

A generalized implicit function theorem with applications to hyperbolic PDEs

Irina Kmit

Humboldt University of Berlin, Germany

Our first result is a generalized implicit function theorem for abstract equations of the type $F(\lambda, u) = 0$. We suppose that $F(\lambda, \cdot)$ is smooth for all λ . It should be stressed that we do not suppose that $F(\cdot, u)$ is smooth for all u . Let $F(0, u_0) = 0$. We state conditions under which for all $\lambda \approx 0$ there exists exactly one solution $u \approx u_0$, this solution u is smooth in a certain sense, and the data-to-solution map $\lambda \mapsto u$ is smooth. Then we apply this result to time-periodic solutions of first-order hyperbolic systems

$$\partial_t u_j + a_j(x, \lambda) \partial_x u_j + b_j(t, x, \lambda, u) = 0$$

and second-order hyperbolic equations

$$\partial_t^2 u - a(x, \lambda)^2 \partial_x^2 u + b(t, x, \lambda, u, \partial_t u, \partial_x u) = 0.$$

This is a joint work with Lutz Recke.