Tracking the trajectory in finite precision CG computations

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CG in finite precision computations

$$Ax = b, \quad A \in \mathbb{F}^{N\times N} \text{ HPD}, \quad b \in \mathbb{F}^N, \quad \mathbb{F} \text{ is } \mathbb{R} \text{ or } \mathbb{C}$$

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Short recurrences

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Short recurrences $\Longrightarrow$ loss of orthogonality

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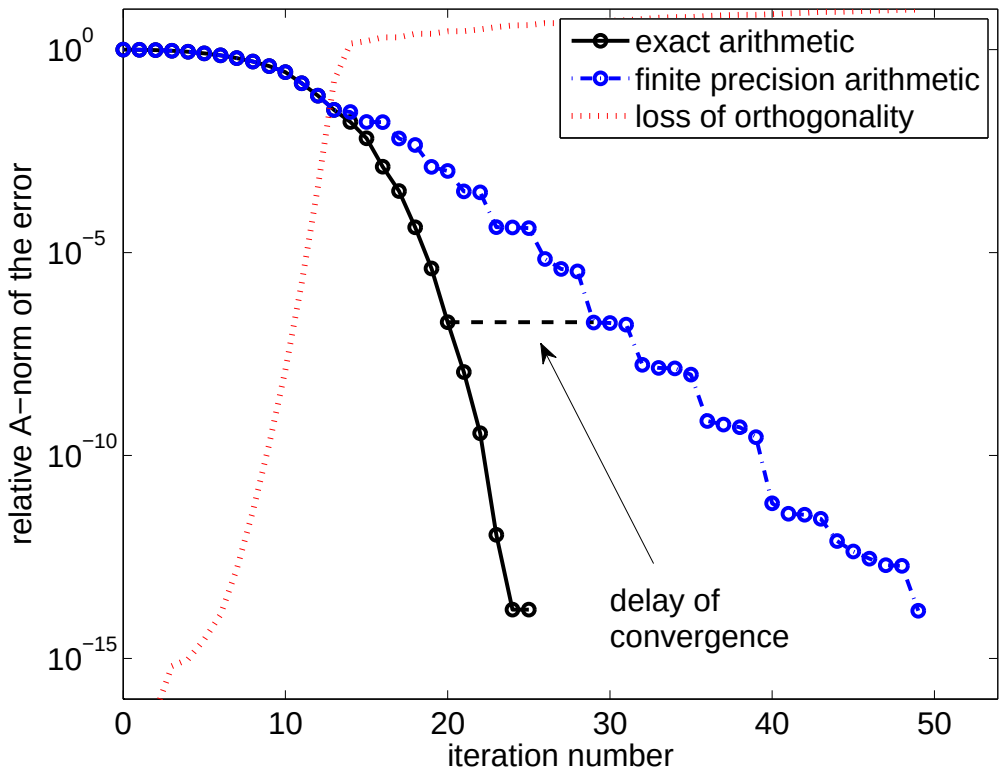
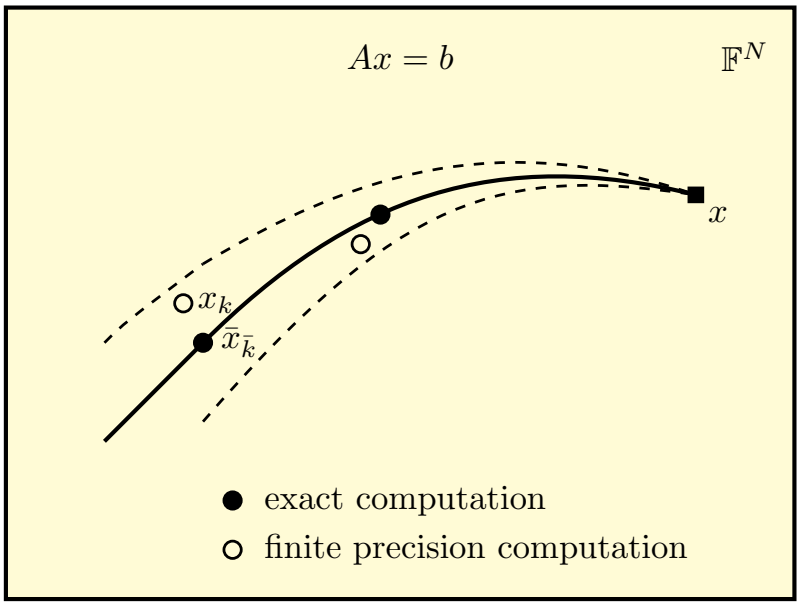
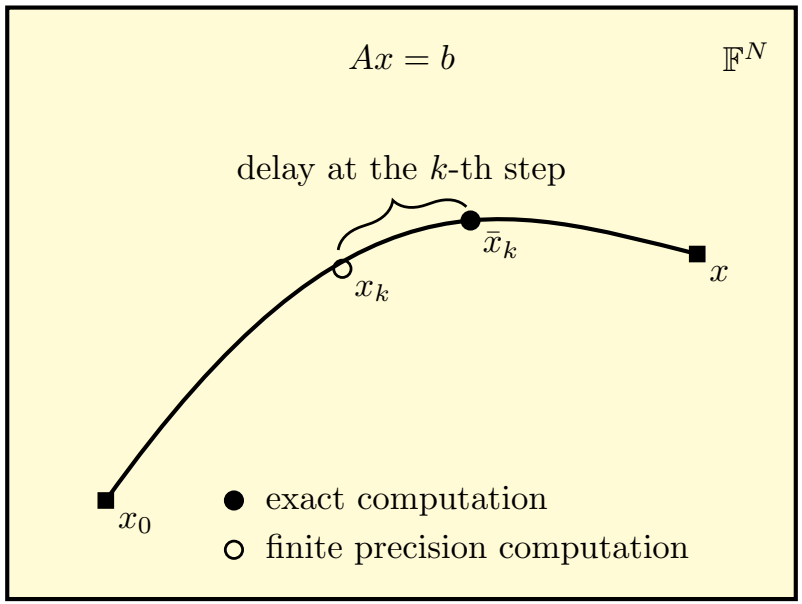
Short recurrences $\Longrightarrow$ loss of orthogonality $\Longrightarrow$ delay of convergence



Comparison of trajectory of approximation vectors





Trajectory of approximations x_k generated by FP CG computations follows closely the trajectory of the exact CG approximations $\bar{x}_{\bar{k}}$.

Concluding remarks & work in progress

☞ Observed "stability" (or inertia) of computed Krylov subspaces represents remarkable phenomenon.

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Thank you for your kind attention

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