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# A MULTIGRID METHOD FOR THE BIOT SYSTEM OF POROELASTICITY ON LOGICALLY RECTANGULAR GRIDS

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Poroelasticity models are present in many societal relevant applications such as geothermal energy extraction, $CO_2$ storage or hydraulic fracturing, among others. In [1], Maurice Biot established the general three-dimensional mathematical formulation for such models, in which the fluid flow and mechanical deformation within a porous media are coupled. In real applications, numerical simulation is mandatory, and a lot of effort has been put into searching suitable discretizations methods, and robust and efficient solvers for the algebraic systems arising from these problems.

In this work, we consider a combined multipoint stress–multipoint flux mixed finite element method for the discretization of the quasi-static Biot's model, recently introduced in [2]. This method is locally conservative, can be formulated on simplicial and quadrilateral meshes, and can handle discontinuous full tensor permeabilities and Lamé coefficients, which are typically associated with subsurface flows.

It is well known that solving the large systems of algebraic equations arising from the discretization of Biot's model is a crucial aspect in numerical simulations, due to the high computational cost that is required. Two relevant solution strategies for such systems are monolithic and iterative coupling methods. In this talk, we propose a monolithic technique based on geometric multigrid for the discretization scheme described in [2] when logically rectangular grids are considered. Such grids take advantage of recent computer architectures, which permit to improve the overall performance by using structured data. Finally, numerical results are presented to illustrate the robustness of the new solver with respect to the physical and discretization parameters of the model.

## REFERENCES

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