Book Review

Liao, Xiao-Xin *Absolute Stability of Nonlinear Control Systems*, Kluwer Academic Publishers, 1993, 178 pp. (Price: US $82.00)

The book deals with the absolute stability of linear dynamical systems with a certain type of nonlinear control terms initiated half a century ago by A. I. Lurie of the former Soviet Union.

The systems under consideration are classified into three types: *the direct control system* or the *basic case (principal case)*, the *indirect control system* or the *first critical control system*, and the *other critical system*. For the basic case, all the real parts of the characteristic roots of the uncontrolled linear dynamical system are negative, while all are negative, except one zero root, for the indirect control systems. All the other cases are included in the third type. Most of the results in this book are for the first type, some for the second type and occasional for the last type.

The focus of the book is on the necessary and sufficient conditions that guarantee the absolute stability of the controlled system and the practical way to use them by engineers. For many sufficient conditions found in the literature, including the V-function of Lurie-type or of Popov-type, there were undetermined matrices or parameters which are difficult to obtain. The author emphasizes on obtaining simple enough and even constructive algebraic sufficient conditions deduced from the necessary and sufficient conditions. The key is to promote the extensive use of modern methods and tools such as M-matrices, K-class functions, Dini-direvatives, partial stability, and set stability.

The book also includes the excellent results of Zhao Suxia and that of other Chinese scholars in the field, including Zhu Siming and Zhang Binggen.

The various chapter headings are as follows: Preface; 1. Principal Theorems on Global Stability; 2. Autonomous Control Systems; 3. Special Control Systems; 4. Nonautonomous and Discrete Systems; 5. Control Systems with m Nonlinear Control Terms; 6. Control Systems Described by FDE.

The Institute of Applied Mathematics, Beijing, China YUANXUN QIN
University of Florida, Gainesville, Florida, U.S.A. SHERMAN X. BAI