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The equivalence problem for Killing tensors defined on spaces of constant curvature

Beginning with the classic 1950 paper by M. N. Olevksii, the study of canonical characteristic Killing tensors of valence two defined on three-dimensional spaces of constant (non-zero) curvature has been thoroughly investigated in the literature. However, there is yet no general theory concerning the solvability of the corresponding equivalence problem.

Thus, we present a solution to the equivalence problem by applying the invariant theory of Killing tensors developed in recent years. In particular, we use the isometry group representation in the vector spaces of Killing two-tensors and apply the resulting invariants and covariants to characterize the orbits corresponding to the characteristic Killing two-tensors.

To illustrate our results, we apply our theory to Hamiltonian systems whose associated Hamilton–Jacobi equation is solvable by orthogonal separation of variables.