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Interval Methods for Systems of Equations

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Publication info: Cambridge University Press, 1979. Pp. x + 190. ISBN 0-521-22161-6.

Am. Math. Monthly 81 (1974), 6: 608-612.
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Interval Methods for Systems of Equations is a book on interval analysis. Interval analysis is a method of computing with intervals of numbers rather than with single numbers. Its purpose is to provide a way to keep track of the accuracy of computations. Suppose that you are given a number x and you know that x is accurate to within ± 0.01. Suppose that you are given a number y and you know that y is accurate to within ± 0.01. Then you know that $x + y$ is accurate to within ± 0.02. But what if you are given x and y and you know that x is accurate to within ± 0.01 and y is accurate to within ± 0.02? Then you know that $x + y$ is accurate to within ± 0.03. And what if you are given x and y and you know that x is accurate to within ± 0.01 and y is accurate to within ± 0.03? Then you know that $x + y$ is accurate to within ± 0.04. And so on.

Interval analysis is a way to keep track of this kind of information automatically. It is a way to do arithmetic on intervals of numbers rather than on single numbers. The result of an interval computation is an interval that is guaranteed to contain the true result. The width of the interval tells you how accurate the result is.

The book is divided into three parts:

1. Interval arithmetic. This part develops the basic theory of interval arithmetic. It includes the definitions of the interval operations, the proofs of their properties, and the algorithms for implementing them.
2. Solving systems of equations. This part applies interval arithmetic to the problem of solving systems of linear and nonlinear equations. It includes methods for finding all solutions of a system, for finding a solution that is guaranteed to be unique, and for finding a solution that is guaranteed to be the best possible.
3. Applications. This part applies interval arithmetic to a variety of problems in numerical analysis, including the evaluation of functions, the integration of differential equations, and the optimization of functions.

The book is written in a clear and readable style. It is well organized and well indexed. It is a good introduction to interval analysis for anyone who has a background in calculus and linear algebra.

The book has a few minor flaws. The notation is sometimes inconsistent. For example, the author uses both "interval" and "quo mood" ("QOC" - does [,], up does "quood" ["QES" - does [,].

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