Controllability of Semilinear Neutral Differential Equations with Impulses and Nonlocal Conditions

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Abstract

When a real-life problem is mathematically modeled by differential equations or another type of equation, there are always intrinsic phenomena that are not taken into account and can affect the behavior of such a model. For example, external forces can abruptly change the model; impulses and delay can cause a breakdown of it. Considering these intrinsic phenomena in the mathematical model makes the difference between a simple differential equation and a differential equation with impulses, delay, and nonlocal conditions. So, in this work, we consider a semilinear nonautonomous neutral differential equation under the influence of impulses, delay, and nonlocal conditions. In this paper we study the controllability of these semilinear neutral differential equations with some of these intrinsic phenomena taking into consideration. Our aim is to prove that the controllability of the associated ordinary linear differential equation is preserved under certain conditions imposed on these new disturbances. In order to achieve our objective, we apply Rothe's fixed point Theorem to prove the exact controllability of the system. Finally, our method can be extended to the evolution equation in Hilbert spaces with applications to control systems governed by PDE's equations.

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