

# Reliability Enhancement of Bio MEMS Based Cantilever Array Sensors for Antigen Detection System Using Heterogeneous Modular Redundancy

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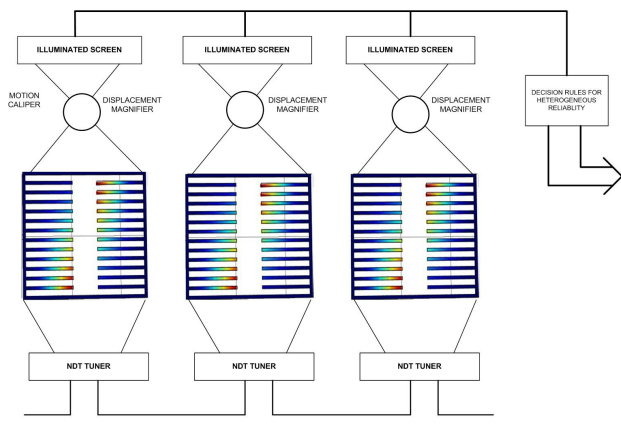
## Abstract

The objective of the work is to propose a reliability enhancement model for antigen detection system (ADS) using bio MEMS based cantilever array sensors using heterogeneous modular redundancy technique. The reliability of the ADS is expressed in terms of the constituent sub systems which are heterogeneous not only in their respective structures and behaviors but also in their forms. The possible modes of operation of micro cantilevers are considered and the design diversity principle is applied to enhance the system reliability. The chemical, structural, thermal and mechanical faults are covered to determine the overall reliability of the proposed ADS through modular redundancy. The sensitivity and specificity of the antibody and the antigen are considered to derive the reliability of individual cantilever. The interaction or binding between antigen and antibody is simulated and the displacement results are achieved using COMSOL Multiphysics. The reliability of the redundant heterogeneous design is assessed using a workflow approach.

## Reference

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- [2] Jeremy A. Walraven,”Future Challenges for MEMS Failure Analysis”, Sandia National Laboratories. Albuquerque, NM USA.
- [3] “Reliability in MEMS Packaging”, Microsystems Design and Packaging Laboratory, Dept. of Mechanical and Aerospace Engineering, San Jose State University, San Jose CA.

## Figures used in the abstract



**Figure 1:** A design model for reliability enhancement using heterogeneous modular redundancy.