On feasibility and robustness of flexible systems of linear equations

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Abstract

A *flexible system* A|B is a system of linear equations in which each coefficient and each element of the right-hand side have an individual imprecision in terms of a scalar neutrix, which is a convex group of nonstandard real numbers. They can be solved by method consisting of (i) a LU-decomposition, (ii) assignment of parameters to the imprecisions, (iii) Gaussian elimination and (iv) substitution of the parameters into the solution by their range. We give conditions for the system to be feasible, i.e.the essential part of the upper triangular matrix LU-decomposition is obtained from A, while the constraints resulting from the imprecisions do only interfere with the range of the solutions. In the case of non-singular systems, we determine the maximal robustness matrix, i.e. the matrix E consisting of the maximal imprecisions such that A|B and (A+E)|B have the same solutions.