[Ricci flow 張樹城] [Curvature] [Mechanics] [Richard Schoen]

§ 4D model of the Ricci flow by Dryuma Valery [ResearchGate]

Monge-Ampere equation $\det D^2 u = f$

$$\frac{\partial g}{\partial t} = -2Ric(g) \quad \cdots(1)$$

$$ds^2 = A(x,y,t)du^2 + 2B(x,y,t)dudv + dudx + C(x,y,t)dv^2 + dvdy \quad \cdots(2)$$

The Ricci tensor of the metric (1) has a five components

$R_{uu}, R_{uv}, R_{vv}, R_{ux}, R_{vx}$

From the conditions of compatibility of the equations (1) we find that they are reduced to the equation

$$4\left(\frac{\partial^2}{\partial x^2}h(x,y,t)\right)\frac{\partial^2}{\partial y^2}h(x,y,t) - 4\left(\frac{\partial^2}{\partial x\partial y}h(x,y,t)\right)^2 - \frac{\partial}{\partial t}h(x,y,t) = 0 \qquad (3)$$

and components of the metric (2) take the form

$$B(x,y,t) = \frac{\partial^2}{\partial x\partial y}h(x,y,t),\ C(x,y,t) = -\frac{\partial^2}{\partial x^2}h(x,y,t),\ A(x,y,t) = -\frac{\partial^2}{\partial y^2}h(x,y,t). \qquad (4)$$

§ Ricci Flow Gravity Wolfgang Graf

Jordan-Brans-Dicke theory

Energy-momentum tensor

$Newton - Nordstr\ddot{o}m$ potential

A non-negative n-form density ϖ makes the manifold a volumetrical manifold。

$\varpi = \omega e^{-\phi}$ where $\omega = |\det g|^{\frac{1}{2}} dx_1 \wedge dx_2 \ldots \wedge dx_n$

$\nabla_X \varpi = -(X \bullet \partial\phi)\varpi$

…

In a volume manifold，a Lie flow with vector ξ is called volume-preserving if

$L_\xi \varpi = 0$ or equivalently $div\xi = 0$

§ General Relativity and the Ricci flow by Mohammed A. Alzain

ADM formalism

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We conclude that the deformation of Riemannian metrics by their Ricci curvature introduces the Newtonian notion of time evolution into the structure of general relativity by allowing the spacetime manifold to evolve (even in the absence of matter) with respect to an external time variable, hence, bridging a major gap between the general theory of relativity and the quantum theory.