

Abstract: Laser-based Structural Sensing and Damage Assessment, Y4

This research project explores the exploitation of visual sensing techniques and unmanned aerial system technologies to generate building information models and multi-scale structural analysis models, which represents as-is conditions of structures, to be used for structural health and condition assessment. In order to achieve this objective, we are developing methodologies and algorithms for processing the collected visual data towards extracting geometric and radiometric features, detecting and recognizing structural elements, establishing complete geometry representation, identifying and quantifying defects, and generating finite element meshes. In addition, we are also calibrating and validating material models for simulating fractures in structures which is essential for estimating structural damage under service loads and predicting the structural collapses under extreme loadings. We are requesting computing resources on XSEDE to calibrate and automatize the mesh generation algorithm, validate the generated structural analysis models against load testing measurements of selected in-service bridges, and complete the validation of our cyclic fracture simulation framework. Computing resources will be also utilized to start our next phase in this research project that includes the development of image-based damage detection algorithms, the damage assessment and collapse prediction of bridges and steel structures with semi-rigid steel/concrete composite diaphragms. In this renewal, we request an allocation of 341900 service units (SU) on SDSC Comet; 2000 GB of temporary storage of results on SDSC Data Oasis.