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Current developments and research applications of the NIST NeXT system

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The NIST Neutron and X-ray Tomography (NeXT) system provides simultaneous complimentary multimodal information for the characterization of materials. Neutrons and X-rays provide complementary non-destructive probes due to the contrast differences that arise from the differences in interaction with matter for the two modes. NIST's NeXT system was initially commissioned in 2015 and has been operating fully in the Center for Neutron Research facility user program with robust demand. The system works by orienting at 90 keV microfocus X-ray tube orthogonally to the thermal neutron beam. With the truly simultaneous capture of the two modalities, it is possible to perform multimodal tomography of dynamic or stochastic samples while penetrating through sample environment equipment such as pressure and flow vessels. Through volume registration and data fusion of the two reconstructed volumes, improvements to image segmentation and phase identification can be made with 2D histograms that leverage the strengths of each mode. Current research applications using the NeXT system range from oil and gas recovery, strength of concrete and building materials, electrochemical energy storage and conversion, geophysics and geochemistry, and cultural heritage, among others. This talk will give an overview of the NeXT system, discuss several recent results obtained on the instrument, and detail future directions for improving the measurement method.

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