systems

Abstract

Existence, uniqueness and well-posedness of quasilinear wave equations that are coupled to first order symmetric hyperbolic systems are established. Hughes, Kato and Marsden studied systems consisting only of second order hyperbolic equations [1]. They proved existence theorems for systems in \mathbb{R}^n whose solutions $(u(t), \partial_t u(t))$ lie in the Sobolev space $H^{s+1} \times H^s$. In particular, they lowered the required value of s to $s > \frac{n}{2}$ in case where the coefficients of highest order terms do not involved derivatives of the unknowns. We extent their results and obtain the same degree of regularity for coupled first and second order hyperbolic systems. This result is applied to show short time existence theorems for Cauchy problems for non-vacuum Einstein equations. This is a joint work with Uwe Brauer.

BIBLIOGRAPHY

- [1] Hughes, T. J. R., Kato, T. and Marsden, J. E., *Well-posed quasi-linear second-order hyperbolic systems with applications to nonlinear elastodynamics and general relativity*, Arch. Rational Mech. Anal. **63**, 273–294 (1977).