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CHARACTERIZATION OF THE TIME-EVOLVING BENDING PROFILE OF MICRO-CANTILEVERS

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Introduction

- We present the statistical analysis of IBM style 8 cantilever sensors that are chemically functionalized for sensing specific biomolecules using a DVD-ROM optical drive [1].
- Several micromechanical-based sensing tools have been verified by their detection capabilities [2].
- In this work, we present new insight on the behavior of cantilevers made possible using a fully automated system for parallel microcantilever-based biosensing and statistical analysis of data [3].
- We are detecting an inflammatory biomarker, Soluble Urokinase Plasminogen Activator Receptor (suPAR).

Conclusions

- It is a great advantage to collect a multitude of data points, as this enables more robust data processing.
- The approach can be used to automatically verify integrity of data.
- The approach prevents that the presence of anomalies or data loss leads to misleading conclusions.
- We believe that it is paramount that cantilevers are scanned in multiple areas in order to ensure sensor reliability.

Signal integrity verification

- The static response over time can be visualized and the quality of the cantilever surface assessed.
- The surface of cantilevers can be rather inhomogeneous and it varies from cantilever to cantilever.
- However, cantilever responses are “quite” stable over time, and this allows both for reliable data integrity verification, as well as estimating static response in case of missing cantilever readouts.

Cantilever surface analysis

- The AFM approach uses an optical leverage system with a spot size of roughly 30 µm, the DVD pick-up has a spot size of ~0.6 µm and scans ~2000 locations across each cantilever apex.
- Each suPAR experiment collects ~2 GB data, and using a MATLAB program anomalies are located and the response is calculated using clean areas only.
- The standard deviation of the points near the anomaly is more than one order of magnitude larger compared to the smooth areas.
- The collected data allows a more precise readout profile and provides a qualitative assessment of the sensor surface.

REFERENCES