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APPROACHES TO CRITICAL POINT THEORY VIA SEQUENTIAL AND PARAMETRIZED TOPOLOGICAL COMPLEXITY

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Abstract. The Lusternik–Schnirelmann category of a space was introduced to obtain a lower bound of the number of critical points of a C^1-function on a given manifold. Related to Lusternik–Schnirelmann category and motivated by topological robotics, the topological complexity (TC) of a space is a numerical homotopy invariant whose topological properties are an active field of research. The notions of sequential and parametrized topological complexity extend the ideas of topological complexity. While the definition of TC is closely related to Lusternik–Schnirelmann category, the connections of sequential and parametrized TC to critical point theory have not been fully explored yet. In this article we apply methods from Lusternik–Schnirelmann theory to establish several lower bounds of numbers of critical points of functions in terms of sequential and parametrized TCs. We carry out several consequences and applications of these bounds, among them a computation of the parametrized TC of the unit tangent bundles of $(4m-1)$-spheres.

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