A review of the book "Systèmes linéaires" by Henri Bourlès, Hermès-Lavoisier, Paris, 2006.

This is a carefully written textbook on linear systems control. It grew out from several lectures given by the author at various engineering schools in Paris. A good mathematical background in functional analysis and especially algebra is assumed. The book is primarily aimed at Master's students, but it also contains some more advanced optional material of interest to postgraduate students and researchers. The covered material is nicely balanced between practical concerns of engineering relevance, with a focus on frequency domain specifications, and more advanced theoretical concepts on structural aspects of linear control systems. Many small numerical examples are inserted into the text to ease the reading and illustrate the main ideas. I believe that students may greatly benefit from going through these examples. At the end of each chapter, the material is complemented by a collection of exercises with full corrections.

An original feature of the book is the systematic use of algebraic concepts, following the tradition of H. H. Rosenbrock (use of polynomial matrices as modeling objects), J. C. Willems (behavioral approach) and M. Fliess (module theory). Most advanced notions on polynomial matrices and modules are however relegated to a 65-page-long appendix, so that the book contents can be appreciated at different levels of reading. The author's preference for algebraic properties of linear systems is evidenced by an advanced chapter 8 entitled "Théorie des systèmes (II)" complementing the 40-page chapter 3 "Théorie des systèmes (I)" on basic structural features.

In this reviewer's opinion, the use of modules and algebraic geometry (see e.g. [D. A. Cox, J. Little, D. O'Shea. Using algebraic geometry. Second Edition. Springer, 2005] for a detailed, yet accessible introduction to modules), together with the ongoing development of numerical polynomial algebra (in the spirit of [H. J. Stetter. Numerical polynomial algebra. SIAM, 2004]), may pave the way for the development of advanced computer-aided control system design techniques for engineers, complementing the existing software arsenal based on the state-space setting and numerical linear algebra. In particular, the module-theoretic approach followed in the book nicely extends to linear time-varying and nonlinear control systems.

In summary, this book is a welcome addition to the rich collection of English-written textbooks dealing with linear systems control. It fills in a gap in the French-written technical literature, and can be considered as a reference for French-speaking students studying systems control engineering.

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