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Sliding modes in control and optimization. Transl. from the Russian. (English) Zbl 0748.93044
Communications and Control Engineering Series. Berlin etc.: Springer- Verlag. xvi, 286 p. with 24 fig. (1992).

The book addresses the behavior of discontinuous dynamic systems described by the equation $\dot{x} = f(x,t)$, where x is a state vector in $\Re^n$, t is time, and $f(x,t)$ has discontinuities at a certain set within the $(n+1)$-dimensional space (x,t). The motion of such systems on discontinuity surfaces, called sliding mode, has properties useful for system linearization, reduction of the system differential equation order, and designing high-accuracy follow-up and stabilization systems. The book considers, from a control-theoretic viewpoint, the mathematical and application aspects of the theory of discontinuous dynamic systems and determine their place within the scope of the present-day control theory. The book follows a regularization approach to the sliding modes analysis through the introduction of a boundary layer. The book consists of 3 parts. Part 1 of 5 chapters is on mathematical tools and covers a wide range of topics on the theory of sliding modes. The topics include the regularization and the uniqueness problems, stability and robustness of discontinuous systems. Part 2 of 10 chapters, the major focus in the book, addresses control systems design methods. The topics covered in that part include decoupling in systems with discontinuous control, control of distributed-parameter plants, eigenvalue allocation, system optimization, and observation and filtering. Part 2 not only presents important results on design of discontinuous control systems, but also relates these results to the present-day control theory. Part 3 of 3 chapters is devoted to applications and provides numerous practical examples, such as the control of a robot arm and the control of electric motors. The book is theoretical and formal, and can be invaluable to researchers in control theory, physics and applied mathematics.

Reviewer: Y.M.El-Fattah (Irvine)

MSC:

93C10	Nonlinear systems in control theory
93C15	Control/observation systems governed by ordinary differential equations
93C41	Control/observation systems with incomplete information
93D09	Robust stability

Cited in **622** Documents

Keywords:

discontinuous systems; regularization; optimization; sliding mode; system linearization

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