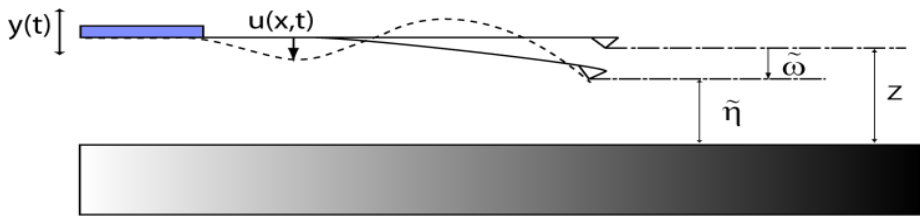
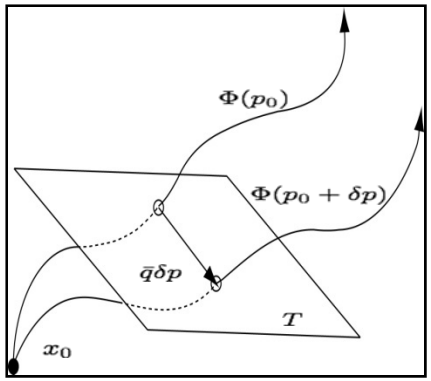
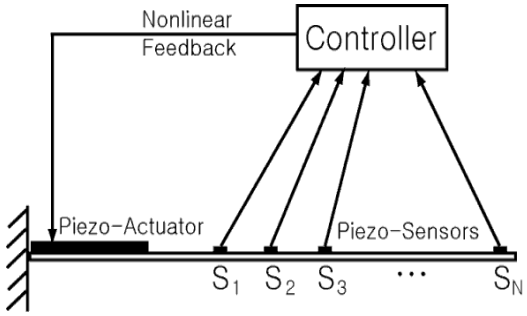
Sensors Based on Nonlinear Dynamics and Active Interrogation

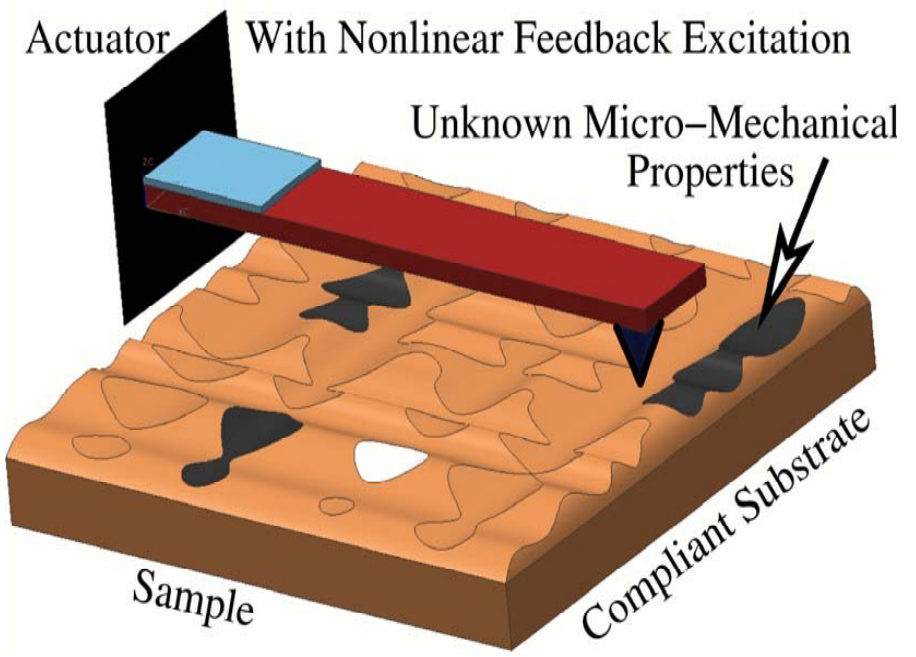
Several current micro-sensing technologies are based on vibratory responses, such as bio-chemical detectors (which use mass measurements) and tapping-mode atomic force microscopy. In those technologies, highly nonlinear systems can provide increased sensitivity and selectivity. In that context, we are creating a comprehensive and radically novel sensing paradigm which provides ultra high sensitivity, robustness, as well as multi-functional sensing capabilities (e.g. sensor self-calibration).

We develop the next generation of high-sensitivity micro-fluid-structural sensors and enable fundamentally novel sensing capabilities for bio-detection, the measurement of micro-mechanical properties, the identification and characterization of micro-fluid-structural phenomena, and homeland defense applications. These capabilities are obtained by three key advancements of sensing technology: (a) active (feedback) and nonlinear sensor interrogation; (b) attractor-based and bifurcation-based sensing (through the identification of attractor and bifurcation morphing modes and sensitivity vector fields); and (c) high-sensitivity sensing obtained by adaptively enhanced nonlinear dynamics.









for details contact Prof. Epureanu