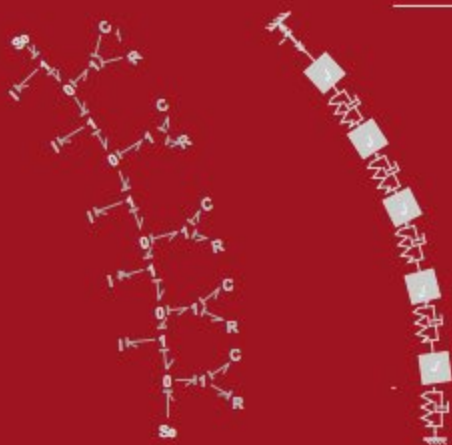


Dynamical Systems for Creative Technology

Job van Amerongen



Dynamical Systems for Creative Technology has primarily been developed with the Creative Technology students at the University of Twente in mind. The book gives a concise description of the physical properties of electrical, mechanical and hydraulic systems. Emphasis is placed on modelling the dynamical properties of these systems. By using a system's approach it is shown that a limited number of mathematical formulas suffices to describe the basic properties of all of these systems. Mathematical functions such as integration and differentiation are introduced and directly related to physical phenomena. A more abstract description helps to systematically analyse these systems and supports the modelling process.

The book helps to understand the behaviour of technical and non-technical systems in general. Emphasis is on making realistic models of physical systems, which can be applied in animations or games. In terms of a dynamical model there is little difference between the suspension system of a car and the motions of a flower in the wind. It is shown that all these systems share the same basic properties, which allows the use of analogon models. A more abstract domain-independent description helps to better understand the dynamic behaviour and allows for modifications of the system in the domain that is most easily accessible.

The last chapters give an introduction to the role of feedback in dynamical systems. Examples are shown by applying these concepts to electronic simulation models with operational amplifiers. Feedback control systems are briefly introduced as a means to change the dynamical properties of a system by means of appropriate software.

Extensive use is made of the modelling and simulation programme 20-sim. Exercises stimulate exploration of the programme and experimenting with the models. The exercises are intended to raise questions rather than being classroom problems with a straightforward solution. The book is also a good background for 20-sim users who want to understand more of the underlying principles of 20-sim.

Job van Amerongen is professor in Control Engineering at the University of Twente. He has been teaching various courses on control engineering. He is author of three courses on modelling and simulation and control engineering of the Open university in the Netherlands. He has been active in research on adaptive control systems applied to adaptive autopilots and rudder-roll stabilisation for ships. He is one of the pioneers of mechatronics. The mechatronic design philosophy, i.e. 'the optimal and integrated design of a physical system together with its embedded control system' forms the basis for this book as well.

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