

Initial Data sets for the vacuum Einstein Equation and their KIDs

ANNA SANCASSANI

ABSTRACT

Noether's Theorem [2] shows that conservation laws are in a one-to-one correspondence with the symmetries of the action of the physical system under consideration. This Theorem still holds in General Relativity, and in this setting the symmetries of the spacetime are generated by the so-called Killing Vector Fields of the metric. A result by Choquet-Bruhat and Geroch allows us to study the Einstein Equation as a Cauchy problem, describing the evolution of suitably defined initial data. As it was proved by Moncrief et al. [4], it is possible to determine from the initial data whether or not the spacetime metric will have Killing Vector Fields. This result motivates the definition of Killing initial data (KID) given by Beig and Chruściel [3], of which we present a generalisation to include a possibly non-zero cosmological constant. We then provide, among other results, a complete characterization of the KIDs of totally umbilic initial data sets for the vacuum Einstein Equation with cosmological constant.

References

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