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Measurements of Fiber and Load-rate Effects on Micro- and Macro-fracture of Ultra-High-Performance Concrete

Prof. Eric N. Landis

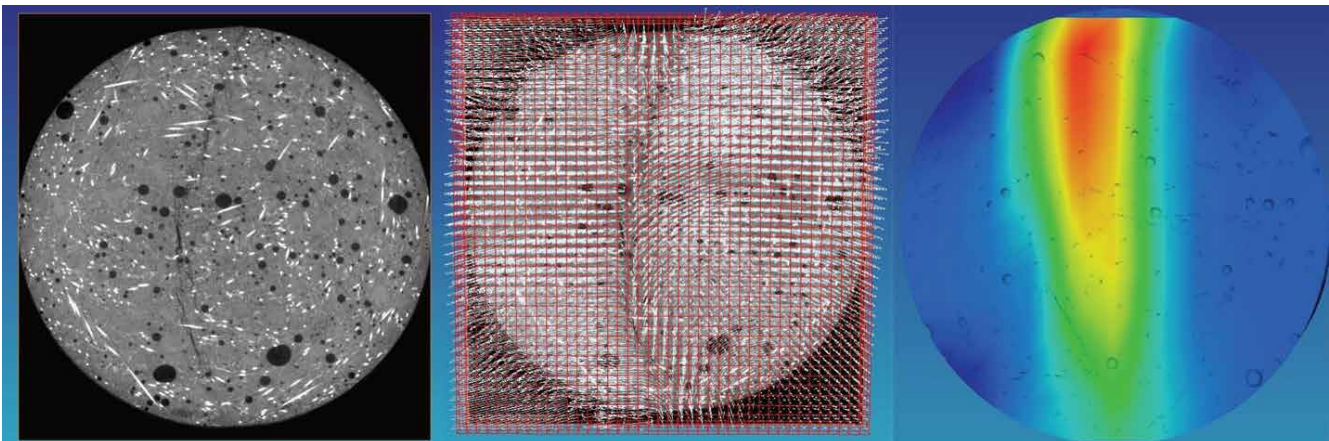
Civil Engineering, University of Maine, USA

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Advances in 3D imaging have opened up different ways to observe the internal mechanisms that dictate how a material dissipates energy under extreme loading conditions. Specifically, quantitative analysis of such 3D images allow us to measure fracture and damage in new ways. In the study presented here, several new analysis techniques were applied to an ultra-high-performance concrete subjected to different loading rates. The cylindrical specimens were subjected to x-ray CT scans to create 3D images of the material's internal structure. Using a combination of digital volume correlation and

discrete crack measurements we were able to break total damage down in macro-cracking and micro-cracking. Here the micro-cracking is defined as that due to the residual strain measured through DIC that is not visible as a macro-crack. While this definition is somewhat arbitrary and dependent on the resolution of the images, it allows us to quantify the effects of both loading rate and microstructure on the distribution of cracking and damage in the material. Such quantitative information can be used to tune and validate computational models for these materials.



Prof. Eric N. Landis

Eric N. Landis is Professor of Civil Engineering at the University of Maine. His research interests are in experimental mechanics, with particular focus on innovative laboratory techniques to capture mechanisms of failure in cement-based and wood-based composite materials. He also dabbles in computational modeling, biomimetics, burrowing marine invertebrates, and

other things he should probably keep his nose out of. He has PhD and BS degrees in civil engineering from Northwestern University and the University of Wisconsin, respectively. Prior to his graduate work he spent several years in civil engineering consulting. He is a licensed Professional Engineer in the State of Maine.