Solving An Identification Problem as an Impulsive Optimal Parameter Selection Problem [1]

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Abstract: In this paper, we consider an interesting identification problem, where an unknown phenomenon is to be identified by the trajectory of an impulsive differential equations. The system coefficients, the locations of the switching time points, and the heights of the jumps at these time points are to be determined such that the summation of the least square errors of the trajectory of the impulsive system and the phenomenon over the observed time points is minimized. This becomes an interesting dynamical optimization problem. We develop an efficient computational method for solving this dynamical optimization problem. Our approach is first to use the control parameterization enhancing transform to convert this dynamical optimization problem into an equivalent optimal parameter selection problem, where the varying time points are being mapped into fixed time points. Then, the gradient formula of the cost function is derived. Thus, this optimal parameter selection problem can be solved as a mathematical programming problem. For illustration, some numerical examples are solved by using the proposed method.

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