Volterra Integral Equation Framework for Optimal Drug Administration in Tumor Growth Control

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Abstract

This paper presents a mathematical framework for modeling tumor growth under treatment using Volterra integral equations. The system incorporates memory effects inherent in biological processes. An optimal control problem is formulated to determine the best drug administration strategy that minimizes tumor size while reducing drug toxicity. Numerical methods, including discretization and optimization techniques such as gradient-based and interior-point methods, are discussed. Simulation results demonstrate the effectiveness of the proposed approach

Keywords: Volterra integral equations, optimal control, tumor growth modeling, numerical simulation, medical treatment optimization.

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