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Scalar configurations in Quadratic Palatini Gravity: The Persistence of Wormholes

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Using the algorithm proposed to map solutions of General Relativity (GR) into Ricci-Based Gravity theories, we extend the search for scalar configurations in quadratic gravity theories with curvature dependence in both Ricci scalar, R, and Ricci-squared scalar, $Q = R_{\mu\nu}R^{\mu\nu}$. We describe the general method to map a scalar configuration of GR into $f(R, Q)$, and illustrate this procedure by applying it to the quadratic model $f(R, Q) = R + aR^2 + bQ$. We find scalar field solutions that, depending on the parameters a and b, can describe quite different compact objects, such as wormholes and compact balls. We compare the solutions found in the $f(R, Q)$ theory context with the GR seed solution and previous scalar configurations found in a quadratic $f(R)$ theory, pointing out some differences between them. We analyze some properties of the solutions found, in particular we study their geodesic structure.

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