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## Three Dimensional Simulation of Fluid Flow in X-ray CT Images of Porous Media

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**Abstract:** A numerical scheme is developed in order to simulate fluid flow in three dimensional (3-D) microstructures. The governing equations for steady incompressible flow are solved using the semi-implicit method for pressure-linked equations (SIMPLE) finite difference scheme within a non-staggered grid system that represents the 3-D microstructure. This system allows solving the governing equations using only one computational cell. The numerical scheme is verified through simulating fluid flow in idealized 3-D microstructures with known closed form solutions for permeability. The numerical factors affecting the solution in terms of convergence and accuracy are also discussed. These factors include the resolution of the analysed microstructure and the truncation criterion. Fluid flow in 2-D X-ray computed tomography (CT) images of real porous media microstructure is also simulated using this numerical model. These real microstructures include field cores of asphalt mixes, laboratory linear kneading compactor (LKC) specimens, and laboratory Superpave gyratory compactor (SGC) specimens. The numerical results for the permeability of the real microstructures are compared with the results from closed form solutions. Keywords: X-ray CT images; flow; permeability; porous media; asphalt mix; non-staggered system; Navier?Stokes equations