MEMS Introduction

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In contemporary society, the MEMS devices has done a significant role in many field, such as…. The scaling of MEMS devices reduces the cost per device although the total cost to fabricate one one wafer. This is because the number of devices on each wafer increase dramatically with the decrease of the feature size of MEMS devices. In addition, the finer fabrication process provides high performance of MEMS devices, e.g. the accuracy and precision of MEMS sensors are orders of magnitude higher than conventional sensors. Therefore, MEMS has become a focus of both fundamental research and applicable engineering. Among all the MEMS applications, the comb drive uses electrostatic force as the actuation principle. 2 More specifically, more and more scientists prefer to use the comb drives for electrostatic actuation, capacitive position sensing and frequency turning.3 [3]They have become an inalienable part of many MEMS devices such as accelerometers, gyroscopes, and micro scanners and so forth.4 (here you should put the problem of MEMS devices, like “since it has multiple fingers, the design and optimization of comb drive sensor becomes a challenge for the society”)

The fabrication technique of the MEMS is becoming more and more mature. Many people have already done some researches about COMS-MEMS which can achieve the aim of realizing out-of-plane actuation and displacement-sensing.5 3Furthermore, it’s also famous to apply it for designing, some scientists have already successfully designed and tested 1-D analog scanning micromirror arrays with hidden vertical comb-drive actuators.6And there are also some people using comb drive to solve out sophisticated problems like to overcome the difficulties of isolating two stationary capacitor comb sets in bulk micromachining by the electrically.7Whereas, those results just lack some visualization, which means the results of them are fixed and hard to show the change of the model.

In this work, I used the new simulate software---COMSOL to make the model more vivid and visual by the moving mesh. The study of the vertical comb-finger actuation for CMOS MEMS is also been realized, simulated and tested, in addition, behavioral simulation using the 3-D NODAS library matches the experimental results within 7% for frequency response. 3Comparing with my work, I do more about the frequency domain to optimize the model which nobody has involved in this filed. I also used fingers to make it parameterized, which can easily change the structure and the parameters of the model.

References

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