

Revisiting the characteristic initial value problem: The conformal vacuum Einstein field equations

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1 Abstract

Using the Newman-Penrose formalism we study the characteristic initial value problem of the conformal vacuum Einstein field equations [?, ?]. We work in a gauge suggested by Stewart [?], and following the strategy taken in the work of Luk [?], demonstrate local existence of solutions in a neighborhood of the set on which data are given. These data are given on intersecting null hypersurfaces satisfying the constraint equations. Existence near their intersection is achieved by combining the observation that the field equations are symmetric hyperbolic in this gauge with the results of Rendall. The main differences from vacuum Einstein field equations are the estimates of conformal factor and the Ricci tensor. To obtain existence all the way along the null-hypersurfaces themselves, a bootstrap argument involving the Newman-Penrose variables is performed.

References

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