



Generalized n -Characteristic, Coincidence and Fixed Point Theorems for a Class of Pairs of Morphisms

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Abstract: This paper is devoted to the construction and study of a topological invariant for a class of pairs of morphisms $(f, g) \in Mor_{Top}(X, Z) \times Mor_{Top}(Y, Z)$, where Top denotes the category of Hausdorff topological spaces and continuous single valued maps and X, Y, Z represent subsets of $\mathbb{R}^{n+1}$ such that X, Y contain the sphere S^n . This invariant termed as a generalized n -characteristic of the pair (f, g) , is derived using homotopy methods serving as a valuable tool in coincidence point theory. The paper establishes several properties of this invariant, extends it to a class of admissible multivalued mappings, and presents a fixed point theorem among its results.

Keywords: *homotopy; topological invariant; n -connected spaces; multivalued mappings.*

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1 Introduction

The concept of topological invariants, degrees, characteristics, or generalized characteristics, has been extensively explored by numerous authors for various classes of single-valued and multivalued mappings (see, for example, [7, 10, 13]). By exploration of various topological techniques, this concept serves as a powerful tool in analyzing and proving results in fixed point theory. This provides practical applications across diverse fields such as nonlinear analysis [6], economics [3], biology [5] and physics [9]. In some cases, they are very useful to prove the existence of solutions for linear or semi-linear dynamical systems [8].

Moreover, topological invariants are highly instrumental for the study of bifurcations and nonlinear dynamical systems (see [9]). In the case when nonlinearities are not smooth enough, they help to identify fixed points and their stability, which are critical

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