# Asymptotic symmetries of gravity at null infinity

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## Abstract

In the present work, we analyze symmetries of asymptotically flat spaces in four dimensions. More precisely, we focus on the null type of boundary, which is a spacetime region that only massless particle can reach. This kind of spaces were first studied by Bondi, Metzner and Sachs [1], who realized that an asymptotic symmetry group of the theory was larger than the usual Lorentz group, and it is infinito-dimensional BMS group. Currently, the BMS group has become more relevant due to recent developments, e.g., the relation between asymptotically anti-de Sitter and asymptotically flat spaces [2] or, more recently, the triangular relation of the infra-red spectra that connects asymptotic symmetries with the Ward identities of the scattering process, and the memory effect [3].

Inspired by the example of electromagnetism, we adopt a field-theoretic gauge fixing approach to gravity to derive asymptotic symmetries on the null boundary of asymptotically flat spaces [4]. We work in Bondi coordinates in the retarded time frame, using the first order formulation, where the vielbien and the spin connection are treated as independent fields. This viewpoint could help us to have a better understanding of the phenomena, in particular the infinite conserved charges and their relation to the gravitational memory effect.

Gauge fixing in the first order formulation, based on the asymptotic behaviour of the metric, is not unique because of the freedom to gauge fix the Lorentz symmetry. Requiring a fast fall-off of the torsion is suitable in Dirichlet gauge, which reproduces only the finite-dimensional symmetry, but it is not good for working in the more interesting Bondi gauge. We will report on our exploration of this issue, with a goal to obtain an infinite-dimensional asymptotic algebra.

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