On pore space decomposition

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Our goal is to understand the link between macroscopic properties of materials regarding transport phenomena and their microstructural geometry. With the use of microtomography, the 3D microstructure of porous media is made available, but before a pore-level characterisation can be made, the porosity must be decomposed into meaningful elements, a difficult process when considering real materials. We present and compare several decomposition methods, all which consist in two main steps. The first locates the pores, their number and connections, while the second determines their respective volumes. For the first step, methods based on the maxima of the distance transform of the pore space are sometimes used but have their limitations, and a topological approach using skeletonisation is preferred. The second step can be achieved with a region growth or watershed algorithm. By comparing different approaches, we can establish the criteria for a good decomposition, and thus extract meaningful parameters for potential correlations with macroscopic properties.

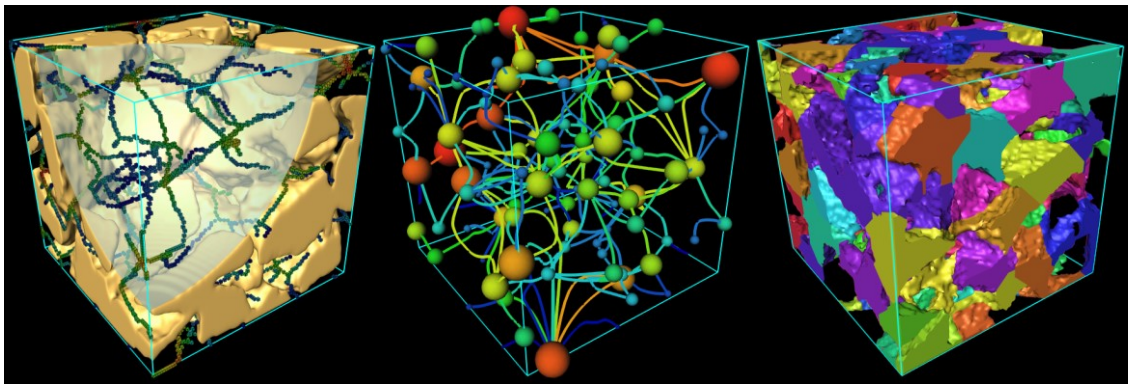

Illustration of a decomposition process: the left image shows a portion of the porous material with the skeleton of the pore space. The centre image is a graph representation of the skeleton, and the right image the result of a region growth using the nodes of the graph.

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