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Hidden symmetries from distortions of the conformal structure

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In the study of geodesic motion, it is well known that the mass of the test particle breaks the symmetries generated by proper conformal Killing vectors; the latter generating integrals of motion only for null geodesics. In this work we study the fate of these broken symmetries. We show that, for a generic spacetime, they are substituted by nonlocal symmetry generators, while, under special geometric conditions, they result in hidden symmetries of the geodesic action. A prominent example of this situation is given by considering a general pp-wave spacetime. We then proceed by introducing an additional symmetry breaking effect and study its further consequences on the conformal structure. This is realized by departing from Lorentzian geometry and by adopting a Bogoslovsky-Finsler type of line element.

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