Microelectromechanical Systems

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A Complete MEMS Analysis System and Implementation

Sponsors

Computer Microvision for Microelectromechanical Systems (MEMS)
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Microelectromechanical Systems (MEMS) are devices that react mechanically to electrical stimuli. They can be used to create complex machines with micron feature sizes. MEMS is an enabling technology where current applications include accelerometers, pressure, chemical and flow sensors, micro-optics, optical scanners, and fluid pumps.

MEMS are fabricated using batch-processing techniques similar to those utilized in the design of digital/analog integrated circuits (IC's). Unlike electronics, however simple methods for testing MEMS devices do not exist. This imposes limitations on their design and manufacture. Since designers cannot visualize the actual motion of the structures that they build, mechanical problems can go undiscovered. Furthermore, manufacturing costs can be high since mechanical testing may not be practical until late in the manufacturing process. This is where computer microvision acts as a good analysis stool to analyze the X, Y, and Z motions of a MEMS device during the development and testing stages of the design process.

Computer microvision is an evolving field where common machine vision algorithms are used to analyze microscopic devices. In computer microvision, a computer system works with a microscope and external hardware for data acquisition. It then processes the results either locally or remotely. Previous applications of computer microvision include the study of the tectoral membrane of the inner ear.

The underlying principle of a computer microvision system is light microscopy and video imaging. External hardware stimulates the device to be tested and generates pulses that control the stroboscopic illumination. Images acquired from a camera at multiple phases of motion can then be inspected and also processed by software.

Presentations

"ERNI-3D: A Technology-Generic Tool for Interconnect Reliability Projections in 3D Integrated Circuits," Syed M. Alam, Donald E. Troxel, and Carl V. Thompson, poster presented at the Interconnect Focus Center Workshop at M.I.T, Cambridge, Mass., March 30, 2001

Publications

Theses

Alam, Syed M., "ERNI-3D: A Technology-Generic Tool for Interconnect Reliability Projections in 3D Integrated Circuits," Master of Engineering, Department of Electrical Engineering and Computer Science, M.I.T., June 2001.

Seth, Danny, "A Remotely Automated Microscope for Characterizing Micro Electromechanical Systems {MEMS)," Master of Engineering, Department of Electrical Engineering and Computer Science, M.I.T., June 2001.