Book Reviews

Haimes, Y.Y. (ed.): Large Scale Systems. North-Holland Publishing Company, Amsterdam 1982, 183 pages, US $ 46.50 / Dfl. 100.–.

Like almost all conference proceedings this volume of seven contributions is of a most diverse nature, ranging from a specific mathematical analysis (e.g. Lasdon) to a broad methodological survey (e.g. Sage).

The unifying topic is to be the analysis of "large scale systems". However, as pointed out by Fink (Large scale in electric energy systems, 143–159), there seems to be some mystifying aura around the issue of large scale systems. There is a great variety of criteria,

e.g. Fink (143): larger in size, greater in number of components, more complex, having multiple independent decision centers, multifarious in nature, etc.

e.g. Haimes (2): a large number of variables, a large number of components, often a nonlinear functional input-output relationship, risk and uncertainty, a hierarchical organizational structure, multiple, noncommensurable, conflicting objectives, multiple decision makers, dynamic changes of the system, etc.

and without a specific background, like e.g. electric energy systems, steel mill operations, econometric models, one is in a frustrating, possibly chaotic "Methodenstreit" (well known to any economist).

Considering the book under this aspect, the central, best and shortest paper is the one of Fink, according to this reviewer. Fink points out the elusiveness of large scale per se, and then discusses three large scale phenomena in a specific environment, i.e. electric energy systems, problems of emergence, of coalescence, of transcendence. The first one being the observation, that formal model building (in electric energy systems) is at least an art, which expands rapidly using new and refined methods. His second observation, the problem of coalescence, means, that problems previously considered to be distinct are to be considered jointly. The problem of transcendence, his third observation, means, that previous solution concepts may fail, when considering (electric energy) systems under the above phenomena of emergence and coalescence. Hence a proper definition of large scale (in electric energy) systems is, that large systems are those, which, for any reason must be partitioned and considered in detail.

Using these ideas of Fink, the book contains two groups within the six additional chapters. Dantzig, Lasdon, and the others. Dantzig (Time staged methods in linear programming: comments, early history, future prospects) gives a survey of his by now wellknown decomposition ideas applied to the staircase structured LP, and Lasond (Large scale nonlinear programs) reports on the successful computational performance with respect to large nonlinear programming packages, as applied to econometric models and electric power systems. The four remaining chapters are less specific and more of a methodological survey nature. Haimes (Modeling of large scale systems in a hierarchical-multiobjective framework) reports on a bewildering array of classification criteria and problem classifications, for which the uninitiated reader will have difficulty to judge its usefulness. Similar in spirit is the chapter of Lefkowitz (Hierarchical control in large scale industrial systems) which additionally stresses the idea of hierarchical design, computation, and control, using several tree diagrams. Obviously these ideas have been successfully implemented in electric power systems and in steel works. Of an even broader methodological flavor is the chapter of Sage (Methodological considerations in the design of large scale systems engineering processes) ranging from time series analysis, simulation, input output analysis, econometric models to microeconomic theory. Finally, there is the chapter of Chestnut (Nations as large scale systems), considering the politics of nations of the world. Obviously the political problems do deserve some more analytical skill. The main item used here are tree diagrams.

The book definitely presents the views of leading authorities on large scale systems ranging from the methodology-only-approach to the very specific analysis of a particular problem. Even if one shares this reviewer's reservations on the methodological aspects, the book appears to be good buy.

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