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Kautz, Richard

Chaos. The science of predictable random motion.

Oxford: Oxford University Press (ISBN 978-0-19-959458-0/pbk; 978-0-19-959457-3/hbk). xiii, 369 p. (2011).

Recently, quite a few nice books introducing the reader to the fascinating world of dynamical systems and chaos have been published. The author's ambitious and nontrivial goal in this new text was to explore the main ideas of chaotic behavior using elementary trigonometry, algebra, vectors and avoiding at the same time calculus. In an attempt to make the book accessible for a wide audience, Dr. Kautz reduced the amount of mathematics involved in the explanations yet pointing out that "although a little math makes the book more challenging, it also affords deeper insights into the nature and origins of chaotic behavior." The book is divided into six parts, the first and the last being, respectively, Introduction, treating the reader with appetizers like butterfly effect or weather prediction, and Conclusion, where several possible applications regarding the use and control of chaos are discussed. The second part, titled Dynamics, describes a variety of deterministic motions starting with the pioneering contributions of Galileo Galilei and Isaac Newton. Other topics include celestial mechanics, linear and nonlinear pendulum motion, and synchronization. The third part relates chaos to random motions and noise. It deals, among other topics, with random rotations, chaotic walks, frequency analysis, and white noise. One of the most typical features of chaos, sensitivity to the data, is addressed in Part IV, where the topics include the celebrated Lorenz system, a popular chaotic amusement park ride Tilt-A-Whirl, billiard-ball chaos, kinetic theory of gases, iterated maps, to mention a few. Finally, more advanced but exciting topological aspects of chaos are explored in Part V, where the reader learns about attractors, stretching and folding, fractal geometry, horseshoe map, homoclinic and heteroclinic tangles, stability of the Solar System, and not only. The material for the book is thoroughly selected and well organized. The exposition is concise and clear, it is enhanced by numerous illustrations and nice computer animations of chaotic motion on a CD that accompanies the book. Biographical sketches of many scientists that contributed to the theory of dynamical systems and chaos are inserted in the text. In addition to the sources of information about chaos (books, articles and videos) listed in the end of the book, every chapter concludes with very useful suggestions for further reading which are conveniently grouped in accordance with the subject. The index is very detailed and helpful. Dr. Kautz wrote a scholarly yet entertaining text supported with a wide range of resources for further discoveries. It is an excellent starting point for the exploration of the amazing world of nonlinear dynamics and chaos.

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Classification: A80 I90 M50
Keywords: chaos; nonlinear dynamics; random motions; noise; attractors; entropy; strange attractors; fractals