General Relativity and Quantum Cosmology

Minimal data at a given point of space for solutions to certain geometric systems

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We consider a geometrical system of equations for a three dimensional Riemannian manifold. This system of equations has been constructed as to include several physically interesting systems of equations, such as the stationary Einstein vacuum field equations or harmonic maps coupled to gravity in three dimensions. We give a characterization of its solutions in a neighbourhood of a given point through sequences of symmetric trace free tensors (referred to as `null data'). We show that the null data determine a formal expansion of the solution and we obtain necessary and sufficient growth estimates on the null data for the formal expansion to be absolutely convergent in a neighbourhood of the given point. This provides a complete characterization of all the solutions to the given system of equations around that point.

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