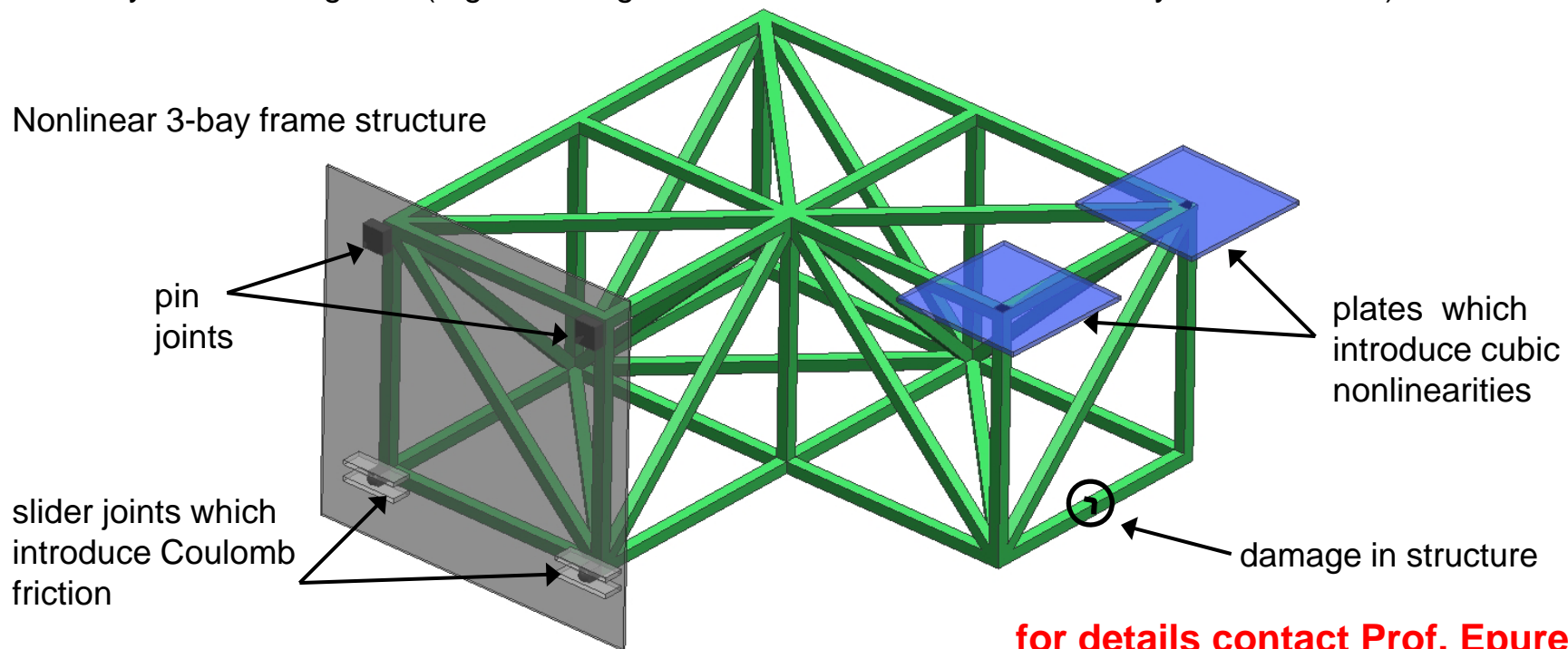


High-Sensitivity Damage Detection in Nonlinear Systems

Current vibration-based damage detection methods have significant limitations and exhibit low performance when applied to nonlinear and high-dimensional systems. We take a radically different approach, and overcome these existing limitations through the development of robust and highly sensitive nonlinear techniques for identifying the location and level of multiple, simultaneous damages. One of the enabling key advancements is our novel approach for modeling nonlinear systems using augmented linear system models.

We focus on space vehicles and structures where their complex and nonlinear dynamics is monitored for assessing structural integrity. For example, we develop monitoring technology for thermal shielding components during operations such as reentry into the earth's atmosphere. Also, we develop diagnostic technology for integrated structural health monitoring of complex systems comprised of interacting structures, flows, hydraulic systems, and electromechanical components. We develop technology which can handle nonlinearities (such as Coulomb friction and cubic stiffnesses). Also, we obtain higher sensitivities by creating novel optimal auxiliary signals for system interrogation (e.g. we design nonlinear controllers for sensitivity enhancement).



for details contact Prof. Epureanu