Oberseminar
Analysis und Theoretische Physik

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The Parametric Resonance
in Wave Maps

Wave maps are the hyperbolic analogue of harmonic maps between two Riemannian manifolds. Wave maps were first introduced by Gell-Mann and Levy'1960 in the context of a quantum field theory (the so-called nonlinear sigma model).

In this talk we concern with the wave maps from the Lorentzian manifold with the periodic in time metric into the Riemanian manifold, which belongs to the one-parameter family of Riemanian manifolds. That family contains as a special case the Poincaré upper half-plane. Our interest to such maps is motivated with some particular type of the Robertson-Walker spacetime arising in the cosmology.

We show that small periodic in time perturbation of the Minkowski space generates parametric resonance phenomena. For the nonlinear scalar waves and the scalar wave map type equations it was proved (KY'01) that the generated by periodic coefficient parametric resonance interacting with the nonlinearity, in general, leads to the blow up of the solutions for arbitrary small initial data and for any dimension of the space of spatial variables.

In order to establish similar result for the wave maps, we first prove that the only stationary wave maps are the constant wave maps. This is why we are interested in the small perturbations of the constant wave maps with the periodic in time metric. We prove that, in the contrast to the case considered by Joachim Krieger (Comm. Math. Phys. 2004, Mem. Amer. Math. Soc. 2006), the global in time solvability in the neighborhood of constant solutions is not a stable property of the wave maps. This problem is closely associated with the Klainerman's Conjecture that sates that classical wave maps originating on 2+1 Minkowski space exist for arbitrary smooth initial data.

This is a joint work with Tatsuo Nishitani (Osaka University, Japan).

Dienstag, 12.07.2011, 16:15 Uhr, Raum g005
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Dazu laden herzlich ein:
Prof. Dr. Joachim Escher
Prof. Dr. Bernhard Krötz
Prof. Dr. Olaf Lechtenfeld
Prof. Dr. Elmar Schrohe
Prof. Dr. Christoph Walker