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Abstract
This study investigates the possibility to improve the performance of a capacitive multi-axis micro-accelerometer. Despite of its advantage on the size-effect, the capacitive micro-accelerometer encounter still some drawbacks, such as weak output signal, insufficient bandwidth, poor sensitivity and nonlinear behavior. By introducing the feedback mechanism with modulation-demodulation, followed by signal processing, the desired improvement is achieved, namely clearer signal better sensitivity and more linearity. The equation is based on linear system and simulated with damping rate is 0.707.

According the result of simulations, the system reaches its stability within 0.6 ms with the sensitivity of 18 mv/g for x-axis direction and the sensitivity of 23 mv/g for y-axis direction under the conditions of a 10 g external acceleration.

Through a series of simulations under the conditions of a 10 g external acceleration, it is found that the system reaches its stability within 0.6 ms with the sensitivity of 18 mv/g for x-axis direction and 23 mv/g for y-axis direction. Then, the simulations with the external acceleration ranging from 5 to 50 g are conducted and its sensitivity was 18, 23mv/g.

Because the acceleration of signal direction to effect x, y-axis and make them to generate the displacement. According above factor, the output signal of 2-axis is simulated with acceleration of 1-axis. First, the simulation under the conditions of a 10 g external acceleration for x-axis direction, the system reaches its stability within 6 ms with the sensitivity of 18 mv/g. It is found that the output signal of y-axis is smaller than x-axis. Second, the simulations with the external acceleration ranging from 5 to 50 g for x-axis direction are conducted and its sensitivity was 18 mv/g. Third, the simulation under the conditions of a 10 g external acceleration for y-axis direction, the system reaches its stability within 0.6 ms with the sensitivity of 23 mv/g. It is found that the output signal of x-axis direction is smaller than y-axis direction. Final, the simulations with the external acceleration ranging from 5 to 50 g for y-axis direction are conducted and its sensitivity was 23 mv/g.

It is shown the proposed controllable law is expected to reach optimal sensitivity and linearity for x-axis direction and y-axis direction.

In the future, the CMOS-based control electric circuits with the micro-structure of the micro-accelerometer manufactured also by CMOS technology.
Advisory Committee Jong-Zen Huang - advisor

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