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Title:

PDE analysis and polynomial optimization

Abstract:

The analysis of PDE systems in many cases leads to a set of integral inequalities. We present a method to reformulate the problem of checking the non-positivity of these integral inequalities into checking the non-positivity of matrix inequalities over some domain. In the case of polynomial data, we solve the associated matrix inequalities by polynomial optimization using the sum-of-squares (SOS) programming techniques. This allows us to cast a class of PDE analysis problems into SOS programs that can be solved by available computational tools. We then show how this methodology can be used to address problems in stability analysis, input-output analysis, fluid flow analysis and safety verification.