
REVIEWED BY D. C. KARNOPP

Anyone interested in the computer simulation of socio-economic systems should read Urban Dynamics. Those who have not previously studied Forrester's Industrial Dynamics may feel the need of some background reading, but speed is of the essence if one is not to feel totally outclassed when Forrester's newest work, World Dynamics, Cambridge, Wright-Allen Press, appears. (The thought occurs to begin feverishly scribbling on Universe Dynamics in order to get the jump on the master, but chances are that Professor Forrester or one of his associates has already thought of this possibility.)

What is done in Urban Dynamics is precisely what engineers and physical scientists do when they mathematically model a physical system using ordinary differential equations and then simulate the dynamic response of the system using a digital computer to integrate the equations. The essential difference between the modeling and simulation process in Urban Dynamics and the counterpart in engineering is that Forrester cannot rely on as large a collection of theories, principles, and experience as engineers and scientists can. In fact, for an engineer, Forrester's books are readily understandable even though one might wish him to use differential equations explicitly and a more standard type of block or signal flow diagram. Engineers may even fail to see why Urban Dynamics should have any great impact except as a report on a particular study of the dynamics of growth and decay in a city.

The importance of the book, and indeed all of Forrester's work, lies in his methods which differ sharply from those usually employed in management, politics, and the social sciences. Forrester attempts to set up a state determined system as his mathematical model while many workers in the social sciences use the words "mathematical model" to describe a rather rudimentary sort of trend analysis derived statistically from noisy data. Neither type of model may yield very good fits with past data nor may they predict very well into the future, but there is a major difference between them. When enough experience has been gathered using Forrester's type of model to set up simulations in new situations with some confidence, then we may begin to truly understand the dynamics of social systems. Since Forrester's state determined system models identify the structure of the interactions which comprise social systems, they are potentially much more useful models than those based on trends observed in the real world. Only with Forrester's type of model could one even attempt to assess the effect of changing the system by means of new laws or regulations, for example. Forrester's models allow one to explore the behavior of many hypothetical system configurations and many hypothetical initial conditions. Statistical time series derived models really deal only with the single trajectory that the world has actually taken; they have little or no capability to predict what will happen if we tamper with the system.

Our policy makers are paid to tamper with our institutions, yet their ability to predict the outcomes of their actions is all too clearly limited.

The modeling of many social systems is obviously more difficult than the modeling of many engineering systems. Yet Forrester's work shows that there is hope for a rational approach. Since we no longer need to fear nonlinear high order systems to the extent that was prudent before the advent of computers, it seems high time to follow Forrester's lead into the quagmire of social system dynamics.

ELECTRONIC COMPONENTS AND MEASUREMENTS, by B. D. Wedlock and J. K. Roberge.

REVIEWED BY P. W. RODGERS

In this carefully written text, the authors have made a very successful effort to introduce the reader to electronic measurement techniques at a very basic and fundamental level. Their approach is to explain each electrical device or component in very simple and how-it-works terms. Following this, a carefully thought out laboratory exercise is presented. These have been chosen so that they are quite stimulating and give a clear insight into the operation of the particular component or device. Special attention is given to frequently neglected points. For example, there is a section treating proper grounding techniques which includes an experiment which demonstrates the undesirable effects of a ground loop.

The material covered by the text is seen from the table of contents: Safety in the laboratory; basic laboratory practices; elements of data presentation and analysis; elementary oscilloscopes; basic d-c and a-c meters; graphical display of two and three-terminal characteristics; resistors; capacitors; inductors and transformers; d-c power sources; advanced oscilloscopes; storage and sampling oscilloscopes; advanced voltage and current measurements; signal and pulse generators; time, frequency, and waveform analysis; operational amplifiers; digital integrated circuits, RF impedance measurements; coaxial cables; thermal measurements and heat sinks; basic characteristics of semiconductor devices.

Although this text was written for undergraduate E.E.'s, in the opinion of this reviewer, this excellent book would serve equally well for M.E. undergraduates taking automatic control or measurement laboratory courses, or for advanced students in automatic control having to use electronic equipment for the first time.

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