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Second-Order Intuitionistic Fuzzy Boundary Value Problems

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Abstract

This paper studies a class of second-order differential equations with integral boundary conditions. Sufficient and easily verifiable conditions ensuring the existence and uniqueness of solutions are established using fixed point theory in Banach spaces [1]. The existence of solutions is proved via compactness arguments based on the Schauder and Leray–Schauder fixed point theorems [2,3], while uniqueness is obtained by Banach's contraction principle under a suitable Lipschitz condition [4]. An illustrative example is presented, including the construction of the Green's function and numerical validation of the assumptions. These results provide a rigorous framework for the analysis of boundary value problems with nonlocal conditions arising in applied mathematics and engineering [5].

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