Computable geometric measures of Einstein-Podolsky-Rosen steering

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A trace-distance-based measure of quantum steerability is proposed by considering the trace distance between a given assemblage and its corresponding optimally local-hidden-state assemblage. The optimal assemblage is obtained by solving the steerability problem under certain physical restrictions. We prove that the corresponding trace-distance-based measure of steerability is a convex steering monotone in the resource theory. For a qudit-qubit quantum state, the elements of the above optimal (normalized) assemblage can be presented on the Bloch sphere, and naturally form a surface corresponding to many sets of measurement settings. We refer to it as the local-hidden-state surface. Together with the quantum steering ellipsoid, we show that one can geometrically witness the steerability of a given quantum state.