Lectures on finite precision computations

Chaitin-Chatelin, Francoise, author

Abstrak

Devoted to the assessment of the quality of numerical results produced by computers, this book addresses the question: How does finite precision affect the convergence of numerical methods on the computer when convergence has been proven in exact arithmetic?
Finite precision computations are at the heart of the daily activities of many engineers and researchers in all branches of applied mathematics. Written in an informal style, the book combines techniques from engineering and mathematics to describe the rigorous and novel theory of computability in finite precision. In the challenging cases of nonlinear problems, theoretical analysis is supplemented by software tools to explore the stability on the computer.
Roundoff errors are often considered negatively, as a severe limitation on the purity of exact computations. The authors show how the necessarily finite precision of the computer arithmetic can be turned into an asset to describe physical phenomena.