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Finite Element Method solver with 3D Brick Elements but without Matrix Assembly

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The paper describes a finite element method (FEM) solver for three-dimensional Poisson equation using hexahedral brick elements. This work extends the work of Valdman & Marcinkowski [1] on element-based FEM solvers that does not require assembly of the global matrix, but rather rely only on local, element matrices and a connectivity matrix.

The second part of the paper focuses on different strategies of speeding-up the code for calculating the element stiffness matrices and the connectivity matrix. The aim of the paper is to implement a solver that is able to work with models with millions of degrees-of-freedom.

Experiments of the solver ...

[1] Marcinkowski, L., Valdman, J. (2020). MATLAB Implementation of Element-Based Solvers. In: Lirkov, I., Margenov, S. (eds) Large-Scale Scientific Computing. LSSC 2019. Lecture Notes in Computer Science(), vol 11958. Springer, Cham. https://doi.org/10.1007/978-3-030-41032-2_69

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