Advanced CAD System for Electromagnetic MEMS Interactive Analysis (Academia)

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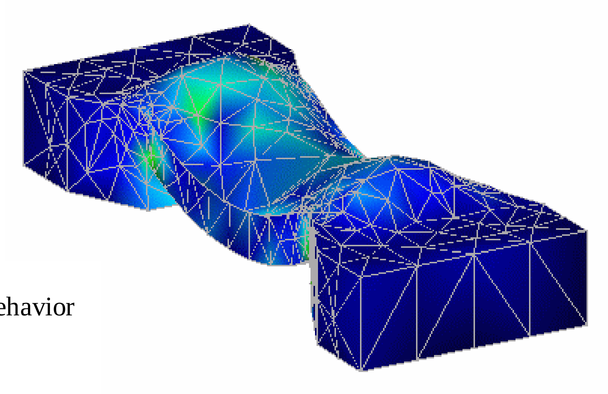

Simulation of RF Switch—both geometry modeling and FEM behavior analysis.

Objectives:

This project will demonstrate key new CAD tools that support creation of geometrically accurate MEMS structures, including process dependencies, and supporting FEM analysis of the multi-physics needed to simulate behavior of RF switches. A range of test structures for characterization of MEMS are being developed:

1. Canonical test structures that will directly benchmark CAD models leading to reduced-order behavioral models needed for design,
2. Materials extraction for fatigue and failure modeling and
3. Structures that provide extraction of materials parameters that support practical applications, including the demonstration of new materials for MEMS applications.

Progress/Results:

A prototype system has been demonstrated for the creation of MEMS-based RF switches that: uses VRML as a portable geometry representation, exploits advanced deposition/etching simulations to capture process dependencies and uses a flexible FEM analysis framework to simulate coupled-domain, multi-physics behavior of the structures. Test structures built using the MUMPS process have provided new electrical means to benchmark structural and electrical characteristics of MEMS-based RF switches; these devices will serve as part of the canonical test structure suite for Composite CAD. Materials characterization efforts have shown details of aluminum fatigue, including microstructure features during failure, for devices tested under uniaxial stress. An array of test structures has been fabricated and characterized for aluminum MEMS layers in support of both new applications using metal structures and the supporting extraction of parameters for CAD modeling of them.

Project Status:

Current efforts are focused on three major targets: a) completion of the canonical test structures (using MUMPS) that benchmark the CAD tools and provide realistic evaluation of application-oriented devices, b) development of new metal layers along with supporting modeling data that demonstrate new applications-pull for RF MEMS and c) materials characterization of these layers that quantify the critical factors that help to define range of operating conditions, limited by fatigue (and failure).