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APPLICATIONS OF DEGREE FOR S^1-EQUIVARIANT GRADIENT MAPS TO VARIATIONAL NONLINEAR PROBLEMS WITH S^1-SYMMETRIES

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1. Introduction

There are developed many topological methods which are powerful tools in the theory of critical points of functionals; see for example [2], [3], [5], [6], [9], [13]–[20], [22]–[25], [27]–[29], [32], [33], [43]–[45], [47], [48], [51], [59]. It happens quite often that functionals whose critical points are important in the theory of differential equations are invariant under an action of a compact Lie group G. Symmetric variational nonlinear problems have been considered by many mathematicians; see for instance [7], [8], [10]–[12], [15], [21], [29]–[31], [34], [37], [41], [46], [55]–[57], [62], [63].

In [55] the author has constructed a degree theory for S^1-equivariant, orthogonal maps (the known class of S^1-equivariant gradient maps is included in the class of S^1-equivariant orthogonal maps). Moreover, we have applied this degree to research of bifurcations of solutions of S^1-equivariant nonlinear variational problems. For other definitions of degree theories for equivariant gradient maps we refer the reader to [21] (in case of S^1-symmetries) and to [37] (in case of symmetries of any compact Lie group). Degree theories for (not gradient) equivariant maps have been constructed in [26], [39], [40].

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