

# This Week's Citation Classic®

Eykhoff P. *System identification: parameter and state estimation*. Chichester, England: Wiley, 1974. 555 p. [University of Technology, Eindhoven, The Netherlands]

This book is concerned with the science of devising optimal types of signal processing, with the purpose of deriving information on the dynamics of the system/process under study. The need for this arises in different fields of engineering, in biology, in economics, and in ecology. The purpose for which this sort of information is needed ranges from scientific research to applications in automatic control and the support of medical diagnoses. [The SC<sup>®</sup> indicates that this book has been cited in more than 470 publications.]

## System Identification: Uncertainty as an Assignment

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Once upon a time there was a friendly publisher who asked me to write a manuscript on adaptive control systems. It was around 1960, and I was working at the Department of Electrical Engineering, University of California, Berkeley, under the Visiting Research Scientists Program of the National Academy of Sciences of the US. After seriously contemplating that invitation, I became convinced that this field was still too patchy. Restriction of the subject would still be needed.

Back at Delft University, and after my 1964 transfer to Eindhoven, our group concentrated on system identification as defined in the abstract above. Due to the omnipresent disturbances in practice, this work entailed "uncertainty as an assignment." On the one hand there were real, fundamental questions to be answered, like "What is the maximum amount of information on the process dynamics that can be derived under specific situations and limited observation time?" On the other hand, applications in measurement, industrial control, and biomedical techniques offered a spectrum of challenges.

A truly fascinating time followed, enriched by much international interaction, including a series of specialized triennial International Federation of Automatic Control symposia which have been held since 1967. I have had lively discussions with colleagues all over the world. These were fine, friendly, and stimulating contacts, in spite of iron curtains and other divisions. There were also ample opportunities to try out ideas at conferences, tutorials, invited lectures, and at home. A publication that in a sense was a precursor to this book also became a *Citation Classic*.<sup>1</sup>

The writing of the book took a lot of time, energy, and...courage. That feeling is hidden behind the motto I chose: "...he that publishes a book runs a very great hazard, since nothing can be more impossible than to compose one that may secure the approbation of every reader."<sup>2</sup> Many decisions had to be made: the amount and the depth of the mathematics used; how much on computation? how many experimental results as illustrations? etc.

Well, after publication the reactions were positive indeed. There also appeared editions of the book in other languages: Russian (1975), Romanian (1977), Chinese (1980), and Polish (1980).

It is a pleasure and an honour to see the work designated as a *Citation Classic*; this testifies that the book has played a noticeable role in the development of this new discipline. Now, after 20 years, the work is dated. There has been intensive research and development carried out all over the world. The Eindhoven group continued to contribute to this field: theory, new techniques, tools (computer programs), and knowledge of and experience with applications, including various real industrial uses.<sup>3,4,7</sup>

One of the rewarding things in life is to put ideas to work; in this respect the book was an effective vehicle. And, even more rewarding, it gave me friendships with numerous colleagues all over the world—very precious indeed!

1. Åström K J & Eykhoff P. System identification—a survey. *Aukmatica* 7:123-62, 1971. (Cited 405 times.)  
[See also: Åström K J. Citation Classic®. (Thackray A, corap. *Contemporary classics in engineering and applied science*. Philadelphia: ISI Press, 1986. p. 38.)]
2. de Cervantes Saavedra M. *The history of Don Quixote*. Vol. 2. London: Cassell, Petter and Galpin, 1867. p. 338.
3. Eykhoff P, ed. *Trends and progress in system identification*. Oxford, England: Pergamon, 1981. 402 p.
4. van den Boom A J W & Eykhoff P. Generalized diagram for various parameter estimation methods: the coherence in pseudolinear regression schemes. (Gertler J & Keviszky L, etc., *A bridge between control science and technology*. Oxford, England: Pergamon, 1985. p. 615-20.)
5. Backx A C P M & Damen A A H. Identification of industrial MIMO processes for fixed controllers. Part 1: general theory and practice. *Journal A—Benelux Quart. J. Automatic Contr.* 30:3-2, 1989.
6. ----- . Identification of industrial MIMO processes for fixed controllers. Part 2: case studies. *Journal A—Benelux Quart. J. Automatic Contr.* 30:33-43, 1989.
7. Zhu Y-C & Backx A C P M. *Identification of multivariable industrial processes for simulation, diagnosis and control*. Berlin, Germany: Springer, 1993. 187 p.  
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