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Killing tensors and photon surfaces in foliated spacetimes

Friday, 9 July 2021 08:10 (20 minutes)

We present a purely geometric method for constructing a rank two Killing tensor in a spacetime with a codimension one foliation that lifts the trivial Killing tensors from slices to the entire manifold [1]. The resulting Killing tensor can be nontrivial. A deep connection is found between the existence of such a Killing tensor and the presence of generalized photon surfaces in spacetime with two Killing vector fields. This technique generates Killing tensors in a purely algebraic way, without solving differential equations. The use of our method is demonstrated for Kerr, Kerr-Newman-NUT-AdS metrics and Kerr-NUT-AdS multicharge gauged supergravity solution.

[1] K. Kobialko, I. Bogush, D. Gal'tsov, arXiv: 2104.02167 [gr-qc].

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