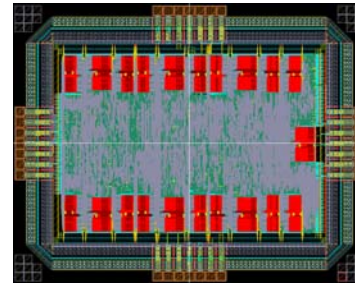


Goals and Potential Impact if Successful

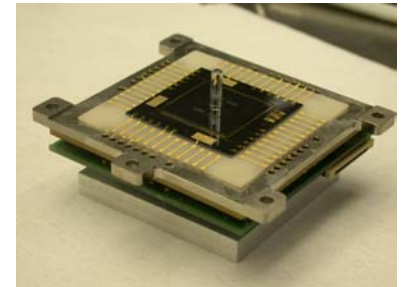
- Microelectromechanical systems are stimulating the move of modern digital control “on chip” for a growing number of sophisticated applications
- One such application is microinertial sensors of ever increasing capability bring inertial awareness to virtually anything that moves
- Modeling, identification and control of this particular genre of MEMS developed through a Boeing and UCLA collaboration is presented as an illustration on the rising edge of this revolutionary transition in the realization and theory of modern control systems

UCLA ASIC & Algorithms



+

Boeing/JPL gyro



= High performance,
low cost sensor

Accomplishments

- Automated tuning of sensor dynamics using ARX algorithms
- Precision frequency response estimates of sensor dynamics using closed-loop identification reveals details of slowly time-varying dynamics
- Analysis and implementation of nonlinear feedback compensation used in this class of devices
- Realization of control and filtering algorithms as a low-power, programmable ASIC that may be configured for individual sensors
- Applications to the Boeing/JPL rate gyros and the HRL Laboratories' electron tunneling sensors

Bottlenecks and Open Research Questions

- System id methods to support rapid throughput: require models for calibration, tuning and control; each stress different aspects of the sensor dynamics
- Develop alternative control architectures for maximizing performance
- Develop diagnostic tools for pinpointing “nonidealities” during manufacturing process so corrective action may be taken