EERI–NYNE SPECIAL LECTURE 5/16/19

Structure-from-Motion & LIDAR: Computational Imaging Tools for Engineers

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Dr. Robert Kayen is a Professor at the University of California Berkeley in Geosystems Civil Engineering, affiliated faculty and Senior Research Scientist and Civil Engineer at the Pacific Science Center of the USGS where he has worked for nearly three decades. He also served as Adjunct Professor in the Department of Civil & Environmental engineering at UCLA, and previously was a Visiting Professor and Visiting Scholar at Kobe University, Japan. Kayen has authored over 350 research publications in the fields of earthquake geotechnical engineering, TLS-LIDAR, Structure-From-Motion geomatics, engineering geophysics, marine-geotechnics, and marine methane hydrate stability. He is one of the founders and long-time steering committee member of the National Science Foundation (NSF) sponsored Association of Geotechnical Extreme Events Reconnaissance (GEER). Dr. Kayen honors include the ASCE Middlebrooks Award, US Department of Justice Commendation awarded by the Environmental Division, and the NASA-Ames Honor Award. In 2017, he was an SFGI-U.C. Berkeley Distinguished Lecturer.

THE LECTURE

The Civil Engineering community is advancing the use of LIDAR and structure-from-motion (SFM) 3D topographic models for understanding the geometry of complex structural and earth deformations and has greatly benefited from these tools. For civil engineering deformation research, LIDAR & SFM are particularly useful for characterizing the dimensions of failures and for monitoring subtle deformations through time. This presentation will present the two technologies and an evaluation of the accuracy, bias, and dispersion of 3D data under controlled experimental conditions. Examples are given from recent field studies using LIDAR and SFM visualization and analysis from some recent extreme-events investigated by the National Science Foundation-funded GEER association. Ultra-high resolution imagery of complex surfaces allows the exploration and visualization of damage in orientations and scales not previously possible. Detailed understanding of the surface morphology allows for better numerical modeling of potential failure modes, deformation patterns, and morphologies. Finally, LIDAR and SFM technology provides for the permanent archiving of 3-D terrain.