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MultiPrecisionArrays.jl: A Julia package for iterative refinement

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Software

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Summary

What is iterative refinement?

Statement of need

Who cares?

Mathematics

$Ax = b$

IR(A, b)

- $x = 0$
- $r = b$
- Factor $A = LU$ in a lower precision
- While $\|r\|$ is too large
  - $d = (LU)^{-1} r$
  - $x = x + d$
  - $r = b - Ax$
- end

Test citations

Kelley (2022b) is a book. Kelley (2022a) is a paper.

Kelley (2023b) is the newest paper

The package lives here Kelley (2023a)

References

Kelley, C. T. (2022a). Newton's method in mixed precision. *SIAM Review*, *64*, 191–211. https://doi.org/10.1137/20M1342902

Kelley, C. T. (2022b). *Solving Nonlinear Equations with Iterative Methods: Solvers and Examples in Julia*. SIAM. ISBN: 978-1-611977-26-4

Kelley, C. T. (2023a). *MultiPrecisionArrays.jl*. https://github.com/ctkelley/MultiPrecisionArrays.jl. https://doi.org/10.5281/zenodo.7521427

Kelley, C. T. (2023b). *Newton's method in three precisions*. https://arxiv.org/abs/2307.16051