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Connectivity-enhancing fracture segmentation from X-ray Tomography (XRT) images of reservoir core samples by machine learning-based method

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Extracting connected micro-fractures from 3D XRT images of carbonate and shale core samples is critically important to perform numerical fluid transport simulation in porous media, but difficult to honour their true connectivity because they are often distorted by noises, artefacts and the complex intersections among the fractures to appear disconnected in the imagery. These challenges can be overcome by utilizing connectivity information appropriately to enhance the structure of interests and to suppress others. We consider a solution by enforcing fracture connection using training images with traced fractures to learn segmentation classifiers using advanced computer algorithms. The learnt classifiers are shown to be able to determine whether a point belongs to one or more fractures or not, and yield segmented fractures of natural rock images with connectivity being superior to those obtained from multiscale Hessian fracture filtering technique on both synthetic images and real fractured shale and carbonate rock sample images.

References

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