
Krylov methods in finite precision, should we go beyond double precision : A Case Study

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Abstract

Krylov methods are ubiquitous when solving large scale problems arising from physics and chemistry. However, round-off errors can slowdown or even prevent their convergence. An obvious solution to this problem is to increase the numerical precision of the computations. However this solution has been largely ignored and current hardware designs tend to lower the numerical precision rather than increasing it. The goal of our work is two fold. First, we aim to demonstrate the relevance of extended numerical precision on various problems from the Suite Sparse matrix collection, as well as on a case study relevant to medical imaging. Second we aim at presenting a hardware and software solution for variable extended precision floating point computations.

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