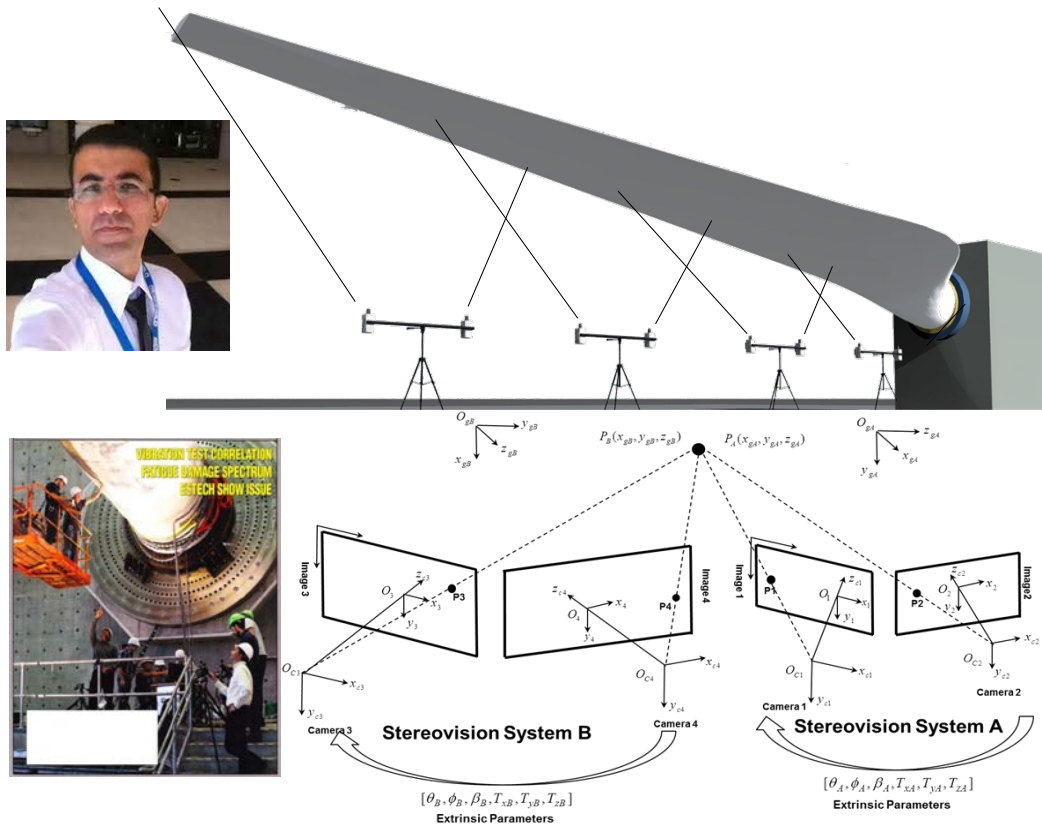## PHD DISSERTATION – PEYMAN POOZESH

A Multi-Camera Stereo DIC System For Extracting Operating Mode Shapes of Large Scale Structures

Stereo photogrammetry and three-dimensional (3D) digital image correlation (DIC) have recently received attentions for the collection of operating data on large wind turbine blades due to their non-contacting, rapid, and distributed measurement capability. Unlike conventional methods that only provide information at a few discrete points on a wind turbine blade, photogrammetry can provide a wealth of distributed data over the entire structure. One of the challenges with using a camera pair to observe a structure is the limited field of view. Because wind utility-scale turbines are so large and the physical limitations within a blade test facility, a single pair of DIC cameras may not be able to accurately measure the desired area of the structure. Thus, in order to perform a DIC measurement on a utility-scale wind turbine blade, it is desirable to couple several pairs of cameras to simultaneously measure the deformations of the entire blade. The measured deformations of each measured section of the blade needs to be stitched together to extract the deformation for the entire blade. In this thesis, a multi-camera 3D DIC measurement is used to identify resonant frequencies and corresponding operating shapes of a utility scale wind turbine blade placed in a cantilevered boundary condition. The setup is composed of multiple pairs of synchronized stereo cameras in which each pair of cameras measures a part of the blade's deformation

Peter_Avitabile@uml.edu   *Christopher_Niezrecki@uml.edu*   *Murat_Inalpolat@uml.edu*   *Zhu_Mao@uml.edu*