
MODULAR HAUSDORFF INTERPOLATIVE METRIC REGULARITY AND COINCIDENCE PROBLEMS WITH APPLICATIONS

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ABSTRACT

In this work, we introduce and explore the innovative geometric framework of "Modular Hausdorff Interpolative Metric Spaces", which effectively unifies the scale-dependent structural flexibility of modular metric spaces with the non-linear, multiplicative error-bounds inherent in interpolative metric geometries. Within this newly established topological setting, we formulate the novel concept of "Modular Hausdorff Interpolative Metric Regularity" for multivalued operators. By analyzing the behavior of the modular open covering rate under interpolative constraints, we establish several robust coincidence point theorems and existence criteria for generalized set-valued inclusions. Furthermore, leveraging the parametric control provided by the modular scale parameter λ , we investigate the sensitivity and robustness of the solution sets, yielding comprehensive Ulam-Hyers stability results that extend classical linear variants. The theoretical framework developed herein provides powerful new variational tools capable of characterizing equilibrium dynamics and stability profiles in systems where classical metric regularities fail due to singularity or unboundedness. To demonstrate the analytical potency of our abstract formulations, we present an application to the existence and stability of solutions for a class of nonlinear implicit integral inclusions.

Keywords multivalued operators · modular metric spaces · nonlinear contraction · interpolative metric spaces · metric regularity

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