Biharmonic wave maps

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Biharmonic wave maps are functions $u : \mathbb{R}^n \times [0,T) \to M$ for a smooth and compact Riemannian manifold M such that the image of the plate operator $\partial_t^2 u + \Delta^2 u$ is normal to M at $u(x,t)$. We show the local wellposedness this system in Sobolev spaces of sufficiently high order and a blow-up criterion in the sup-norm of the gradient of the solutions. In contrast to the well studied (second-order) wave maps system, we use a vanishing viscosity argument and an appropriate parabolic regularization in order to obtain the existence result. Our arguments heavily employ the geometric nature of the problem.

If M is a sphere, we construct global weak solutions by means of a Ginzburg-Landau type approximation. The proof relies on a reformulation of the system as a conservation law.

The talk is based on two joint papers with Sebastian Herr (Bielefeld), Tobias Lamm (Karlsruhe) and Tobias Schmid (Karlsruhe).