12 months post-doc position

Image method using mean-curvature flow for network models in complex fractured media

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Porous Networks Model (PNM) is a widely used method in porous media flow modeling (Giudici et al, 2023) since direct numerical simulations are computationally demanding (Guibert et al, 2015). Nevertheless, even if PNM provide interesting qualitative answer about local flow distribution, they need many improvements to be accurate (Raeini et al, 2018), some of those are hard to make generic. In the case of flows within fracture, the idea of finding the geodesic network of saddle points within two surfaces has been proposed in (Plouraboué et al, 2006). Even interesting, in the special case of smooth rough surfaces, this approach needs many improvements to be generic and applied and large 3D volumes. Recent investigations nevertheless confirm the idea that saddle nodes of the aperture map are the interesting feature to build networks onto, so as to improve accuracy and computational speed (Franc et al, 2021, Guibert et al, 2023).

The aim of this post-doc position is to carry-on an under-going new developed method, to geometrically build PNMs, in order to drastically simplify the transport properties of complex, fractured, heterogeneous media. The novelty of the method relies on considering surface rather than volumic mesh in order to build the mean-curvature flow leading to the discrete network. This method is already coded within our group, and we wish to prove and illustrate its capability for various applications in many different geometries.

Key words: porous networks model, mean-curvature flow, fracture networks
Expected skills: C and C++ programming, python language, scientific paper writing, experience in computational fluid dynamic
Practical information: starting between September 2023 and December 2023, located at IMFT, salary ~2500 euros per month

Bibliography

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Computational permeability determination from pore-scale imaging: sample size, mesh and method sensitivities, Guibert et al, *Transp. Por. Med.*, 2015.
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