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# Advances in Time-Delay Systems

**Series: Lecture Notes in Computational Science and Engineering**

In the mathematical description of a physical or biological process, it is a common practice to assume that the future behavior of the process considered depends only on the present state, and therefore can be described by a finite set of ordinary differential equations. This is satisfactory for a large class of practical systems. However, the existence of time-delay elements, such as material or information transport, often renders such description unsatisfactory in accounting for important behaviors of many practical systems. Indeed, due largely to the current lack of effective methodology for analysis and control design for such systems, the time-delay elements are often either neglected or poorly approximated, which frequently results in analysis and simulation of insufficient accuracy, which in turn leads to poor performance of the systems designed. Indeed, it has been demonstrated in the area of automatic control that a relatively small delay may lead to instability or significantly deteriorated performances for the corresponding closed-loop systems.

Softcover reprint of the original 1st ed. 2004, XIV, 452 p.

## Printed book

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159,99 € | £139.99 | \$199.99

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