Workshop on Geometric and Renormalization Group Flows

ZEIT:
22.11.2006 - 24.11.2006

ORT:
Max Planck Institute for Gravitational Physics
(Albert Einstein Institute)
Potsdam, Germany

PROGRAMM:

22.11.2006

10:00 **Arkady Tseytlin**

String sigma models and RG flows

11:00 Coffee Break

11:30 **Knut Smoczyk**

Mean curvature flow in higher codimension
In the talk I will report on the most recent results in mean curvature flow of submanifolds in higher codimension. Of particular interest will be the Lagrangian mean curvature flow and selfsimilar solutions.

12:30 Lunch

14:00 **Ioannis Bakas**

Field theoretic and algebraic aspects of certain curvature flows
I describe the realization of three curvature flows in field theory. The Ricci flow as bulk renormalization group equation of sigma models; the mean curvature flow as boundary renormalization group equation

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of sigma models; the Calabi flow as equation for gravitational radiation in general relativity. Then, I shall explain the use of algebraic techniques for integrating some of these curvature flows in two dimensions.

23.11.2006

10:00 **Alexander Zamolodchikov**

Boundary RG flows

11:00 Coffee Break

11:30 **Ernst Kuwert**

The Willmore flow
The talks discusses the motion of curves and surfaces by the negative gradient of the total squared curvature integral, reporting on results which have been obtained with Reiner Schaetzle (Tuebingen) in the past years. Despite of the progress, many global questions for these flows are not well understood.

12:30 Lunch

14:00 **Eric Woolgar**

A gradient flow for non-linear sigma models: some applications of Hamilton-Perelman theory
Renormalization group flow for nonlinear sigma models can be approximated by Ricci flow when the B-field and stringy corrections beyond first order are unimportant. Thus, results from the study of Ricci flow should have applications in the physics of the sigma model. I will discuss some of these applications. In particular, Perelman has shown that Ricci flow is gradient with respect to a positive-definite metric on the space of Riemannian metrics if the coordinate gauge is chosen wisely. I will describe how this generalizes to give a gradient flow and monotonicity formula on the space of coupling constants of the sigma model with B-field, to first order in the string scale and modulo a suitable gauge choice. I will also describe recent results on the spherically symmetric Ricci flow that indicate the behaviour of mass under RG flow on asymptotically flat manifolds. Time permitting, I will put forward some open problems. This talk is based on joint papers with my collaborators Todd Oliynyk and Suneeta Vardarajan.

24.11.2006

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10:00 **Mauro Carfora**

Ricci flow, entropies and the averaging of cosmological spacetimes

I will discuss Ricci flow deformation of cosmological Initial data sets. This is one of the oldest application of the Ricci flow, devised in an attempt to formalize G.F.R. Ellis' fitting problem and cosmological averaging program. Initial data set deformation generate curvature back-reaction effects in the cosmological modelling of the curvature of the physical space. They have recently drawn attention in the controversial issue as to what is the origin of the acceleration of the Universe. Regardless of their actual role in physical cosmology, I will argue that Ricci flow deformations of the initial data sets for Einstein equations provide a number of challenging mathematical problems. We show that Perelman's extension of the Ricci flow sheds new light on such an issue, in particular we analyze the role that entropy-like quantities may have in controlling the deformation procedure.

11:00 Coffee Break

11:30 **Klaus Ecker**

Mean Value Formulas for Evolving Metrics

12:30 Lunch

14:00 **Burkhard Wilking**

Manifolds with positive curvature operators are space forms

Confirming a conjecture of Hamilton, we show that on compact manifolds the normalized Ricci flow evolves metrics with positive curvature operators to limit metrics of constant sectional curvature (joint work with Christoph Boehm).

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