Computational complexity and interval Linear Algebra

Jaroslav Horáček

Charles University, Faculty of Mathematics and Physics, Department of Applied Mathematics, Prague, Czech Republic

Abstract

More and more scientists are interested in the field called interval analysis. The key idea of this field is replacing numbers with intervals. We might want to do so because of many reasons (verification, taking into account rounding errors). The interesting question is "What happens with linear algebra, if we replace numbers with closed real intervals?" We have to slightly redefine the classical tasks such as checking regularity of a matrix, finding inverse matrix, solving a system of linear equations, deciding whether the same system is solvable, determining spectral radius of a matrix etc.

How does incorporating intervals in our problems change computational complexity? The problems should be of at least the same difficulty as in classical linear algebra, since real numbers are actually intervals with the same lower and upper bound. Unfortunately, solving interval problems often becomes NP-hard. The more it is important to look for special instances of problems, that are easily solvable.

In this talk we explore the classical linear algebraic tasks mentioned earlier and their computational complexity from the perspective of interval linear algebra.

Keywords

Interval analysis, Interval linear algebra, Computational complexity.

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